



THE UNIVERSITY OF DANANG
UNIVERSITY OF ECONOMICS

in conjunction with



is proud to present

**The 1st International Student Research
Conference on Economics and Business
(SR-ICYREB 2022)**

Sponsored by



Welcome



On behalf of The University of Danang, University of Economics, I'd like to welcome you to the 1st International Student Research Conference on Economics and Business. SR-ICYREB 2022 is honored to have the BIDV, Vietcombank, and VietinBank as our key sponsors, and we hope that all of you will continue to support us in the future.

The SR-ICYREB aims to create and develop an environment for research students' academic exchange from higher education institutions in economics, business, and management. The annual event is to promote students' scientific research activities in the period of international integration and in responding to the "New Normal" of the post-Covid-19 pandemic.

In closing, I'd like to recognize the hard work of the organizing committee, including our partner universities. I wish you well in your discussions.

A/P. Manh Toan Nguyen,
Rector

On behalf of the organizing committee, I would like to welcome you to the 2022 International Student Research Conference on Economics and Business (SR-ICYREB).

Following the success of last seven consecutive years' conferences of International Conference for Young Researchers in Economics and Business (ICYREB) from 2015 through 2021; today, we are honored to be the host for the first ICYREB version for research students in our beautiful Danang city. This initiative presents a tremendous opportunity for students and their supervisors to collaborate and develop new ideas, and explores the current and emerging trends on a domestic and international scale.

We are especially honored to have an expert in NFTs and cryptocurrencies, Professor Mieszko mazur, as our keynote speaker.

The event has an impressive line-up of presenters and talented students and I thank them for their time and for sharing their insights. I hope you find this conference inspiring, transformative and enjoyable.

A/P. Thuy Anh Vo,

Vice Rector for Research & International Cooperation

Keynote Speaker



Associate Professor MAZUR Mieszko,
*Professor of Finance, ESSCA School of
Management, France.*

Professor MAZUR obtained PhD in Management Sciences and Finance at Tilburg University.

His research interests include several aspects of financial markets - their design and market microstructure, blockchains, cryptocurrencies and decentralized finance.

Professor MAZUR has served as the editorial committee member of several academic

professional journals in Finance, including *Journal of Banking & Finance*, *Applied Economics*, *Journal of Multinational Financial Management*, and *Finance Research Letters*. He also received a number of research grants from European Commission Research Fellowship Program and European Commission.

His research has been published in peer-reviewed journals including *Journal of Financial Markets*, *Journal of Alternative Investments*, *Journal of Applied Corporate Finance*, *Finance Research Letters*, and *Journal of Small Business Management*.

Organizing Committee

- Assoc. Prof. Nguyen Manh Toan, *The University of Danang - University of Economics*
- Assoc. Prof. Vo Thi Thuy Anh, *The University of Danang - University of Economics*
- Prof. Tran Thi Van Hoa, *National Economics University*
- Assoc. Prof. Bui Huy Nhung, *National Economics University*
- Assoc. Prof. Nguyen Thi Bich Loan, *Thuongmai University*
- Assoc. Prof. Truong Thi Thuy, *Academy of Finance*
- Assoc. Prof. Le Van Luyen, *Banking Academy of Vietnam*
- Assoc. Prof. Nguyen Anh Thu, *University of Economics and Business – VNU Hanoi*
- Assoc. Prof. Dao Ngoc Tien, *Foreign Trade University*
- Assoc. Prof. Truong Tan Quan, *University of Economics – Hue University*
- Prof. Su Dinh Thanh, *University of Economics Ho Chi Minh City*
- Assoc. Prof. Hoang Cong Gia Khanh, *University of Economics and Law – VNU HCMC*

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- Assoc. Prof. Dang Huu Man, *The University of Danang – University of Economics*
- Assoc. Prof. Pham Thi Bich Chi, *National Economics University*
- Assoc. Prof. Tran Manh Dung, *National Economics University*
- Assoc. Prof. To Trung Thanh, *National Economics University*
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- Tran Thi Phuong Lien, *Academy of Finance*
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- Assoc. Prof. Nguyen Thuy Duong, *Banking Academy of Vietnam*
- Assoc. Prof. Nguyen Ha, *Banking Academy of Vietnam*
- Dr. Nguyen Duc Lam, *University of Economics and Business – VNU Hanoi*
- Assoc. Prof. Vu Hoang Nam, *Foreign Trade University*
- Assoc. Prof. Hoang Trong Hung, *University of Economics – Hue University*
- Dr. Pham Xuan Hung, *University of Economics – Hue University*
- Dr. Pham Duong Phuong Thao, *University of Economics Ho Chi Minh City*
- Assoc. Prof. Trinh Quoc Trung, *University of Economics and Law – VNU HCMC*
- Truong Trong Hieu, *University of Economics and Law – VNU HCMC*

Program at a Glance

| Saturday, July 30 th 2022 (GMT+7) | | |
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| 07.45-08.15 | Welcome and Opening Remarks | Main Hall A |
| | Associate Professor Thuy Anh Vo <i>Vice-Rector, University of Economics, The University of Danang (Vietnam)</i> | |
| 08.15-08.30 | ICYREB Group MOU signing ceremony | |
| 08.30-09.15 | Keynote Address | Main Hall A |
| | Digital Economy. On the importance of NFTs, cryptocurrencies, and metaverse Associate Professor MAZUR Mieszko <i>ESSCA School of Management (France)</i> | |
| 09.15-09.30 | Tea-break | |
| 09.30-12.00 | Parallel Sessions | |
| Eco 1. Economics & International Economics | | Building D Room D.101 |
| Co-Chairs: Assoc. Prof. Vu Hoang Nam (FTU), Dr. Nguyen Thanh Dat (UD-DUE) | | |
| 09.30-09.55 | Research impact of the shadow economy on income inequality <i>Authors: Le Huyen Trang, Bui Ngoc Nhung, Vu Tien Dat, Ly Thi Hoai (Banking Academy of Vietnam)</i> | |
| 09.55-10.20 | Does macroprudential policy foster or constraint economic growth? <i>Authors: Nguyen Thi Phuong Thao, Nguyen Ngoc Tram (University of Economics and Business – Vietnam National University Hanoi)</i> | |
| 10.20-10.45 | Economic integration and energy intensity: An empirical study from Asia-Pacific countries <i>Authors: Nguyen Thi Ngoc Linh, Nguyen Phuong Duy, Nguyen Thao Nguyen (University of Economics Ho Chi Minh City)</i> | |

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| 10.45-11.05 | <p>Does rising gasoline price affect the shifts in selection on means of transportation? Vietnamese students' perspectives</p> <p><i>Authors: Le Thanh Bao Ngan, Do Hoai Bao, Cao Do Thu Huong, Ly Thi Tuyet Nhung (Hoa Sen University)</i></p> |
| 11.05-11.30 | <p>Socio-economic impact of the Covid-19 pandemic on tourism: Preliminary evidence from labors working in Hue city</p> <p><i>Author: Nguyen Gia Tieu Ngoc (University of Economics – Hue University)</i></p> |
| <p>Eco 2. Economics & International Economics</p> | |
| <p>Building D Room D.102</p> | |
| <p>Co-Chairs: Dr. Nguyen Hoang Dung (UEL), Dr. Pham Xuan Hung (HU-HCE)</p> | |
| 09.30-09.55 | <p>Investigate the impact of Covid-19 on commercial and service sectors in Danang</p> <p><i>Authors: Tran Thi Huyen Trang, Le Thi Phuong Anh, Nguyen Thi Phuong Dung, Nguyen Tien Vuong (The University of Danang – University of Economics)</i></p> |
| 09.55-10.20 | <p>Promoting the theoretical and practical value of the price – salary – money reform</p> <p><i>Authors: Cu Hoang Lam Vu, Nguyen Thi Huyen, Le Thi Hong Nhung, Pham Quang Nhat Minh (Academy of Finance)</i></p> |
| 10.20-10.45 | <p>Enterprise digital transformation and labor productivity: An empirical study in Vietnam</p> <p><i>Authors: Nguyen Thi Hang, Tran Thi Quynh Nhu, Hua Thi Thanh, Nguyen Thi Lan Anh, Nguyen Hoa Kim Thai (University of Economics and Law – Vietnam National University Ho Chi Minh City)</i></p> |
| 10.45-11.05 | <p>The role of foreign supplier diversification in export performance: An empirical study on Vietnam's textile industry</p> <p><i>Authors: Dang Thi My Hanh (The University of Danang – University of Economics)</i></p> |
| <p>Eco 3. Economics & International Economics</p> | |
| <p>Building D Room D.104</p> | |
| <p>Co-Chairs: Assoc.Prof. Truong Hong Trinh (UD-DUE), Tran Thi Phuong Lien (AOF)</p> | |
| 09.30-09.55 | <p>Institutional quality in Vietnam's provinces and economic growth</p> <p><i>Authors: Luong Bao Thanh Khoa, Hoang Hai Dan, Nguyen Nhat Vy (University of Economics Ho Chi Minh City)</i></p> |

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| 09.55-10.20 | Debt, growth opportunity and investment of Vietnam listed companies <i>Authors: Dang Van Tan, Huynh Thi Tuyen, Le Thi Thao Nhi, Tran Ly Hoang Quyen, Nguyen Duy Anh (University of Economics and Law – Vietnam National University Ho Chi Minh City)</i> | | |
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| 10.45-11.05 | Impact of organizational capacity and social-economic conditions on choosing structural or non-structural flood mitigation strategy in Vietnam <i>Authors: Pham Tien Duy, Vo Thi Hue, Nguyen Thi Thanh, Luong Thi Duong (National Economics University)</i> | | |
| <table border="1" style="width: 100%; background-color: #f4a460; color: white;"> <tr> <td style="width: 70%; padding: 5px;">Bus 1. Management and Business</td> <td style="width: 30%; padding: 5px; background-color: #008000; color: white;">Building D Room D.105</td> </tr> </table> | | Bus 1. Management and Business | Building D Room D.105 |
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| Co-Chairs: Assoc. Prof. Nguyen Thi Minh Nhan (TMU), Dr. Phan Hoang Long (UD-DUE) | | | |
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| 10.45-11.05 | Purchase intention of smart home services in Ho Chi Minh city and vicinity: A stimulus – organism – response model <i>Authors: Doan Thanh Thien Kim, Huynh Quang Bach, Phan Mai Thuy Trinh, Do Thanh Danh (University of Economics Ho Chi Minh City)</i> | | |
| 11.05-11.30 | Factors influencing on fake news sharing behaviour about Covid-19 on social media <i>Authors: Tran Thi Phuong Vy, Pham Minh Chau, Nguyen Thi Hai Nguyet, Truong Pham Bao Nhi, Pham Khanh Linh (University of Economics and Law – Vietnam National University Ho Chi Minh City)</i> | | |

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| 11.30-11.55 | <p><i>“Coolness is in the eyes of the beholder”</i> Children as consumers and beholders of brand coolness</p> <p><i>Authors:</i> Nguyen Thi Ngoc Trinh, Ngo Thi Toan (The University of Danang – University of Economics)</p> |
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| <p>Co-Chairs: Assoc. Prof. Tran Van Trang (TMU), Dr. Tran Thanh Thu (AOF)</p> | |
| 09.30-09.55 | <p>The impacts of authentic leadership on employee’s satisfaction</p> <p><i>Authors:</i> Do Thuy Linh, Luong Hoang Lan, Pham Thi Hong Diep, Phan Thi Hanh (Banking Academy of Vietnam)</p> |
| 09.55-10.20 | <p>Research impact of financial literacy on students’ use of black credit in Hanoi city</p> <p><i>Authors:</i> Ngo Thu Uyen, Le Hoang Long, Nguyen Anh Tu, Pham Thi Hong Nhung, Ha Hoang Nam (Banking Academy of Vietnam)</p> |
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| 10.45-11.05 | <p>Factors influencing the behavioral intention to use mobile learning in online learning of students studying at universities in Ho Chi Minh City</p> <p><i>Authors:</i> Nguyen Le Lam Tuyen, Hoang Thi Kim Nguyen, Luong Ngoc Hien, Tran Thanh Tuyen (University of Finance – Marketing)</p> |
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| 11.30-11.55 | <p>Factors affecting the effectiveness of E-learning during the Covid-19 pandemic</p> <p><i>Authors:</i> Dang Khanh Uyen, Pham Thi Y Nhi, Bui Thi Hai Yen, Nguyen Pham Ngoc Nam, Nguyen Quang Minh (Academy of Finance)</p> |
| <h2 style="color: white; margin: 0;">Bus 3. Management and Business</h2> | |
| <h3 style="margin: 0;">Building D Room D.201</h3> | |
| <p>Co-Chairs: Dr. Pham Thu Trang (BAV), Dr. Tran Trieu Khai (UD-DUE)</p> | |
| 09.30-09.55 | <p>The influence of user-generated content (UGC) on the purchase intention of generation Z customers case of Ho Chi Minh City</p> <p><i>Authors:</i> Le Minh Anh, Nguyen Ngoc Hoang, Hoang Ngoc Mai, Huynh Nhu Ngoc, Phung Hieu Minh (University of Economics and Law – Vietnam National University Ho Chi Minh City)</p> |

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| 10.20-10.45 | Factors affecting Hanoian consumers' attitude and behavior towards eco-friendly bags: A PLS-SEM approach <i>Authors: Nguyen Duong Viet Anh, Nguyen Thi Lan Anh, Vu Nguyen Boi Linh, Trinh Huong Mai, Nguyen Thuy Trang</i> (Foreign Trade University) | | |
| 10.45-11.05 | Do the characteristics of SME owners affect the decision to perform technological innovations? An empirical research in Vietnam <i>Authors: Nguyen Phan Hoang Minh, Tran Gia Bao, Pham Hoang Duy, Vo Pham Anh Khoa, Nguyen Khoa Nguyen</i> (Foreign Trade University) | | |
| 11.05-11.30 | Solutions to improve business efficiency of listed coal companies in Vietnam <i>Authors: Vu Khanh Linh, Ngo Phuong Linh, Phung Thanh Thao, Bui Thi Minh Anh, Nguyen Tuan Kiet</i> (Academy of Finance) | | |
| <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="background-color: #f4a460; padding: 10px;">BI 1. Business Intelligence</td> <td style="background-color: #008000; color: white; padding: 10px;">Building D Room D.202</td> </tr> </table> | | BI 1. Business Intelligence | Building D Room D.202 |
| BI 1. Business Intelligence | Building D Room D.202 | | |
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| 09.30-09.55 | Factors affecting students' intention of using e-wallets - An empirical research with MoMo E-wallet <i>Authors: Dang Ngoc Minh Quang, Nguyen Thi Song Ha</i> (Thuongmai University) | | |
| 09.55-10.20 | Online food delivery services (OFDS) in Ho Chi Minh city in the new normal state: A study of the factors influencing consumers' behavioral decision, satisfaction and loyalty <i>Authors: Truong Thuc Nghi, Nguyen Tien Loi, Nguyen Ly Do Quyen, Ha Tuong Vi, Vo Thi Nhat Vi</i> (University of Economics Ho Chi Minh City) | | |
| 10.20-10.45 | Make me trust or give me joy: Mechanisms inducing consumer purchase intention in live streaming commerce <i>Authors: Nguyen Van Thao, Ho Kha Mung, Pham Thi Le Hang</i> (The University of Danang – University of Economics) | | |
| 10.45-11.05 | A research on young customers' usage decisions in Vietnam for Fintech's products and services <i>Authors: Nguyen Luu Hoai Thuong, Nguyen Thi Nhat Anh, Pham Thi Thanh Tu, Truong Thai Ngoc, Nguyen Hoang Vinh</i> (University of Economics Ho Chi Minh City) | | |

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Co-Chairs: **Dr. Su Ngoc Diep, Dr. Truong Tran Tram Anh (UD-DUE)**

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| 09.30-09.55 | The Impact of Electronic Word-of-Mouth (EWOM) on the purchase intention of northern Vietnamese youth on E-commerce platforms <i>Authors: Vu Thi Tra My, Hoang Minh Anh, Phung Thi Kim Dung, Nguyen Ha My, Le Thi Thanh Nhan (Foreign Trade University)</i> |
| 09.55-10.20 | The impacts of socio-cultural factors on intention to use Airbnb in Hanoi <i>Authors: Nguyen Ha My, Nguyen Huu Binh Nguyen, Nguyen Thao Hau, Hoang Nguyen Long, Nguyen Thi Minh Tam (National Economics University)</i> |
| 10.20-10.45 | Factors affecting Vietnamese youth's intention to use Chatbots in online shopping <i>Authors: Nguyen Phuong Anh, Vu Minh Anh, Nguyen Minh Thanh, Phan Van Vu (National Economics University)</i> |
| 10.45-11.05 | Factors effect on the pro-environmental behavior in the workplace in Ha Noi, Vietnam <i>Authors: Nguyen Duc Thang, Nguyen Thi Phuong, Nguyen Phuong Thao, Duong Thi Thu Trang, Nguyen Duc Truong (National Economics University)</i> |

Fin 1. Accounting, Finance & Banking

Building D
Room D.205

Co-Chairs: **Dr. Pham Thu Thuy (BAV), To Cong Nguyen Bao (UEH)**

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| 09.30-09.55 | Examine the impact of financial constraints on firm performance of enterprises listed on the Ho Chi Minh Stock Exchange in the context of the Covid – 19 <i>Authors: Nguyen Khanh Linh, Hoang Dieu Linh, Le Thi Thanh Ngan (Banking Academy of Vietnam)</i> |
| 09.55-10.20 | A deep - net approach to scenario generator: Application for bank stress test <i>Authors: Vu Hoang Lan (University of Economics and Business - Vietnam National University Hanoi)</i> |
| 10.20-10.45 | Impact of taxation on dividend: Evidence from Vietnam <i>Authors: Nguyen Gia Khiem, Luong Bao Thanh Khoa, Nguyen Nhat Vy (University of Economics Ho Chi Minh City)</i> |
| 10.45-11.05 | Digital transformation in banking - Situation and solutions <i>Authors: Dao Minh Anh, Vu Hanh Nguyen, Ha Van Chi, Le Vu Ngoc Hue (Academy of Finance)</i> |

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| 11.05- 11.30 | Bank business complexity and the implications for bank risk and bank profitability - Evidence from Vietnam <i>Authors:</i> Dinh Ngoc Han, Nguyen Hong Hanh, Dang Thi Phuong Tu, Nguyen Quynh Anh , Nguyen Duy Nghia, Tran Thi Van Trang (Banking Academy of Vietnam) | |
| Fin 2. Accounting, Finance & Banking | | Building D Room D.206 |
| Co-Chairs: Dr. Nguyen Huu Tan (AOF), Dr. Luu Ngoc Hiep (UEB-VNU), Dr. Nguyen Thanh Liem (UEL) | | |
| 09.30- 09.55 | Factors affecting the efficiency of accounting information systems minimize fraud and errors in small and medium sized enterprises in the northern provinces of Vietnam <i>Authors:</i> Tang Thi Van Anh, Tang Thi Thao Anh, Vu Lan Huong , Doan Thi Phuong Lien, Hoang Thi Lanh (National Economics University) | |
| 09.55- 10.20 | Forecast of government bond yields by machine learning <i>Authors:</i> Nguyen Duc Minh Tan , Nguyen Vu Thien, Nguyen Viet Thuong, Ha My Duyen, Huynh Thuy Tien (University of Economics and Law – Vietnam National University Ho Chi Minh City) | |
| 10.20- 10.45 | The nexus between the oil price, gold price and ASEAN+3's stock market indexes, and the contribution of the Covid-19 pandemic <i>Authors:</i> Pham Hong Phuc, Nguyen Thanh Hang, Nguyen Minh Hoang, Bui Ha Hanh Nguyen, Nguyen Thi Thu Uyen (Banking Academy of Vietnam) | |
| 10.45- 11.05 | The impacts of capital inflows on bank lending in Vietnam <i>Authors:</i> Nguyen Thi Nhung , Pham Ngoc Nguyet Minh (Banking Academy of Vietnam) | |
| 11.05- 11.30 | Stock market reaction to Covid-19 pandemic: Evidence from an emerging market <i>Authors:</i> Huynh Thi Thanh Phuong (The University of Danang – University of Economics) | |
| 11.30- 11.55 | Herd behavior in Vietnamese Stock Market during COVID-19 pandemic: The influences of Government Policies <i>Authors:</i> Nguyen Thi Thu Ha , Tran Duc Nam, Dao Nhat Nam, Hong Ngoc Truc Linh (Foreign Trade University) | |
| 12.00- 12.15 | Best paper awards | Main Hall A |
| 12.15- 12.30 | Closing ceremony & Group photo | Main Hall A |
| 12.30- 14.00 | Lunch | Main Hall E |

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RESEARCH IMPACT OF THE SHADOW ECONOMY ON INCOME INEQUALITY

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ABSTRACT

This paper presents theory and evidence about the impact of the shadow economy on income inequality. To measure the impact of the shadow economy on income inequality, a panel data set including 73 countries and territories has been compiled. Of which, there are 39 high-income countries, and 34 middle-income countries, based on the World Bank classification for the period 2002-2017. We concluded that higher shadow economy, higher income inequality. Moreover, among the control variables, Post-secondary education, Trade openness trade, and Institution quality have a negative impact on income inequality, and GDP per capita has an inverse U-shaped relationship with income inequality.

Keywords: income inequality, shadow economy, education, trade openness, institution quality, FEM

1. Introduction

According to Credit Suisse's Global Wealth Report, in 2020 the combined wealth of the richest 1.1% of adults is \$192 trillion (46% of global wealth), about 35 times that of 55% of adults. The poorest are \$5.5 trillion (1.3% of global wealth). In addition, due to the severe impact of the Covid-19 pandemic, the World Bank forecasts that in 2021, about 150 million more people will fall into extreme poverty (living on less than 1.9 USD a day). The rate of extreme poverty over the last decade has been on a downward trend, but slowly, Covid-19 has reversed it to rise again for the first time in 2020. In the future, this rate still has to face conflict and climate change (World Bank, 2020).

Firstly, researchers have argued that access to services such as education, health care, and employment, among other opportunities, declines as income inequality increases. In the worst case, income inequality causes people to be disgruntled and have some degree of resistance, resulting in political instability in the country and reducing their opinions. Even with productive labor, countries do not produce material wealth. The country is therefore increasingly weakened. In addition, people also find ways to combat income inequality, such as migrating to other countries, but because the cost of this measure is quite high, choosing to operate in the shadow economy is the most suitable option for those who want to escape the tax burden. Secondly, Ostry et al. (2014) assert an almost opposing view that people will invest more in capital and technology when income inequality stops to some extent, despite the growth of economic and income inequality, and there is no clear relationship.

In every country in the world, the shadow economy always accompanies the official economy. In contrast to the formal economy, the shadow economy, although existing in many forms and on a rather large scale, is not statistically recorded and observed formally. After studying the previous academic literature, the team recognized two dimensions of the shadow economy. Firstly, the shadow economy, in some respects, promotes economic growth, especially in the business activities of enterprises (Dell'Anno and Solomon, 2008). Furthermore, the shadow economy provides jobs for unskilled individuals who do not meet the criteria in the formal economy, which leads to a shift in aggregate demand in the general economy towards a positive because the capital generated from shadow economy activities is transformed into the formal economy. The second direction is that the shadow economy causes errors in the statistics of economic indicators, as a result, policies made from these data do not hit the right heart of the problem, causing problems to arise economically, and social is not well controlled (Feige 1989; Schneider and Enste 2000).

The goal of this research is to determine the impact of the shadow economy's size on income inequality, thereby proposing several policies to limit the expansion of the shadow economy while controlling inequality in income equality. This study has the following contributions: (1) Examining the theoretical underpinnings of the shadow economy's impact on income inequality; (2) Using three econometric models to measure the influence of the shadow economy on income inequality OLS, REM, and FEM; (3) Proposing solutions based on the model's conclusions to narrow the income inequality gap and at the same time limit the popularity of the shadow economy.

In this study, the team used the following models: (1) Least-squares (OLS); (2) Fixed Effect Model (FEM); (3) Random Effect Model (REM). Based on data from 73 countries throughout the world, the study examines the influence of the shadow economy on income inequality and develops and evaluates the correlation link between income inequality and the shadow economy from 2002 to 2017. Proposing to use a static model, the team has tested models including the fixed effects model (FEM), random effects model (REM), and pooled OLS model. Through the testing steps, including the Hausman test and the Lagrange multiplier test, for the dataset of the group, the FEM model becomes the most suitable model. Next, the team tested for possible defects in the model. The results show that the model does not have multicollinearity, has autocorrelation defects, and has a variable variance.

2. Theoretical framework

2.1. The shadow economy

Currently, there is no unified concept of shadow economy. Roubard and Seruzier (1991) suggest a trend of phrases used to refer to an economy outside the formal economy based on its impact on the formal economy.

The studies presented by the authors have many differences, Schneider et al (2017) argued that the shadow economy consists of unobserved activities that, if statistically recorded, are included in the gross national product, i.e., criminal activities are ignored. Meanwhile, the shadow economy includes all legal and illegal activities of the economy that are not recorded in the official GDP given by Smith (1994), Razim et al (2018), Alm and Embay (2013). Besides, Lippert and Walker (1997) also had a study on shadow economy and they introduced a very broad concept: shadow economy includes not only illegal activities but also undisclosed income obtained from the production of legitimate goods and services, from monetary or non-monetary transactions.

In this research, the terms, definitions, and assessments of the shadow economy are used from Schneider's view. Therefore, when referring to the shadow economy, it only includes legal activities but is not disclosed to public authorities and does not consider illegal or informal activities. In addition, historical research used the shadow economy metric as presented by Schneider (2015), where the shadow economy is calculated as a percentage of GDP. The database built by Schneider and his collaborators is used by various authors in their research on the shadow economy (Kearney, 2013, European Commission, 2014).

Measuring the shadow economy was divided into three ways: direct, indirect and model-based by Friedrich Schneider and Leandro Medina (2017). Each way has different advantages and disadvantages.

2.2. Income inequality

According to Carol M. Kop (2020), Income inequality, also known as income disparity, refers to an unequal distribution of income throughout the population; the less equal the distribution, the greater the income disparity. Wealth inequality, or an unequal distribution of wealth, is frequently linked to income disparity. Different levels and forms of income disparity, such as income inequality by gender or race, can be represented by segmenting populations in a variety of ways. For the World Bank (2017), income inequality is defined as the degree to which the distribution of income or consumption expenditure among individuals or households in an economy deviates from the full distribution of Equality. More specifically, income inequality is the unequal distribution of income among different actors in an economy (OECD 2017). Income distribution is a distribution factor that is connected to the distribution of outputs and is expressed as income.

In quantitative and qualitative research, researchers often distinguish between two types of income distribution: the size (or individual) distribution and the functional distribution. The size distribution looks at how income is distributed among households or individuals. The primary goal of this approach is to examine whether income is distributed equitably among groups in society (Todaro, 1998). From the above theories, income inequality is defined as a state where income is unevenly distributed among individuals, or households in society and this concept is used by the research team throughout the study.

There are many measures to describe income inequality in the economy. The topic only gives the measures commonly used in experimental studies. These are Lorenz curves, Gini index and Atkinson index.

According to Kuznets (1955), the disparity in relative average income tends to widen as per capita production in urban economic activity grows faster than in agricultural. However, despite the cumulative effects of savings concentration, according to Kuznets (1955), these trends will eventually reverse over time, as a result of both redistributive government intervention through through the intervention of laws and political decisions and a set of less obvious factors that characterize a dynamically developing economy. First, the declining share of the rich is the result of more control by households in this income group, and increasing immigration at group levels reduces the share of 5 percent of the population. top earners. Second, dynamic economies foster an environment of relative individual opportunity, allowing for speedier growth in younger industries and, as a result, the emergence of new middle classes. Third, there is a growing trend in these economies of employees moving from low-wage to higher-wage industries. In addition, McCall, L., & Percheski, C. (2010) observed that the increase in income inequality from the mid-1990s to the present is characterized by rapid income growth among those with high incomes. Economic inequality research has expanded beyond a narrow focus on wage and labor market inequality to include incentive wages, corporate governance, gross income, and corporate governance, among other topics. Families, economic and social policy, and political institutions are all factors to consider. The authors evaluate and critique recent research in these areas, as well as recommend areas where sociological study can provide fresh insights into the characteristics and causes of current income inequality.

2.3. Relationship between the shadow economy and income inequality

In fact, there have been many separate studies for income inequality and the size of the shadow economy, but currently there are not many research works on the relationship between them (Huynh & Nguyen, 2020).

By a microscopic approach that includes the share of the shadow economy in a wage equation, Valentini (2009) found that having income tied to the shadow economy tends to reduce inequality as measured by ordinary wages in the particular case of the Italian private sector. This result is consistent with Smith's (2002) hypothesis that the shadow economy creates jobs make the poor. Huynh and Thanh (2020) also support the view that the shadow economy reduces income inequality by generating income for the poor. In addition, the two men believe that the shadow economy is attractive leading the poor and small and medium-sized enterprises, unfair competition by circumvention and evasion of the law reduces the income of the rich and increases the income of the poor, thereby reducing income inequality. import. Even so, an increase in participants in the shadow economy could increase wage inequality in both sectors as a whole because wages in the formal economy are more stable than those in the economy as a whole. In the shadow economy, there is a strong fluctuation range (Binelli and Attanasio, 2010; Binelli, 2016). In addition, if workers find employment in the shadow economy but continue to receive low wages, the income gap between individuals is likely to be larger than before, thus increasing employment in the sector. shadow economy contributes to income inequality (Xue et al. 2014). Because of such conflicting views, the study of the impact of the shadow economy on income inequality is still limited are attracting many scholars from all over the world.

In this study it is argued that the shadow economy has a positive effect on income inequality for several reasons. The first is the prevalence of the shadow economy, which undermines the government's ability to collect taxes and provide a fair level of public goods and services (Gerxhani 2004), besides The

shadow economy also weakens the government's power to effect redistribution thereby potentially exacerbating income inequality (Ahmed et al. 2007). Second, the rich invest and look for more profitable sources, so they may shift to participate in the shadow economy so that they are out of the sight of management agencies, while the poor invest less and even do not, thus leading to higher income inequality. In sum, a larger shadow economy can widen income disparities. Based on these arguments, the group hypothesized the implicit economy higher leads to higher income inequality.

2.4. Determinants of income inequality

According to endogenous growth theory, changes in income inequality are the outcome of changes in the distribution of wealth in a community, which is then governed by the distribution of ownership of property, land, capital, education, and technology. Many factors influence the distribution of ownership over time, including household savings, investment decisions, education spending, politics, institutional quality, governance effectiveness, technical advancement, economic freedom, and globalization. When analyzing the causes of income inequality, scholars and researchers have suggested a few factors:

2.4.1. Trade globalization

Many countries' growth has been fueled by trade, which has boosted competitiveness and increased efficiency. However, large trade and financial flows between countries, which are fueled in part by technological advancements, are sometimes blamed for economic disparities. The ability of enterprises to embrace labor-saving technologies and outsourcing services is a primary cause of the manufacturing sector's decline and an increase in skill prices in advanced nations (Feenstra et al. Hanson, 1996, 1999, 2003). Furthermore, trade openness in advanced nations might have a mixed influence on unskilled wages. It raises the remuneration for advanced skills, but it can also raise real wages by lowering (import) prices. Increased trade flows, on the other hand, might help EMDCs reduce income inequality by raising demand and pay for lower-skilled workers.

2.4.2. Financial globalization

FDI can lead to skill-specific technology progress, which is linked to skill-specific pay bargaining, resulting in more training for skilled workers than for less skilled individuals (Willem te Velde, 2003). Furthermore, low-level output FDI from rich countries might become a source of high-level FDI inflows for developing nations (Figini and Görg, 2011), aggravating the need for high-level FDI. Financial deregulation and globalization are also highlighted as causes in the financial industry's increased wealth, relative skill levels, and earnings, which is one of the fastest-growing in advanced economies.

2.4.3. Financial strengthening

People and enterprises with financial empowerment can have access to resources to meet their financial needs, such as saving for retirement, investing in education, pursuing entrepreneurial opportunities, and responding to shocks. Financial reform paired with more inclusive financial institutions can help to reduce income inequality while also improving resource allocation. More financial systems provide a financial boost that reduces income inequality while enhancing resource allocation (Dabla-Norris, 2015). According to Greenwood and Jovanovic (1990), financial development may benefit the wealthy in the early phases of development, but the benefits become more widely shared than in advanced economies. Indeed, multiple studies have discovered that early-stage financial development, as defined by the relative shares of the banking and stock market sectors in the economy, boosts top incomes. Furthermore, inequality may increase as people with higher incomes and assets have greater access to finance, contributing to higher wages and return on investment.

2.4.4. Changes in labor market institutions

Flexible labor market institutions More activity can promote economic dynamism by reallocating resources for businesses that are more productive and allow for restructuring enterprise Greater flexibility, However, may pose difficulties for workers, particularly those with low skills, and thus plays an important

role in explaining inequality patterns (Alvadero et al associates, 2013). A decrease in union membership (union rate) can reduce workers' relative bargaining power, thereby exacerbating wage.

2.4.5. Redistributive policy

Historically, public policy has reduced inequality in advanced economies, primarily through progressive taxes and social transfers such as public pensions (CBO 2011). However, many advanced countries are now experiencing rising income inequality, gaps in tax systems, and transitions to combat rising market inequality. However, progressive taxes have been reduced in some advanced economies over the last few decades, resulting in lower effective taxes for high-income households and businesses.

2.4.6. Education

Education can play an important role in reducing income inequality, as it determines career choices, access to employment and wages, and plays a role. In the employment market, it plays a significant function as an indication of skill and productivity. Although there is a positive association between education and income inequality, the human capital model of income distribution (Mincer, 1958; Becker and Chiswick, 1966) shows that the effect of higher education on income inequality can be positive or negative depending on the development of the rate of return to education. Overall, the evidence suggests that the unequal impact of education is determined by a number of factors, including the size of private and public investments in education, as well as the rate of return on those investments.

In summary, the causes of income disparity identified in earlier studies can be divided into six categories: (Huynh Cong Minh, 2019). Macroeconomic indicators such as GDP growth, inflation, and unemployment are included in the first group. The second category includes fiscal policy actions such as government size, spending, and subsidies (Dupont and Martin, 2006). Institutional quality, political considerations, corruption, governance, democracy, and political freedom make up the third group (Reuveny and Li, 2003; Chong and Gradstein, 2007). The fourth group consists of economic factors such as globalization, economic openness, economic freedom, and foreign direct investment. The fifth group is education (Gregorio and Lee, 2002), which includes school years, secondary and tertiary education, and unequal distribution of education (Gregorio and Lee, 2002). The last group includes natural resources, land distribution, and initial wealth distribution (Fum and Hodler, 2010).

3. Research method

3.1. Model specification

$$INE_{i,t} = \alpha_0 + \alpha_1 SHA_{i,t} + \alpha_2 Control_{i,t} + \mu_i + \varepsilon_{i,t}$$

Based on the theory and models of previous studies, to analyze the influence of the shadow economy on general income inequality in the world, the thesis uses the following empirical model:

$INE_{i,t}$ is the income inequality in country i at year t .

$SHA_{i,t}$ size of the shadow economy of country i in year t .

$Control$ is a vector of control variables including:

- OPE: Trade openness of the country
- INS: Institutional quality index
- EDU: Post-secondary education index
- UNE: Unemployment rate

ε is the random error. α is the vector of the estimated coefficients

To further clarify the impact of the shadow economy on income inequality for each group of countries, the study adds a dummy variable IG (income group) and an interaction variable $IG \times SHA$ with $IG=1$ if that country is a high-income country, $IG=0$ if the country is a middle-income country.

$$INE_{i,t} = \alpha_0 + \alpha_1 SHA_{i,t} + \alpha_2 Control_{i,t} + IG + IG \times SHA + \mu_i + \varepsilon_{i,t} \quad (1)$$

In addition, the research team also added a variable that reflects the size of the economy or the wealth of a country through the variable (GDP per capita) to check if there is a difference in the effect of the impact of the shadow economy on income inequality between high and middle-income countries. Income inequality and income level have an inverted U-shaped connection, according to Kuznets (1955). Income inequality rises with income levels in the early phases of economic development until a particular threshold of GDP per capita is reached. Higher salaries will assist to minimize income disparity after this turning point. Following Kuznets' (1955) theoretical framework, this study proposed an inverted U-shaped link between income levels and income disparity. The model is:

$$INE_{i,t} = \alpha_0 + \alpha_1 SHA_{i,t} + \alpha_2 Control_{i,t} + Log_{GDPpc} + Log_{GDPpc}^2 + \mu_i + \varepsilon_{i,t} \quad (2)$$

Table 1: Sign Expectations of variables that affect income inequality

| Variables | Expectation sign | References |
|-----------|------------------|---------------------------------------------------|
| SHA | + | Schneider & Enste (2000), Ahmed (2007) |
| OPE | - | Barro (2000), Asteriou et al. (2014) Wood (1997) |
| INS | - | Carmignani (2009) |
| EDU | - | Gupta et al. (2002) |
| UNE | + | Rice & Lozada (1982) |
| GDPpc | Inverted U-shape | Kuznets (1955) |

Source: Author's compilation

To test the effect of the shadow economy on conditional income inequality on education, institutional quality, and openness of the economy, in the model, We define three interaction terms. Interaction terms are frequently used in the empirical literature to capture the contingency effect on the relationship between variables of interest (Ibrahim and Law, 2016). Firstly, the group includes the interaction term between the shadow economy and trade openness to uncover the moderating role of free trade in the relationship between the shadow economy and income inequality. The new model has the following form:

$$INE_{i,t} = \alpha_0 + \alpha_1 SHA_{i,t} + \alpha_2 Control_{i,t} + \alpha_3 OPE \times SHA + \mu_i + \varepsilon_{i,t} \quad (3)$$

Fourth, the interaction term between the shadow economy and institutional quality is included in the model (4) to determine how the relationship between the shadow economy and income inequality changes with development in countries with better institutions. The following equation represents the estimated model:

$$INE_{i,t} = \alpha_0 + \alpha_1 SHA_{i,t} + \alpha_2 Control_{i,t} + \alpha_3 INS \times SHA + \mu_i + \varepsilon_{i,t} \quad (4)$$

Fifth, the team applies the same equation to examine the regulatory role of education with the relationship between the level of the shadow economy and income inequality. The study includes the interaction variable between the shadow economy and education as follows:

$$INE_{i,t} = \alpha_0 + \alpha_1 SHA_{i,t} + \alpha_2 Control_{i,t} + \alpha_3 EDU \times SHA + \mu_i + \varepsilon_{i,t} \quad (5)$$

3.2. Estimation method

In this study, for the panel data regression model, three commonly used methods are: (1) the Pooled least-squares estimation model (POLS); (2) the fixed effects model (FEM); and (3) the random effect model (REM).

To choose between POLS and REM, the LM (Breusch-Pagan Lagrange Multiplier) test is used. To choose between REM and FEM, the Hausman test is used.

To remove the effect of unobserved country (u_i) characteristics, the team applied fixed and random impact estimates. In addition, the term error ($e_{i,t}$) can have non-stationary variance and can be sequentially correlated; therefore, the team used the likelihood ratio test for variable variance and Wooldridge's (2002) serial autocorrelation test. Then, the variable inflation factor (VIF) was used to test for multicollinearity, the Breusch-Pagan Lagrange Multiplier test to check for variable variance, and the Wooldridge test to check for autocorrelation.

3.3. Data

To measure the impact of the shadow economy on income inequality, a panel data set including 73 countries and territories has been compiled. Of which, 39 high-income countries, and 34 middle-income countries, based on the World Bank classification for the period 2002-2017 show all variables in the equation.

The study employs the after-tax and post-transfer Gini to measure income disparity for the dependent variable, which is taken from the Standardized World Income Inequality Database (SWIID). This data was created for cross-country income inequality research by maximizing data comparability while preserving the broadest feasible coverage between nations and over time. The SWIID Gini Index of income inequality is calculated by household income using Luxembourg Income Study (LIS) data. The size of the shadow economy is measured as a percentage of GDP. The results were aggregated according to the study of Medina and Schneider (2018) using the MIMIC method (many causes, many indicators).

Other control variables include: OPE (Trade Liberalization) as measured by a country's total exports and imports as a percentage of that country's GDP (in %); UNE (unemployment rate) as % of the total labor force (ILO model estimate); GDP per capita (2010 constant USD); EDU (education index - post-secondary education) are compiled from World Bank Open Data. The INS (Institutional Quality) variable was generated by averaging the six Global Governance indicators components. Because the Global Governance Indicators database only includes continuous data beginning in 2002, the sample estimate ranges from 2002 to 2017.

Table 2: Descriptive statistics result

| Variable | Obs | Mean | Std.Dev | Min | Max |
|------------|-------|--------|---------|--------|---------|
| INE | 1.168 | 36.139 | 8.439 | 22.9 | 63.5 |
| OPE | 1.168 | 91.126 | 52.039 | 20.722 | 416.389 |
| SHA | 1.168 | 25.416 | 13.783 | 5.1 | 69.9 |
| INS | 1.168 | 0.398 | 0.914 | -1.607 | 1.970 |
| EDU | 1.168 | 52.914 | 24.353 | 0.713 | 136.602 |
| UNE | 1.168 | 8.081 | 5.176 | 0.21 | 33.58 |
| Log_gdppc | 1.168 | 9.286 | 1.250 | 6.332 | 11.626 |
| Log_gdppc2 | 1.168 | 87.787 | 22.937 | 40.095 | 135.163 |

Source: Authors' calculation

4. Results and discussion

4.1. Main results

To obtain the results for the research topic, the team used 03 estimation methods (POLLS, FEM, REM) to choose the estimation model that best fits the model proposed by the group.

Table 3: Estimation results of factors affecting income inequality according to OLS, REM and FEM

| | OLS | REM | FEM |
|-------|------------|------------|-----------|
| SHA | 0.0625** | 0.171*** | 0.168*** |
| OPE | -0.0268*** | 0.0143*** | 0.0130*** |
| INS | -2.321*** | 0.800* | 0.283 |
| EDU | -0.134*** | -0.0194*** | 0.0217*** |
| UNE | 0.215*** | 0.0685*** | 0.0647*** |
| _cons | 43.24*** | 30.64*** | 31.19*** |
| N | 1168 | 1168 | 1168 |

t statistics in parentheses

* p<0.05, ** p<0.01, *** p<0.001

Source: Authors' caculation

As a result, the team found that FEM is a suitable model for the research topic. Next, the tests on multicollinearity, series autocorrelation, and variable variance were carried out and resulted in the following conclusions: The model does not appear phenomenon. multicollinearity, variable variance, and autocorrelation. The team took steps to correct the defect and released the final research results.

Table 4: Model results after fixing defects

| Variables | INE |
|-----------|-----------|
| SHA | 0.072*** |
| OPE | -0.005** |
| INS | -2.745*** |
| EDU | -0.018*** |
| UNE | -0.018 |
| _cons | 36.31*** |
| N | 1168 |

t statistics in parentheses

* p<0.05, ** p<0.01, *** p<0.001

Source: Authors' caculation

The results in Table 4 show that the shadow economy positively affects income inequality (calculated by Gini coefficient after tax and conversion) and is statistically significant at 0.1%. Specifically, when the size of the shadow economy as a share of official GDP increases by 1%, income inequality increases by 0.072 units. In other words, the shadow economy can increase income inequality. These findings are consistent with the initial work on the issue by Rosser, Rosser and Ahmed (2000), who conservatively concluded that there is a positive relationship between the shadow economy and income inequality. This result shows that in high- and middle-income countries, income inequality seems to be more strongly affected by the shadow economy. However, this effect is generally still unclear, meaning that income disparities are largely dependent on other factors.

The variable is statistically significant at 0.1% and has a negative sign in the model, reaching the sign expectation suggested by the group, that is, the higher the level, quality, and awareness of education, the income inequality tends to increase. shrink direction. The sign of the variable is compatible with the study of Gupta et al. (2002) that the group references. The model shows that when the rate of post-secondary education increases by 1%, income inequality will decrease by 0.018 units. It can be explained that in high- and middle-income countries, Although education level is not a significant factor of income distribution, it is an useful tool for addressing income inequities (De Gregorio and Lee, 2002; Lessmann and Seidel, 2017).

For OPE variables and variables, both have negative signs and have statistical significance at 1% and 0.1% respectively. The findings of the group support the premise that trade liberalization reduces income disparity significantly (Krieger and Meierrieks, 2016). It is consistent with several empirical studies showing that trade liberalization helps to balance income distribution. Specifically, when free trade increased by 1%, income inequality decreased by 0.05 units. This effect is not yet clear, suggesting that income inequality has little relationship with trade openness. However, it contradicts other research that implies that greater trade openness raises income. The variable also gives the expected result, that is, the higher the country's institutional quality, the smaller the income inequality between countries. The sign of this variable is similar to the study of Chong and Gradstein (2007), Carmignani (2009) that the team investigated. When institutional quality is increased by 1 unit, income inequality decreases by 2.745 units. Overall, these findings strongly support human capital investment, institutional quality, and trade liberalization in addressing income inequality.

However, with a positive expectation, UNE is the only variable that is not statistically significant. This means that the UNE variable does not completely affect the dependent variable INE. To explain the above problem, the group gave the following reasons: The time of data collection for the group's research was in the period 2002 - 2017 with 73 research countries, which is the later stage of previous studies. Improved, real-time earnings metrics lead to different results than previous studies.

Table 5: Estimation results of the models

| | (1) | (2) | (3) | (4) | (5) |
|--------|-----------|-----------|-----------|-----------|-----------|
| SHA | 0.014* | 0.03* | 0.057*** | 0.079*** | 0.104*** |
| OPE | 0.001 | -0.003* | 0.005 | -0.004* | -0.003* |
| INS | 0.135 | 0.477** | -2.426*** | -3.742*** | -2.521*** |
| EDU | 0.009*** | 0.012*** | 0.017*** | 0.021*** | 0.004 |
| UNE | 0.039*** | 0.036*** | 0.019 | -0.033** | -0.008 |
| IG | -10.59*** | -7.743*** | | | |
| IGxSHA | 0.008 | -0.041 | | | |

| | | | | | |
|------------|----------|------|----------|----------|----------|
| Log_GDPpc | | | 7.791*** | | |
| Log_GDPpc2 | | | 0.479*** | | |
| OPExSHA | | | 0.004 | | |
| INSxSHA | | | | 0.038*** | |
| EDUxSHA | | | | | 0.001*** |
| Cons | 41.41*** | 0.24 | 36.50*** | 36.87*** | 34.96*** |

statistics in parentheses

* p<0.05, ** p<0.01, *** p<0.001

Source: Authors' calculation

From Table 5, in all models (1) - (5), the team finds that the estimated coefficient of the shadow economy is positive and statistically significant, which means that an increase in the shadow economy leads to discontent. income equality is higher, not less.

In column (1), when classifying water groups, the OPE and INS variables are not statistically significant. However, the variable UNE is statistically significant and has a positive sign in line with expectations. The dummy variable has a negative sign and is statistically significant at 1%, indicating that middle-income countries face a larger income gap than high-income countries by 10.59 units. In addition, this reduces the impact of the shadow economy on income inequality. When the shadow economy increases by 1%, inequality only increases by 0.014 units. This means that in high-income countries, income inequality is less and the shadow economy's impact on it is less.

Model (2) when adding control variables, all variables in the model are statistically significant and most of them reach the expected sign. In this model, The shadow economy continues to have a favorable effect on income inequality, but this effect is still relatively small, only 0.03. Besides, the variable of institutional quality has a positive impact on income inequality, specifically, when institutional quality increases by 1%, it increases income inequality by 0.477 units. This suggests that, in high-income countries, better institutional quality will increase income inequality.

The team considers the moderating role of other control variables for implicit economic size in increasing income disparities. Columns (3) - (5) of Table 2 show statistically significant coefficients of the censored variables. The OPExSHA interaction variable is not statistically significant, which means that trade openness does not affect the shadow economy to increase income distribution. In column (4), the variable INSxSHA has a positive sign providing strong evidence that, for a given country, the shadow economy's influence on income inequality increases as institutional quality increases. Going to model (5), we can see that the interaction variable has a negative sign and is statistically significant at 0.1%, which indicates that education has a negative relationship with the shadow economy to reduce discontent. income equality. First, a higher level of education helps to reduce income disparities caused by progress in the economic structure. For example, if low-wage workers receive greater education, they will be more fitted to the job's increasing needs. As a result, rather of widening, the pay disparity between low-skilled and unskilled workers narrows. In a world of less education, ineffective and low-quality institutions, and less open economic conditions, the shadow economy cannot reduce income inequality.

4.2. Robustness

The team tested these results for persistence with the following modifications. First, the group tests the certainty of the results by changing the representative of the dependent variable. Specifically, the pre tax and transfer Gini index will be used instead of the post-tax and transfer Gini index. However, when carrying out the re-estimation, the research team had difficulty in finding a suitable model due to the Gini coefficient.

Table 6: Estimation results with Gini pre tax and transfer

| Variables | Gini pre tax and transfer |
|-----------|---------------------------|
| SHA | 0.132*** |
| OPE | 0.018*** |
| EDU | -0.01* |
| INS | -0.038 |
| UNE | 0.179*** |
| _cons | 40.80*** |
| N | 1168 |

t statistics in parentheses

* p<0.05, ** p<0.01, *** p<0.001

Source: Authors' calculation

The estimated results obtained from Table 4 show that with the Gini coefficient before tax and conversion, the variable is not statistically significant, the remaining variables are significant in the range of 0.1% - 1% and tend to have an impact. to the difference in income in line with the hypothesis proposed by the research team. In this result, the Shadow variable has a regression coefficient of 0.132, which means that when the size of the economy increases by 1%, it will increase income inequality (according to the Gini pre tax and transfer coefficient) by 0.132 units. This is roughly 1.86 times larger than the shadow economy's impact on income inequality as measured by the post tax and transfer Gini coefficients.

Furthermore, to test whether the study results are sensitive to the exclusion of outliers, the team removed three countries (the 5% of the countries with the highest income inequality in the sample) are: Honduras, Peru and Colombia, and then re-estimate the results in column (6). The group applies the same approach to countries with the lowest levels of income inequality (lowest 5% of all countries in the sample): Belarus, Denmark, and Slovenia get their results in column (7) .

Table 7: Estimation results of robustness

| Variables | (6) | (7) |
|-----------|-----------|-----------|
| SHA | 0.069*** | 0.076*** |
| OPE | -0.003* | -0.004* |
| EDU | -0.014*** | -0.002*** |
| INS | -2.368*** | -2.821*** |
| UNE | -0.015 | -0.022 |
| _cons | 35.39*** | 36.45*** |

N

1120

1120

t statistics in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: Authors' calculation

From Table 7, it can be seen that in both models (6) and (7) the variables are almost all statistically significant and are similar to the expected sign given by the group. In particular, the variable with statistical significance at the 0.1% level and bearing a positive sign shows that leaving these countries does not significantly change the main results of the model. Overall, the outliers did not influence the group's conclusions about the positive effect of the shadow economy on income inequality.

5. Conclusion

The groups conclusion after summing up the main research results is: The shadow economy has a positive impact on income inequality, specifically, when the shadow economy increases to 1%, income inequality increases to 0.072 unit.

It is necessary to consider the shadow economy and income inequality in relation to each other. So, first of all, countries including Vietnam must make accurate statistics on the size of the shadow economy and make it an indicator that needs to be monitored. The group called on politicians to promote the legalization of undeclared economic activities and the reduction of dependence on natural resources as mechanisms to reduce the structural problem of income inequality.

Trade, institutions, and education on the one hand directly affect income inequality, on the other hand, indirectly affect income inequality through the shadow economy, so countries need to focus on adjusting all three main policies. this book, specifically:

Firstly, a common pattern for the whole world is impossible, considering the speed of economic development of countries. Therefore, policymakers need to rely on the situation of each country and specific region, such as the state regime, and the capacity to implement policies to make the most effective policy. Furthermore, policies to reduce the size of the shadow economy are required; however, these policies must be implemented in tandem with other poverty and inequality reduction solutions, as the shadow economy is a source of income for the poor.

Second, policies to reduce income inequality should emphasize economic freedom, increased trade exchange, improved institutional quality, job creation, and effective natural resource allocation. course. The group recommends that governments in the region restructure their economies to change the way they participate in global integration and develop measures to ensure that all their citizens can benefit from globalization.

Third, Improving the quality of education, removing financial barriers to higher education, and providing support for apprenticeship programs are the keys. Because educated people are better prepared to deal with technological and other changes that directly affect them, these measures can also assist improve the income prospects of future generations. in terms of productivity.

Fourth, promote financial inclusion securely. Financial development within countries needs to be accompanied by greater inclusion in order to reduce inequality. In addition, financial development is the expansion of the range of bank branches commerce, giving residents easier access to cashless payments – whether via mobile, card, or online – through automated teller machines (ATMs) and credit can boost the government's ability to reach out to and help informal participants during recessions like COVID-19 (Fang, Kennedy, and Resnick, 2020; World Bank, 2019). Governments have a central role to play in reducing obstacles to the development of the financial system by creating the relevant legal and regulatory framework (e.g. protecting creditor rights, regulating behavior. business and oversee recourse mechanisms to protect

consumers; reduce business start-up costs and the number of formalities required to start a business, further training in entrepreneurship and improve educational outcomes, social insurance

Fifth, is the complementarity between the purposes of development and income equality. Reforms desired at increasing intermediate residence averages could likewise influence earnings allocation. Clearly, managing inequality moves outside work conditions and colonial interest though including finance and surcharge guidelines. The legend to mitigating the downside of both globalization and technological transformation in state-of-the-art thrifts is an approach schedule of ethnicity to the top instead of ethnicity to the footing - a timetable that includes. Techniques for skilled production. Policies aimed at upskilling everyone, ensuring that a country's infrastructure meets its needs, and encouraging innovation and technology adoption are thus required to drive growth and ensure more inclusive prosperity.

As for Vietnam, recently General Secretary Nguyen Phu Trong affirmed that Vietnam is building a socialist-oriented market economy, which means both economic development and social security must be ensured. Along with the reduction of the shadow economy, there should be policies of education, subsidies, social welfare, and job creation for individuals escaping from the shadow economy. Thus, the group has certain quantitative research results that: reducing the shadow economy reduces income inequality, but every policy has its two sides, if reducing the shadow economy, there is a part of the people living in the excluded shadow economic sector will lose their livelihood, so in addition to the above-mentioned policies of trade, institutions and education, the role of the state is to strengthen pulling them out of the economy. However, it is important to acknowledge that income inequality only tells part of the story regarding inequality. So, societies are not necessarily concerned with reducing income inequality but with ensuring that all their residents have an equal opportunity to achieve the outcomes they care about.

Finally, the group proposes that the following studies should develop directions such as: implementing theoretical models, dynamic models, SGMM models with instrumental variables, lagged variables, and non-linear or inverted U relationships between business shadow economy and income inequality.

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DOES MACROPRUDENTIAL POLICY FOSTER OR CONSTRAINT ECONOMIC GROWTH?

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ABSTRACT

Purpose

After the crisis period in 2008, the macroprudential policy becomes more popular and is pursued in many countries worldwide to ensure financial system stability. However, the terrible consequence of Covid-19 stimulates the need of understanding the effectiveness of the macroprudential policy on the post-pandemic economic recovery and growth process. Therefore, this study aims to examine the impact of macroprudential policy on economic growth for 124 countries over the period from 2000 to 2019. Moreover, we investigate how different impact of macroprudential individual instruments on economic growth and whether excessive tightening policy influences real growth.

Data /Methodology

This study uses the new comprehensive data administrated by the IMF which provides detailed information on the macroprudential policy and macroprudential individual instruments pursued by each country. To evaluate the impact of macroprudential policies on economic growth, we adopt the regression model and use the dynamic two-step system GMM estimator to suffer endogeneity bias. Additionally, we test the consistency of the GMM estimator for reported results by conducting two specification tests including Sagan test and Hansen test.

Findings

Our result implies that tightening of the macroprudential policy has made positive contributions to economic growth, especially in the period following the on-set of the global financial crisis. Moreover, we find that in the set of 16 tools, tightening five tools including loan loss provisions (LLP), loan-to-value (LTV), lending restriction (LoanR), liquidity requirements (Liquidity), and systemically important financial institutions (SIFIs) measures lead to higher economic growth. In contrast, we provide evidence that the strict regulation of debt service to income (DSTI) and loan to deposit (LTD) generates economic slowdown, the other nine remaining tools have no significant impacts on economic growth. Furthermore, we also find that excessive tightening policy can be a barrier to economic growth. We also conduct a series of robustness tests to ensure our findings of macroprudential policy influence on real growth.

Contributions

Shedding light on the real effectiveness of macroprudential policy in economic growth, we contribute to the literature about macroprudential policy. Our findings also provide useful insights for policymakers to carefully consider utilizing and combining macroprudential instruments for different economic purposes in distinct periods of time. In addition, our results warn policymakers to carefully consider setting appropriate limits in implementing policy to avoid undesirable adverse effects leading to an economic slowdown.

Keywords: Macroprudential policy; economic growth; two-step system GMM

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ECONOMIC INTEGRATION AND ENERGY INTENSITY: AN EMPIRICAL STUDY FROM ASIA-PACIFIC COUNTRIES

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ABSTRACT

By using GMM estimator for unbalanced panel data, we examine the impacts of economic integration on energy intensity in two aspects: production energy intensity and consumption energy intensity in 38 Asian-Pacific countries over the period from 2005 to 2019. Our results reveal that economic integration appears to be the main driver for changes in energy demand through different channels (namely scale effect, composite effect and technological effect). Due to geographical characteristics of the APAC region, we obtain that the oil price does not much affect the energy intensity. Likewise, high speed of urbanization do not account for higher energy demand owing to lack of access to energy. We also observe that the flows of inward FDI tend to weaken because of policy changes. Therefore, our findings suggest that policy makers should adopt insightful strategies focusing on clean energy and green finance by using globalization as an economic tool to utilize energy efficiently and sustain economic development.

Keywords: economic integration, energy consumption, energy intensity.

1. Introduction

The Asia-Pacific region encompasses a distinct, diverse and dynamic group of economies that exhibits a microcosm of the globe and long-term prospect for strong economic progress. In recent years, the Asia-Pacific region has attracted world attention by considerably recognizing the significance of intra-regional cooperation while displaying the dynamism of economic development, expanded economic sectors and enhanced interdependence. Outstandingly, this region accounted for approximately one third of the world's gross domestic product (GDP) and consumed more than half of the global energy supply (ESCAP, 2019). The GDP growth rate of Asia and the Pacific region is projected to reach an annual rate of 3.5% by 2030, which is higher than that of the rest of the world. This would naturally translate into faster growth in regional energy demand with 2.4% per year by 2030 - compared with 1.5% growth rate in global energy demand by 2030 (ADB, 2009). In other words, increasing the energy supply to fuel growing industries and energy-intensive lifestyles is of top priority of developing economies within the APAC region.

Consequently, the model of economic development accompanied with increasing energy demand has made this region achieve at the expense of their environment such as climate change, resource scarcity, and other environmental issues (Phimphanthavong, 2013). When it comes to take grips with environmental degradation, the improvement in the efficient use of energy is emphasized as one of the most indispensable instrument of socio-economic development and strategic commodities for sustainable development (Sahir & Qureshi, 2007; UN, 2019). Given the diversity in levels of economic development and natural resource endowments, Asia-Pacific countries need to demonstrate global efforts with a view to promoting regional energy cooperation and responding to global challenges. In 2017, an important milestone was reached with the foundation of the ESCAP Committee on Energy which acts as a dedicated Asia-Pacific intergovernmental platform on energy. Furthermore, the adoption of the 2030 Agenda for Sustainable Development and Paris Agreement is expected to shape the energy future of Asia-Pacific countries by signaling an acknowledgment of the importance to enhance energy security and ease tensions at the economy-environment interface (UN, 2018).

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On the grounds that Asia-Pacific countries are facing with challenges that lead them to make a choice between economic growth and environmental protection, it is important to trace out to what extent these economies are exposed to different energy intensity levels. Empirically, there are several particular studies documenting the linkages between economic integration and technology spillovers (Wolfgang, 2010); economic integration (combining with different perspectives such as financial development, economic growth, carbon emissions) and environmental conditions (Muhammad et al., 2011; Rashid S. et al., 2013); economic integration and CO₂ emissions (Phuc Nguyen et al., 2019; M. Shahbaz et al., 2019). At the empirical level, the findings from a number of studies examining the influence of trade openness and inward FDI flows on energy intensity are controversial and inconclusive across countries, data and methodologies. To the best of our knowledge, the roles of the economic integration on energy intensity across APAC region has far been under studied, comparing to researches on energy in other regions (such as MENA, EU,...). Thus, arising from the ambition of the Asia-Pacific region to continuously pursuing economic in an eco-friendly way and the urgency of current situation, the objective of our research is “Economic integration and energy intensity: An empirical study from Asia and the Pacific countries”.

This article is structured as follows. The next section presents a review of the theoretical basis and the related studies devoted to energy intensity and the impacts of FDI, trade on energy intensity. The third section discusses in details the research model, data and econometric approaches. Afterwards, the fourth section illustrates empirical results and discussions while the fifth section concludes the paper by proposing general recommendations for policymakers as well as limitations and future orientation.

2. Literature Review

2.1. Theoretical basis

2.1.1. STIRPAT (Stochastic Impacts by Regression on Population, Affluence and Technology) model

A STIRPAT model was developed by Dietz and Rosa (1997) and worked as a mathematical advancement to the IPAT model proposed by Ehrlich and Holdren (1971). Theoretically, this model is employed for unraveling driving forces of the influence (I) of human activities on environment, which are synthesized into the population (P), affluence (A), and technology (T). The STIRPAT model is widely used for empirical researches and policy recommendations to minimize environmental damage (Shi, 2003; Tian and Da Costa, 2014). In the field of energy intensity, due to differences between energy consumption and energy production for some purposes, the use of energy for consumption is accompanied by lifestyle and economic process while the energy utilization in the manufacturing process would be contingent on the level of technological advancement.

Accordingly, there is a particular literature that probed into the STIRPAT model to explore the impacts of the economic growth on energy intensity (Parikh and Shukla, 1995; York, 2007; Shahbaz et al., 2015; Ji et al., 2017). Cole and Neumayer (2004) revealed a positive correlation between CO₂ emissions and population, urbanization, energy intensity through examining eighty-six-country panel data over the period from 1975 to 1999. By the analysis of Behera and Vishnu (2011) in India between 1960 and 2007, the driving forces of CO₂ emission (consisting of urbanization, population, industrialization, GDP per capita) were indicated to deteriorate the environment. Furthermore, Wang et al. (2013) applied an extended STIRPAT model to investigate the positive relationship between population, the degree of economy, technology, urbanization, industrialization, and energy consumption structure on the energy-related CO₂ emissions in China from 1980 to 2010.

2.1.2. Pollution-haven hypothesis (PHH) and Pollution-halo hypothesis (PHHH)

The pollution-haven hypothesis (PHH) introduced by Pethig (1976) proposed a positive correlation between inward FDI flows and environmental degradation. Accordingly, reductions in trade barriers allow developed countries to concentrate on clean production (Cole 2004) by outsourcing their emissions, while underdeveloped countries with their lax environmental standards are prone to attract “dirty” production. However, there has been substantially open to debate over the empirical significance of this hypothesis (Copeland and Taylor, 2004; Kearsley and Riddel, 2010; Atici, 2012; Öztürk and Yildirim, 2015).

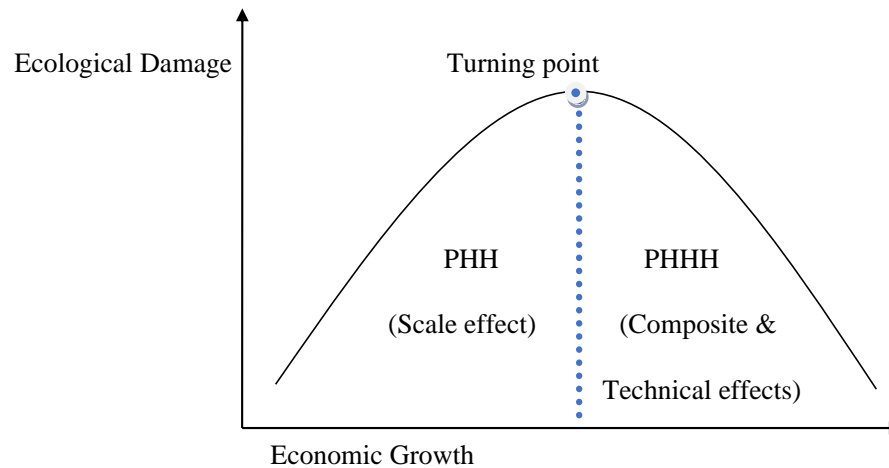


Figure 1: Pollution-haven hypothesis (PHH) and Pollution-halo hypothesis (PHHH)

In comparison to the PHH, the pollution-halo hypothesis posits that FDI inflows and trade openness are conducive to environmental welfare and attributes this effect to the adoption of green technologies and know-how transfer (Atici, 2012). The pioneer study of this two-way relationship is Antweiler et al. (2001) who broke down the roles of economic growth on the environment into three broad classes: scale effect, composition effect and technology effect. Accordingly, scale effect suggests that the expansion of economic activities leads to increased levels of pollution and greater consumption made possible by more wealth (Lopez, 1994). Composite effect indicates how environmental performance is influenced by the composition of output, which is based on the level of globalization as well as a country’s comparative advantages. Thanks to a greater degree of trade and a tendency towards cleaner productions, technique effect helps host country to achieve better technologies and environmental management practices (Grossman and Krueger, 1996). Subsequently, there have been several studies that demonstrated the existence of the PHHH as well as undermined the validity of the PHH (Eskeland and Harrison, 2003; Tamazian et al., 2009; Liu and Kim, 2018).

2.2. Previous studies

2.2.1. Economic integration and Energy consumption

Before embarking on the empirical analysis, it is pivotal for us to understand the importance of economic integration and emphasize how it affects energy consumption through relaxing restrictions on cross-border trade and investment flows. Conceptually, economic integration involves the interconnectedness among countries, which has the capacity to promote economic growth, support a better allocation of resources as well as stimulate efficiency and productivity through potential channels comprising productivity growth, trade and financial integration (Ehigiamusoe and Lean, 2018) (see Figure 2 for a conceptual framework). In other words, economic integration exerts its influence on economic growth primarily through trade openness and direct foreign investment (FDI) inflows, in which the role of foreign direct investment (FDI) and trade in promoting economic activities has been extensively studied in literature (Kojima, 1973; Buckley and Casson, 1976; Bhagwati and Tironi, 1980; Helpman, 1981). Theoretically, economies that are engaged in trade and investment activities to accelerate growth have witnessed a greater

prosperity over the past few decades (Tang et al., 2015) through knowledge transfers and competitiveness (Shahbaz, 2012; Eriş and Ulaşan, 2013; Ee, 2016).

Despite great advantages, there still remains a well-documented linkage between environmental performance and economic development in the existing literature since globalization has been a key parameter in hastening natural resource depletion and environmental devastation (Zakarya et al., 2015; Zhang and Zhou, 2016). Also, Sohag et al. (2015) revealed that the elasticity of economic development to energy intensity varies among countries as each country's growth model depends on its phases of economic cycle. By employing different econometric methodologies such as Granger causality tests, error correction models (ECM), ARDL bounds testing and panel cointegration, a plethora of researchers has shed light on the energy-growth nexus and uncovered heterogeneous results, which can be broken down into four possible hypotheses: Firstly, the growth hypothesis postulates unidirectional causality from energy consumption to economic growth (Odhiambo, 2009; Imran and Siddiqui, 2010; Apergis and Payne, 2010); Secondly, the conservation hypothesis indicates unidirectional causality from economic growth to energy consumption (Kraft and Kraft, 1978; Gelo, 2009; Bartleet and Gounder, 2010; Binh, 2011); Thirdly, the feedback hypothesis reflects the interdependence and the bidirectional causality between these two terms (Jumbe, 2004; Paul and Bhattacharya, 2004; Belloumi, 2009; Belke et al., 2010); Lastly, the neutrality hypothesis confirms the absence of any causality between economic growth and energy consumption, which implies that energy conservation policies will have an insignificant impact on economic development (Jobert and Karanfil, 2007; Chiou-Wei et al., 2008).

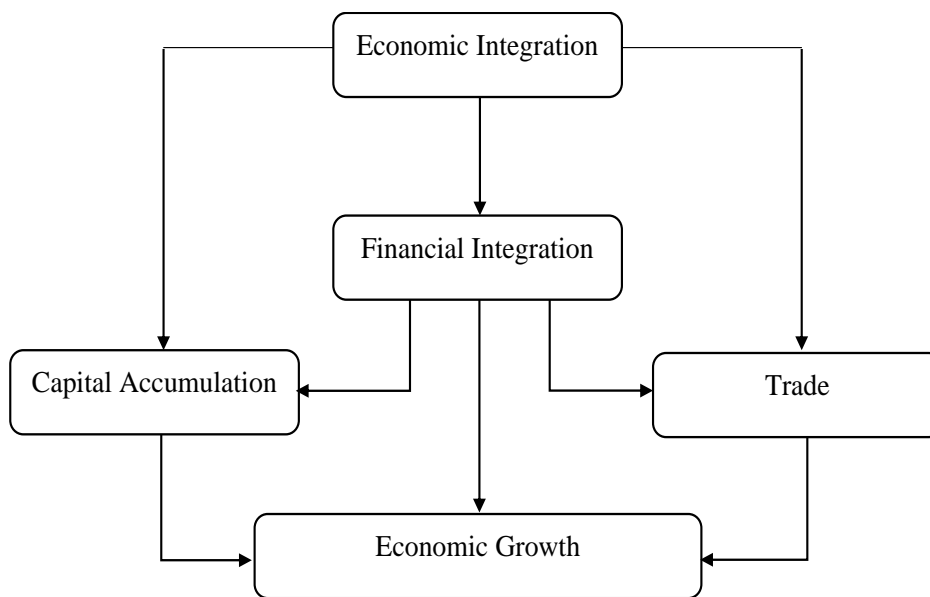


Figure 2: The conceptual framework of the relationship between economic integration and economic growth

2.2.2. Trade openness and Energy intensity

By and large, a relatively open economy grows faster than a relatively closed economy for the reason that trade openness generates higher levels of income, helps utilize the resources efficiently and exploits the economies of scale through its static and dynamic gains deriving from the process of resource reallocation and productivity gains respectively. As far as the greater role of trade openness is concerned, this phenomenon impacts environmental performance via the scale effect, the composite effect and the technique effect (Papageorgiou et al., 1991; Tsurumi and Managi, 2010) (see Figure 3 for a detailed framework). The scale effect anticipates that trade expansion will help achieve economies of scale thanks to increased flows of domestic production and consumption. Globalization through trade makes a significant contribution to the improvement of economic structures by changing the production inputs' ratio, which is called the composite effect. The technique effect asserts that on the brink of continuous *technical* innovations, trade openness will

provide the host country with opportunities to access emerging technologies from advanced countries, thereby compounding the positive environmental impact.

Taskin and Zaim (2001) adopted an econometric approach on 50 countries from 1970 to 1990 and demonstrated that trade openness had a positive effect on environmental sustainability. Cole (2006) in a study of 32 countries explored that when trading volume increases, it will stimulate capitalization and economic activities, thus affecting the host country's energy use. Furthermore, by generating higher levels of income, trade openness promotes people's awareness of the importance of environmental protection, which helps accelerate the political pressures on policy makers for a better environment. Shahbaz et al. (2013) employed ARDL and ECM approaches on South African economy covering the period 1965 to 2008 and obtained that trade openness enhances environmental quality, *ceteris paribus*, if technical effect dominates scale effect. Rafiq et al. (2016) employed both linear and nonlinear panel models for the data collected in 22 emerging economies and realized that energy intensity is considerably declined against trade openness. Outstandingly, in an attempt to emphasize the positive impact of trade openness on the environment, Hossain (2011) and Sebri and Ben-Salha (2014) studied the case of BRICS countries from 1971 to 2010 and found that trade openness appeared to have a significant influence on the promotion of renewable energy. These studies also showed that trade liberalization favored a transfer of advanced foreign and green technologies, thus helps the host country stimulate more investments in renewable energy and without undermining the quality of the environment.

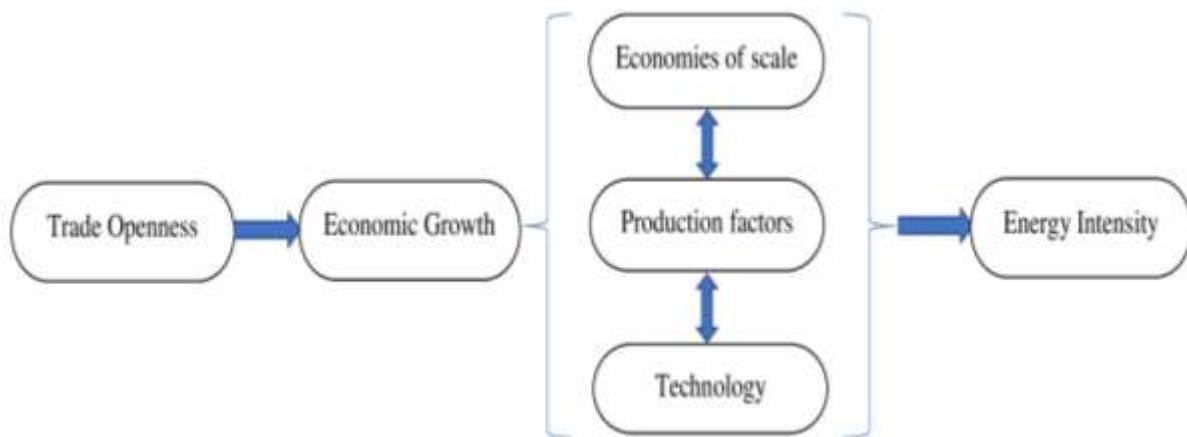


Figure 3: The conceptual framework of the interconnection among trade openness, economic growth and energy intensity

In contrast with these works, Antweiler et al. (1998) acknowledged that expanded trade might aggravate environmental performance in the absence of appropriate environmental policies. Ahmed (2017) and Munir and Ameer (2018) gave contradictory results that trade openness increased pressure on natural resources and led to an increased specialization in energy-intensive production techniques. Also, Zakarya et al. (2015) documented that due to less stringent environmental regulations, developed countries would seek for a 'pollution-haven' and swing their pollution-intensive industries towards developing countries in order to avoid paying expensive pollution control costs in their own countries.

2.2.3. Foreign direct investment (FDI) and Energy intensity

A handful of empirical studies on the existing FDI literature have recently been concentrated on the spillover effects of FDI on energy intensity and demonstrated that FDI could pose a threat to the environment on the one hand as it could be a driving force for energy efficiency on the other hand. First and foremost, Mielnik and Goldemberg (2002) illustrated a considerably declined energy intensity in response to a rise in FDI flows owing to the advent of modern technologies for a sample of 20 developing economies. In support of this view, Hubler (2009) employed CGE modeling to analyze the relationship among FDI, trade, and energy-saving technologies and discovered that FDI and trade could significantly encourage the energy-saving technologies. The results also indicated that the host country would take great advantage of advanced

low-carbon economy concepts from foreigners, thus, in turn improves the national sustainable development capacity. Ting et al. (2011) applied the LMDI model to decompose the energy intensity into three driving determinants including scale effect, composite effect, and technical effect. The results argued that the scale effect reduces the energy intensity, while the composite and technological effects of FDI do not appear to promote energy efficiency. In an extensive study, Yue et al. (2011) relied on country-specific characteristics of China to examine how FDI exerts its influence on energy use and concluded that only the FDI scale effect has played a leading role in the decline of energy intensity. Dean et al. (2009) reported that the eco-friendly FDI inflows of joint ventures which are specialized in pollution abatement, could be a key determinant to undermine the validity of pollution-haven hypothesis.

The role of FDI on energy intensity, ipso facto, is still open to debate due to its mixed results owing to different samples and environmental regulations, which reflects variations in the capacity of regions to absorb and benefits from environmental spillovers. Therefore, the quality and quantity of FDI inflows are determined by how strict and appropriate the environmental regulations are, which will bring about different influences on energy intensity (Shen et al., 2017; Hou et al., 2018). Correspondingly, the accumulation of foreign direct investment may exacerbate the discrepancies in the energy intensity of regions with lax environmental regulations. In the new, digital-driven era of globalization, it is believed that FDI will loosen the environmental regulations and accelerate the energy consumption to manufacture pollution-intensive products due to the fact that the host country strives to gain their competitive advantages (Copeland and Taylor, 2004; Kolstad and Wiig, 2012).

3. Methodology and Data

3.1. Hypotheses

As it is one of the primary inputs used in the energy production process, regardless of the development level of countries, energy supply needs to be sustained to maintain and improve the current production level and prosperity (Alam et al., 2016). Considering that countries tend to specialize in sectors where they can gain competitive advantages in global markets, trade openness is convinced to induce economic growth by requiring further energy demand, and thereby leads to a deterioration in environmental quality. Consequently, we state hypotheses on the nexus between trade openness and two aspects of energy intensity, as follows:

H₁: There exists a positive relationship between trade openness and consumption energy intensity.

H₂: There exists a positive relationship between trade openness and production energy intensity.

On the one hand, financial openness increases loan supply and decreases loan costs, which stimulates the investments and consumption made by companies and households as well as economic activities. Ipso facto, the demand for fossil fuels increases, while environmental deterioration increases (Koengkan et al., 2018). On the other hand, R&D activities can be developed and pollution-intensive industries reduced by using hybrid technologies that provide high energy efficiency (Tamazian et al., 2009; Aung et al., 2017). As a result, we hypothesises on the nexus between FDI inflows and two aspects of energy intensity, as follows:

H₃: There exists a positive relationship between flows of inward FDI and consumption energy intensity.

H₄: There exists a negative relationship between flows of inward FDI and production energy intensity.

3.2. Empirical Models

With the purpose to measure the scale of the impacts of economic integration through FDI inflows and trade openness on energy intensity, our study applies a baseline function from the theoretical grounds of IPAT model (the Influence, Population, Affluence, and Technology) developed by Ehrlich and Holdren (1971) and the stochastic version of IPAT (namely STIRPAT model) proposed in 1997 by Dietz and Rosa. We decompose the energy intensity function into three key driving factors: income level (Income), industrialisation (Industry), urbanisation (Urban), which are employed as main variables in several empirical investigations (Lin et al., 2017; Majeed and Tauqir, 2020; Pham et al., 2020). Furthermore, we consider trade openness (Trade) and FDI inflows (FDI) as indicators of economic integration (Phuc Nguyen et al., 2019).

While the oil price (OP) is included as a determinant of the oil demand side (Omri and Nguyen, 2014), the energy supply (ES) is added to substitute for the supply side's determinant (Azam et al., 2015). Based on these high-ranking literature, we study the empirical research of energy intensity through the following equation:

$$(1) EI_{it} = a_0 + a_1EI_{it-1} + \beta_1Income_{it} + \beta_2Industry_{it} + \beta_3Urban_{it} + \beta_4Trade_{it} + \beta_5FDI_{it} + \beta_6OP_{it} + \beta_7ES_{it} + \gamma_i + \varepsilon_{it}$$

where: i, t refers to country i at year t . a and β are the estimated coefficients. γ_i denotes country effects and ε_{it} is the error terms.

Taking advantage of the previous literature of Phuc Nguyen et al. (2020), we examine the influences of economic integration on energy intensity from two main aspects: production energy intensity (PEI) and consumption energy intensity (CEI), separately. To specify, the production energy intensity is highly related to the industrial structures since industrialization makes higher value-added manufacturing use more energy than does traditional agriculture or textile industries (Lin and Zhu, 2017) while urbanization is a major determinant impacting the energy consumption intensity due to an increase of residential households demand urbanization and economies of scale (Shahbaz et al., 2015). Consequently, we keep industrialization as the main factor of the model for production energy intensity and use urbanization as the key determinant for consumption energy intensity model:

$$(2) PEI_{it} = a_0 + a_1 PEI_{it-1} + \beta_1 Income_{it} + \beta_2 Industry_{it} + \beta_3 Trade_{it} + \beta_4 FDI_{it} + \beta_5 OP_{it} + \beta_6 ES_{it} + \gamma_i + \varepsilon_{it}$$

$$(3) CEI_{it} = a_0 + a_1 CEI_{it-1} + \beta_1 Income_{it} + \beta_2 Urban_{it} + \beta_3 Trade_{it} + \beta_4 FDI_{it} + \beta_5 OP_{it} + \beta_6 ES_{it} + \gamma_i + \varepsilon_i$$

3.3. Data and Variables' description

This study uses panel data covering 2005–2019 on 38 countries across Asia and the Pacific region (see Table 1, for sub-regions and countries list). These selected countries are based on WTO's members list and the availability of the database. Besides, there has been a lack of updated secondary data of CEI and crude oil prices over the period from 2016 to 2019. Accordingly, income level, industrialisation, urbanisation, trade openness, and FDI are measured as the logarithm of real GDP per capita, industrial value added (% GDP), urban population (% total population), trade openness (% GDP), FDI net inflows (% GDP) respectively, which are previously used in several studies (see Canh et al, 2019; Canh et al., 2020 among others). The annual average crude oil price and total primary energy production are sequentially transformed to the natural log before using them as a proxy for energy price and energy supply, respectively. The data were collected from the electronic database of the World Bank, the EIA, the Federal Reserve Economic Data and statistics portals (Statista and Wordometer).

Table 1: Asia and the Pacific's sub-regions and countries list

| Sub-region | Country |
|-----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| Central and West Asia | Afghanistan, Georgia, Kazakhstan, the Kyrgyz Republic, Pakistan, Tajikistan, and Uzbekistan; |
| East Asia | Japan, Hong Kong, the Republic of Korea, Macao, Mongolia, the People's Republic of China, Taiwan; |
| The Pacific | Australia, Fiji Islands, Kiribati, New Zealand, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga, and Vanuatu; |
| South Asia | Bangladesh, Bhutan, India, the Maldives, Nepal, and Sri Lanka; |
| Southeast Asia | Brunei Darussalam, Cambodia, Indonesia, the Lao People's Democratic Republic, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Viet Nam; |

Details of our variables and their descriptions are presented in the Table 2.

Table 2: Variables, Measurements, and Descriptions

| Symbols | Data range | Measurements | Sources | Expected Sign | |
|--------------------------------|------------|---------------------------------------------------------------------|--------------------------|---------------|------------|
| □ Explained variables | | | | | |
| CEI | 2005-2019 | Log of Primary energy consumption per capita (kg/person) | WDIs & Our World in Data | N/A | |
| PEI | 2005-2015 | Log of Energy intensity level of primary energy (MJ/\$2011 PPP GDP) | WDIs & EIA | N/A | |
| □ Explanatory variables | | | | | |
| | | | | PEI | CEI |
| Income | 2005-2019 | Log of GDP per capita (constant 2010 US\$) | WDIs & CEIC | - | + |
| Industry | 2005-2019 | Industry (including construction), value added (% of GDP) | WDIs & Statista | - | + |
| Urban | 2005-2019 | Urban population (% of total population) | WDIs & Wordometer | - | + |
| ES | 2005-2019 | Log of Primary energy production per capita (kg/person) | WDIs & EIA | + | + |
| OP | 2005-2015 | Log of Crude oil prices | FRED | | - |
| FDI | 2005-2019 | Foreign direct investment, net inflows (% of GDP) | WDIs & CEIC | - | + |
| Trade | 2005-2019 | Trade (% of GDP) | WDIs & CEIC | + | + |

□ Note: N/A denotes not applicable since CEI and PEI are regressands. We keep their lags as independent variables to indicate their persistence.

3.3.1. Foreign Direct Investment (FDI)

FDI is an important economic tool for economic development where the flows of FDI could address the gap between desired investment and the mobilization of domestic savings (Todaro and Smith, 2003) and help the host country break the vicious circle of underdevelopment by generating more job alternatives, sufficient capital financing as well as boosting economic growth (OECD, 1997; Hayami, 2001). However, FDI is often a double-edged sword through different channels. It introduces advanced technologies to improve energy efficiency on the one hand as it may lead to a “rebound effect”, which results in an increase in energy consumption by attracting more pollution-intensive industries on the other hand.

3.3.2. Trade Openness (Trade)

Trade openness can be calculated as the ratio of a country's aggregate value of exports and imports to the country's gross domestic product (GDP) in a year. The degree of trade openness demonstrates the progress of the trade structure of a country and its integration into the world trade. Trade openness has sped up the growth of both developed and developing economies through inducing higher trade volume and expanding scale of economic activities. Thus trade openness changes the structure of production of goods by changing the capital-labour ratio and brings energy-saving techniques to the host country, thus might help to reduce energy intensity for both production and consumption. Adversely, an increase in trade potentially accelerates ecological damages when the way of consuming energy does not focus on going green.

3.3.3. Energy Intensity (EI)

Energy intensity refers to the energy requirements to produce a unit of GDP and reflects an efficient allocation of energy resources to attain wealth and higher standards of living. Through different decomposition approaches, it can measure the marginal impact of industrial structure, technological innovation and other factors on the change of energy efficiency (Fisher-Vanden et al., 2004). The lower energy intensity is, the more efficiently and effectively a country is utilizing its energy resources. Obviously, as the level of energy intensity is determined by the level of economic development, it is assumed that the energy intensity of highly developed members tends to be lower than that of developing ones.

3.3.4. Level of Income (Income)

The higher the living conditions and income levels are, the more urban residents increase their consumption. As a result, consumer behaviors have gradually shifted from 'survival mode' to 'development mode' and eventually to 'enjoyment mode', which may directly or indirectly accelerate total energy use. Moreover, a country is believed to have an energy-dependent economy if there exists a causality running from energy consumption to income. It means that any shortage of energy could affect income adversely. Intuitively, once a country achieves an economic turning point, it will pay more attention to environmental issues and hence, makes an effort towards minimising pollution.

3.3.5. Industrialization (Industry)

Industrialization plays a crucial role in human sustainable development through its impact on technological innovations and social changes. As the economy goes through the stages of pre-industrialization, industrialization, and post-industrialization, there are adjustments in the final demand structure. In the pre-industrialization stage, traditional agriculture or basis manufacturing is the dominant industry that can be satisfied with low energy intensity. Next, in the industrialization stage, newer infrastructure projects are conducted to facilitate mass production and mass consumption. Then, the post-industrialized stage witnesses a remarkable shift from a *manufacturing* to a *service-oriented or knowledge-based economy*, thus in turn exposes to a lower energy intensity level. Accordingly, on the researches of Welsch & Ochsen (2005), the empirical results concluded that technical progress such as budget effect and adoption of energy-intensive technologies acts as an energy saving factor. In a comparative study, Tan and Zhang (2010), Sohag et al. (2015) and Wei et al. (2016) noted that in different countries technological innovation has a positive influence on energy efficiency and correspondingly reduces energy consumption at a given level of output.

3.3.6. Urbanization (Urban)

The urbanization process means the large-scale movements of the labor force and thus leads to changes in industrial structure of the whole economy. Urbanization can affect energy use by several channels, which might be classified under four groups (Madlener, 2011). Firstly, urbanization affects energy use by promoting production. Due to the increases in economic activities, a transition process has shifted from the less energy-intensive agricultural sector to the more energy-intensive industrial sector. Secondly, urbanization exerts its influence on mobility and transportation by raising the level of private transportation, which in turn increases the demand for energy and raw material of urban areas. Thirdly, increased urbanization is accompanied by infrastructure expenditures and intensive construction activities, which makes upwards pressure on energy intensity. Fourthly, urbanization can influence energy demand through its impact on consumer behaviors involving consumer needs and lifestyles of households. It means that urbanization makes city-dwellers wealthier, and hence, consumption structures of people change with more energy-intensive products. Correspondingly, Poumanyong et al. (2010) reinvestigated the impact of urbanization on road energy use using the data of countries classified by income and noted that urbanization raises more demand for energy in higher income countries comparatively in lower ones.

3.4. Research methods

In the context of a dynamic panel data model with a lagged dependent variable and a sample having a relatively large number of cross-sections (N = 38 countries) but a relatively short duration of time (T = 11 years), we applied diagnostic tests for panel regressions and tested endogeneity problem through different regression models: pooled OLS, fixed effects (FEM), random effects (REM), Feasible Generalized Least Squares (FGLS). Then, we also treat the strong existence of measurement error by employing a two-step system GMM for the estimation of dynamic unbalanced panel data (Lee, 2007). This method was proposed by Arellano and Bond (1991) as a technique to deal with endogeneity, heteroscedasticity, and serial correlation through the creation of a weighting matrix of the internal instruments. According to Roodman (2006), the validity of the instruments used in GMM estimator is checked by employing the Hansen and the Arellano-Bond's AR (2) tests. As the two-step system GMM estimator (SGMM) is a good estimation tested in many existing studies, this is the reason why we used it as a robustness check in this paper.

4. Estimation results and Discussions

4.1. Descriptive statistics

Table 3: Result of Descriptive Statistics

| Variable | Observations | Mean | SD | Minimum | Maximum |
|----------|--------------|-----------|-----------|-----------|----------|
| PEI | 439 | 0.6758845 | 0.2549139 | -0.370412 | 1.395623 |
| CEI | 546 | 2.958728 | 0.6129587 | 1.314447 | 4.183442 |
| Income | 599 | 3.606599 | 0.6097508 | 2.552954 | 4.857285 |
| Industry | 595 | 26.43779 | 12.28262 | 3.720151 | 74.11302 |
| Urban | 600 | 48.29127 | 25.77952 | 12.978 | 100 |
| Trade | 592 | 100.1658 | 74.73598 | 0.1674176 | 442.62 |
| FDI | 600 | 4.977157 | 7.327972 | -37.17265 | 58.51875 |
| OP | 600 | 1.842258 | 0.1172925 | 1.636424 | 1.998564 |
| ES | 441 | 2.628066 | 1.679656 | -2.10319 | 9.708259 |

4.2. Correlation matrix

According to Baltagi (2008), if the correlation coefficient is greater than 0.8, there is an existence of multicollinearity in variables. Thus, our result indicates that there does not happen multicollinearity problem since none of the correlations have an absolute value above 0.8. Consequently, these five explanatory variables can be together in the same model when we employ regression estimators on them.

Table 4: Correlation matrix

| Variable | PEI | CEI | Income | Industry | Urban | Trade | FDI | OP | ES |
|----------|---------|--------|--------|----------|--------|---------|---------|--------|-------|
| PEI | 1.000 | | | | | | | | |
| CEI | 0.2301 | 1.000 | | | | | | | |
| Income | -0.0655 | 0.8671 | 1.000 | | | | | | |
| Industry | 0.2859 | 0.4109 | 0.2458 | 1.000 | | | | | |
| Urban | -0.0504 | 0.8517 | 0.8627 | 0.1906 | 1.000 | | | | |
| Trade | -0.2687 | 0.3795 | 0.3633 | -0.1423 | 0.4323 | 1.000 | | | |
| FDI | -0.2710 | 0.2381 | 0.2158 | -0.2402 | 0.3262 | 0.7134 | 1.000 | | |
| OP | -0.0407 | 0.0055 | 0.0194 | -0.0206 | 0.0023 | 0.0392 | 0.0402 | 1.000 | |
| ES | 0.2504 | 0.4566 | 0.3805 | 0.4714 | 0.4098 | -0.3036 | -0.2639 | 0.0045 | 1.000 |

4.3. Diagnostic tests

4.3.1. Test of Multicollinearity

Table 5: Multicollinearity test with VIF on PEI & CEI model

| Variable | PEI model | | CEI model | |
|----------|-----------|----------|-----------|----------|
| | VIF | 1/VIF | VIF | 1/VIF |
| Trade | 2.62 | 0.380986 | 4.97 | 0.201396 |
| FDI | 2.04 | 0.489113 | 4.03 | 0.248206 |
| ES | 1.82 | 0.548000 | 2.72 | 0.367376 |
| Income | 1.75 | 0.572738 | 2.12 | 0.471635 |
| Industry | 1.34 | 0.746211 | 1.84 | 0.543377 |
| OP | 1.00 | 0.997246 | 1.00 | 0.995753 |
| Mean VIF | 1.76 | | 2.78 | |

A Variance Inflation Factor (VIF) is applied to test multicollinearity in this paper. According to Freund et al. (2006), if $0 < VIF < 10$, the multicollinearity is acceptable; if $10 < VIF < 100$, there will be multicollinearity; if $VIF > 100$, there will be strong multicollinearity. According to Table 4.3 and 4.4, the mean VIF of the variables in our models are 1.76 and 2.78, respectively. Since the results are less than ten, the multicollinearity problem does not exist.

4.3.2. Test of Heteroskedasticity

Table 6: Heteroskedasticity with PEI and CEI model

| | PEI | CEI |
|-----------------------------|--------|--------|
| Chi ² -statistic | 0.0000 | 0.7751 |

If the test statistic has a p-value (preferably) below a threshold (e.g. $p < 0.05$) then the null hypothesis of homoskedasticity is rejected and assuming the hypothesis H_1 : Variance of the residual term from a regression changes. We applied the variance test of Breusch-Pagan/Cook-Weisberg (1979, 1983) and explored that there exists heteroskedasticity in PEI model.

4.3.3. Test of Autocorrelation

Table 7: Autocorrelation test with PEI and CEI model

| | PEI model | CEI model |
|----------|-----------|-----------|
| F(1, 37) | 17.00 | 12.82 |
| F(1, 37) | 17.00 | 12.82 |

As the test statistic has a p-value smaller than 0.05, we reject the null hypothesis H_0 : no first order autocorrelation in the model and accept the alternative hypothesis H_1 : There is an existence of autocorrelation in the model. Using Wooldridge (2002) test, we observed a phenomenon of autocorrelation in both PEI and CEI models.

4.4. Regression results

4.4.1. Pooled OLS regression

Table 8: Regression result of the Pooled OLS

| | PEI model | CEI model |
|----------|------------------------|--------------------------|
| Income | -0.043927** (0.021) | 0.5219872*** (0.0449) |
| Industry | 0.0036998*** | |

| | | |
|--------------|------------------------|--------------------------|
| | (0.0009) | |
| Urban | | 0.0074309*** (0.001) |
| Trade | -0.0002128 (0.0002) | 0.0011362*** (0.0003) |
| FDI | -0.0029223 (0.002) | -0.0012551 (0.003) |
| OP | -0.057556 (0.096) | -0.0469624 (0.132) |
| ES | 0.0190563** (0.008) | 0.0697528*** (0.01) |
| CONS | 0.8542217*** (0.19) | 0.5209878* (0.27) |

Note: *, **, *** denote statistical significance at the 1%, 5% and 10% levels, respectively.

As a pooled OLS is a simple OLS technique, it ignores all the individually specific effects and violates some basic assumptions such as the orthogonality of the residual terms. Therefore, Fixed effect model (FEM) and Random effect model (REM) (Brooks, 2008) which are applied in most financial research, are necessary to employ in order to avoid unobserved heterogeneity. While fixed effects model includes constant variables across individuals which allows the individual or time explicit effect to be correlated with explanatory variables, random effects model is a statistical model in which the model parameters are random variables. This type of model is more adaptable and the endogeneity problem can be addressed by including mean of the time-varying covariate as an indicator in the model (Bell et al., 2015). Outstandingly, the pros of REM are the cons of FEM and the limitations of REM are the strengths of FEM.

4.4.2. Fixed-effects model & Random-effects model regression

Table 9: Regression result of the FEM & REM

| | PEI model | CEI model | PEI model | CEI model |
|-----------------|--------------------------|--------------------------|--------------------------|-------------------------|
| Income | -0.280103*** (0.044) | 0.5149027*** (0.064) | -0.2030485*** (0.036) | 0.516354*** (0.058) |
| Industry | -0.0035977*** (0.001) | | -0.0014612 (0.001) | |
| Urban | | 0.0083931*** (0.0027) | | 0.008792*** (0.002) |
| Trade | 0.0007645*** (0.0002) | 0.0003387 (0.0002) | 0.000504*** (0.0002) | 0.0004086* (0.0002) |
| FDI | -0.0003436 (0.0008) | -0.0005982 (0.001) | -0.0007688 (0.0008) | -0.0005697 (0.001) |
| OP | -0.0382269 (0.028) | -0.0041388 (0.035) | -0.0470011* (0.027) | -0.0068197 (0.034) |
| ES | -0.0014285 (0.012) | 0.0538231*** (0.015) | 0.0140459 (0.01) | 0.0526476*** (0.013) |
| CONS | 1.799876*** (0.158) | 0.5395881*** (0.187) | 1.468522*** (0.135) | 0.5129084*** (0.169) |

Note: *, **, *** denote statistical significance at the 1%, 5% and 10% levels, respectively.

Not only does the Hausman test detect the endogenous regressors in the model, but it also helps researchers make a decision between two methods (FEM and REM) for a panel data approach. The Hausman test checks for a more proficient model against a less effective one to make sure that the more suitable model gives the expected outcomes consistently. According to Brooks (2008), if the p-value for the Hausman test is less than 1% and leads to reject the null hypothesis H_0 , it suggests that the random effect model is not suitable, thus the fixed effect model is preferred.

H_0 : Random effect model is appropriate

H_1 : Fixed effect model is appropriate

With the following testing results:

Hausman test for PEI model: Prob > chi² = 0.0000

Hausman test for CEI model: Prob > chi² = 0.9925

According to the results of the Hausman test, since the p-value of the PEI model is 0.0000 which is smaller than 5%, we reject the null hypothesis “the random effect model is appropriate”. The p-value of the CEI model is 0.9925 which is higher than 5%, as a result, the null hypothesis “the random effect model is appropriate” fails to reject. These testing results concludes that the fixed effect model is suitable for the PEI model and the random effect model is appropriate for the CEI model.

4.4.3. Feasible Generalized Least Square estimation (FGLS)

Table 10: Regression result of FGLS

| | PEI model | CEI model |
|-----------------|---------------------------|-------------------------|
| Income | -0.0215372 (0.015) | 0.4514494*** (0.041) |
| Industry | 0.0027698*** (0.0007) | |
| Urban | | 0.0108216*** (0.001) |
| Trade | -0.0003032*** (0.0001) | 0.0002676** (0.0001) |
| FDI | -0.0010764** (0.0005) | -0.0000976 (0.0005) |
| OP | 0.009714 (0.011) | -0.0026193 (0.011) |
| ES | 0.0081079 (0.0061) | 0.034573*** (0.0099) |
| CONS | 0.7126667*** (0.057) | 0.7168542*** (0.105) |

Note: *, **, *** denote statistical significance at the 1%, 5% and 10% levels, respectively.

In terms of PEI model, we choose *Income*, *OP* and *ES* to be instrumental variables due to the insignificant impacts of these exogenous variables on *PEI* and specific characteristics of the APAC region. With regards to CEI model, *Trade* and *OP* are picked as instrumental variables since they are not influenced by the other variables in the model. Moreover, *FDI* is not selected to be an instrumental variable despite its statistical insignificance on *CEI*. To specify, the amount of inward FDI should be considered as an

endogenous variable as it can directly or indirectly affects the economies of scale and leads to structural changes in energy consumption.

4.4.4. GMM estimation

We employ the two-step system GMM estimator which was first proposed by Arellano and Bover (1991) to overcome the issue of autocorrelation by using lagged regressor as well as control the endogeneity and heteroskedasticity problems within individuals (Roodman, 2006).

Table 11: Regression result of the GMM

| | PEI | CEI |
|--------------------|----------------------------|---------------------------|
| Income | -0.0059615* (0.002997) | 0.0611511*** (0.009) |
| Industry | -0.0012416*** (0.00023) | |
| Urban | | -0.002264*** (0.0003) |
| Trade | 0.0000678* (0.00004) | 0.0000945* (0.00005) |
| FDI | 0.0009649*** (0.0003) | 0.0024796*** (0.0004) |
| OP | 0.0056301 (0.0067) | 0.0054835 (0.0079) |
| ES | 0.0066669*** (0.0018) | 0.0200058*** (0.0014) |
| CONS | 0.0144834 (0.0194) | -0.1251905*** (0.0184) |
| AR(1) | 0.007 | 0.090 |
| AR(2) | 0.333 | 0.422 |
| Sargan test | 0.388 | 0.595 |
| Hansen test | 0.748 | 0.659 |

Note: *, **, *** denote statistical significance at the 1%, 5% and 10% levels, respectively.

On the grounds that all Hansen tests are greater than 0,1; the AR(1) test has the p-value less than 0,1; AR (2) test shows the p-value greater than 0.1, we can conclude that the conditions for the model's consistency and rationality are satisfied.

4.5. Discussions

This paper investigates the relationship between economic integration and energy intensity on two aspects with seven factors considered as main indicators of energy intensity. The empirical results indicate that GDP per capita as income level has a negative impact on production energy intensity, which is consistent with existing studies (Canh et al., 2020) and supports the idea that higher income level exerts a positive influence on renewable energy transition (Hesary and Rasoulinezhad, 2020). Accordingly, when GDP per capita increases, people tend to voice their concerns about environmental issues, which in turn makes an upwards pressure on the government for stricter environmental regulations and the promotion of

energy transitions. Correspondingly, FDI inflows to the region witnessed a decline by 2 per cent in 2017 due to policy changes and fast growth of digital economy-related sectors (ESCAP, 2019). Furthermore, *Industry* shows a negative impact on production energy intensity, which is supported by previous studies (Li and Lin, 2014; Canh et al., 2020). In other words, a reduction in energy intensity within the APAC region can be attributed to significant energy efficiency gains made in the industrial sector and the fast growth of digital economy-related sectors such as e-commerce business. Adversely, trade openness exerts its positive influence on energy intensity, which can be indicated that the higher level of trade liberalization a country has, the greater use of its energy resources is required for manufacturing and consumption. Specifically, pollution-intensive industries that use more energy and capital, have a tendency to encourage trade due to lower tariffs or non-tariff barriers (Shapiro, 2021). Besides, our empirical result shows that FDI has a significantly positive influence on the production energy intensity, which reveals that FDI can stimulate a shift from less energy-intensive industries to greater ones (Michael et al., 2008). What's more, there exists a statistically insignificant correlation between the oil price and production energy intensity. Particularly, thanks to great natural resource endowments, the majority of APAC economies are net energy exporters such as Kazakhstan, India, Indonesia, Iran, Malaysia, to name but a few (ESCAP, 2016). Nandha and Hammoudeh (2007) also examined the linkage between oil price and energy intensity in 15 APAC countries and reported that no country was fundamentally sensitive to the rise or fall in crude oil price.

With regards to consumption energy intensity, there is a strongly positive correlation in the relationship between *income level* and *consumption energy intensity* (CEI), which was supported by previous literature (Canh et al., 2020; Trong et al., 2020). Precisely, a 1% rise in GDP per capita would bring about an increase the consumption energy intensity by 5.5%. This suggests that when the living conditions and income levels are improved, urban residents have a tendency to increase their consumption by shifting their consumer behavior from 'survival mode' to 'development mode' and finally to 'enjoyment mode'. For instance, energy consumption accompanied with the transportation sector has risen in line with the growing passenger vehicle uptake. Additionally, *urbanization* is negatively correlated with *consumption energy intensity*, which was reported in the study of Bilgili et al. (2017) for a sample of 10 Asian countries from 1990 to 2014. In spite of the fast speed of urbanization and the advent of mega-cities across the APAC region in the observed period, the number of people living in these modern cities at that time remained unremarkable and there was still a lack of access on energy. Besides, a positive relationship between *trade liberalization* and *consumption energy intensity* means that the more a country is open to trade, the greater the number of goods and services are exported and imported among countries. Likewise, being consistent with the study of Chongmen and Yu (2018), our result shows a positive impact of inward FDI flows on CEI, which indicates that the FDI inflows has created a more favorable environment for the expansion of economies of scale and structural changes, which in turn sped up the growth of pollution-intensive industries. Outstandingly, *oil price* has an insignificant effect on energy for consumption, which means that if the oil price goes up or down, energy demand for consumption remains unchanged. In other words, a lower oil price environment is not the only determining factor that boosts demand for oil or stimulates economic growth as consumer confidence regarding the future outlook has an immense impact on the level of spending within an economy (The Asia-Pacific Risk Center, 2017). Amongst other reasons, fuel subsidies and governments' resilient policies against future oil price increases may play roles in the insensitivity of movements in energy prices, especially in East Asia (Han and Phoumin, 2014). Last but not least, primary energy supply (ES) shows a significantly positive sign in the correlation with both PEI and CEI, which is true with the case of APAC economies (Canh et al., 2020).

Lastly, this implies that the higher degree of trade openness and FDI inflows play a vital role on energy intensity transformation in the face of oil price falls. In the policy setting, the long-term aims of higher energy intensity can be supported by green finance, which will help not only firms but also citizens in reducing their energy consumption intensity.

5. Conclusion

5.1. Conclusion and policy implications

The model of economic development accompanied with increased energy demand has made APAC region achieve at the expense of their environment. In recent years, the issue of energy scarcity has attracted a great deal of attention from environmentalists, policy-makers and academics due to its far-reaching influences on the sustainable development of mankind. Also, reducing energy intensity is believed to be a way to at least partially mitigate concerns about global warming, energy security issues, which in turn address poverty and underpin economic growth. Furthermore, the APEC governments can duplicate the renewable energy in its energy mix, which helps utilize clean energy resources and develop the energy-saving technologies. What's more, advancing the resilience of the energy infrastructure is considered as feasible measure to alleviate the disruptions of energy supply by improving the immediate response mechanisms and capacity building.

Accordingly, our empirical results illustrate the combined effect of FDI inflows and trade openness on energy intensity for APAC countries with a view to drawing some implications for policy makers. The paper is based on panel data covering the period from 2005 to 2015, where the regression parameters are estimated by GMM estimator. Therefore, findings from our research helps provide useful information for policy makers to alleviate trade tensions and global policy uncertainties within APAC countries through regional integration associated by attempts to buckle down to green finance and digitalize trade.

5.2. Limitations and future research

5.2.1. Limitations

The empirical results in this study have remarkably contributed to the relationship between economic integration and energy intensity in Asian-Pacific region, however, there are still limitations existing in this study as there is little research examining this nexus across Asia and the Pacific region. Secondly, the number of observations is just including 38 selected APAC economies due to the availability of database so that the empirical results are not truly precise and highly reliable. This may make the results of the study partly different compared with some previous domestic and abroad researches. Another limitation is the explanatory variables in this study. In addition to the variables that used in this study, there are other independent variables that impact energy intensity in selected economies across APAC region such as R&D capital stock, technology spillover, institutional quality, operating hours, human capital. However, this study only focuses on main independent variables and assess whether these variables have an impact on energy intensity or not, but has not yet built an optimal model to measure and forecast precisely. The limitations mentioned above will make a considerable contribution on helping us determine the direction for future research.

5.2.2. Future research

From the above limitations, the next research direction is to expand the time period of observations and add some above-listed variables that potentially can exert their influences on energy intensity. Besides, we have an intention of using the World Bank's income classification to split the sample into three classes: high-income, upper-middle income and lower-middle income. What's more, for the next research, we are to add more econometric approaches such as FMOLS or CCR for assessing the long-run effects among those variables, which in turn make the following research become more reliable and consistent.

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DOES RISING GASOLINE PRICE AFFECT THE SHIFTS IN SELECTION ON MEANS OF TRANSPORTATION? VIETNAMESE STUDENTS' PERSPECTIVES

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ABSTRACT

The aim of this research is to examine whether rising gasoline prices affects the shift in choice of university students on means of transportation. We conducted a survey of 400 university students in Ho Chi Minh city during May, 2022. The research applied logic regression and linear regression with the use of Statistical Package for the Social Sciences (SPSS) 20 to measure the effect of rising gasoline prices on shift in selection of transportation means. The study findings found that the rising gasoline prices did not significantly affect the shift to bus or electric motorbike from motorbike. However, our outcome revealed that students' monthly spending and household books had a significant relationship with the shift to electric motorbike from motorbike. In particular, a student with higher monthly spending is more likely to shift to Electric Motorcycle than a student with lower monthly spending. Alternatively, a student whose household book is in the North of Vietnam is more likely to shift to Electric Motorcycle than the one whose household is in the South of Vietnam and the Middle of Vietnam. Furthermore, we found that there was a 64.3% probability that students who own motorbikes will shift to Electric Motorcycles in relation to the monthly spending and household books.

Keywords: gasoline prices, university student, transportation.

1. Introduction

Petroleum is known as an important input fuel of the whole economy. However, in recent times, gasoline prices have been continuously adjusted up, leading to increased pressure on inflation, negatively affecting the lives of Vietnamese people. (Minh Phuong, 2022). Specifically, from February 21st, 2022, the price of gasoline and diesel products in the country continued to increase in line with the rising trend of world oil prices. The latest increase of VND 1,550 RON95 price per liter reached VND 29,980 on May 11th, marking an eight-year high price in Vietnam (Minh Hoang, 2022). One of the main reasons for the increase in CPI was that gasoline prices were adjusted 10 times, causing the price of A95 gasoline to increase by 4,700 VND/liter, E5 gasoline price by 4,580 VND/liter, and diesel oil by 7,780 VND/liter. In the first four months of the year, domestic gasoline prices increased by 48.84% over the same period last year, causing the overall CPI to increase by 1.76% (Le Van, 2022). The large fluctuations in domestic and global gasoline prices has recently affected the general psychology of the people. The impact of gasoline prices on spending and travel has become a big problem for many low- and middle-income households (Ba Toan, 2022). Even many families in Vietnam have had to consider a financial balance plan and cut daily expenses (Ba Toan, 2022).

Several prior studies have focused on the effects of gas prices. Theoretically, this topic has been analyzed by a number of domestic and foreign authors from many different perspectives. However, previous studies often assessed the impact of gasoline prices on macro variables of the economy, few studies analyzed the effects of gasoline prices on travel, discretionary spending, necessities, and other types of expenditure. In addition, there are quite a few studies reporting on the consumption expenditure index (CPI) of Vietnamese people, but there are very few statistical reports related to specific areas of change. On the other hand,

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motorbikes are known as the most popular means of transport for Vietnamese people with more than 65 million registered units, out of a total population of 96 million (ABeam, 2020). Because motorbikes are a means of transportation suitable to the current socio-economic conditions, traffic infrastructure in Vietnam and the living habits of Vietnamese people. Especially for students, most of them travel by personal motorbike - a vehicle that uses gasoline as the input fuel - which has become more and more expensive recently.

On the basis of inheriting from previous studies, in this study, we analyze the impact of increasing petrol prices on traffic use habits of Vietnamese students. At the same time, whether public transport or green vehicles based on the factor "increasing fuel prices" will become an alternative solution in the decision of Vietnamese students to participate in traffic. The results of this study contribute to the scientific literature on various aspects. First, the research team will examine whether the price of gasoline actually affects the students' long-standing motorbike habits. Second, research on the impact of gas prices related to changes in students' choice of mode of transportation. Last but not least, based on the previous findings, the authors will hypothesize that students may change their travel habits due to the "increasing fuel price" factor. In terms of practicality, the research results help managers understand the factors affecting students' motorbike riding habits. Besides, the study will also make suggestions and recommendations, when the price of gasoline increases, it is necessary to change the means of transportation: from motorbikes to electric motorbikes or public transport such as buses. This is also an opportunity for businesses to invest in other means of transportation that helps people to reduce travel expenses.

Accordingly, the purpose of the research is to examine whether rising gasoline prices affects the shift in choice of university students on means of transportation. The paper consists of 5 sections. Section 2 presents the literature review. The research methodology is described in section 3. Next, section 4 shows the research results and discussion. Section 5 provides the conclusions and recommendations.

2. Theoretical framework and literature review

2.1. Theoretical Framework

2.1.1. Theory of consumer behavior

The theory of consumer behavior is in fact understood in many ways. According to Charles, Joseph and Carl (2000), consumer behavior is a process that describes the way in which consumers make decisions to choose or reject a product or service. Applying this theory to our research, the consumer behavior of petroleum is understood as the customer's reactions under the impact of price of petroleum, leading to the shifts in selection on means of transportation using petroleum to vehicles using other cheaper energy sources.

2.1.2. The price elasticity of demand

The second theory used in this paper is the price elasticity of demand. Accordingly, price elasticity of demand is the change in quantity demanded when there is a change in price. The case where the demand for a good is price elastic occurs if the quantity demanded changes drastically as the price changes. Conversely, demand is price inelastic if quantity demanded changes little or no change when price changes. The commodity studied in this research paper is petroleum - an essential commodity and difficult to replace, so the elasticity of demand for this commodity is low. Therefore, from this theory, our team wants to consider the behavior of consumers in the current context of increasing petrol price, whether there are shifts in selection on means of transportation using petroleum to vehicles using other energy.

2.2. Literature review

2.2.1. National studies

In a study by Nguyen (2020) on "The Asymmetric Effect of gasoline Price on Consumer Prices in Vietnam Market: The Nonlinear Autoregressive Distributed Lag Model Approach", the author examines the disproportionate influence of gasoline prices on consumer prices, experimentally in the Vietnamese market in the short and long term. Research results show that in the short and long term, gasoline prices have a

disproportionate effect on consumer prices. Since then, the author has shown that the petrol and oil price management policy in recent years has had limitations and inadequacies that have not met the expectations of consumers. At the same time, the author has also given some suggestions for the policy of petrol price management in Vietnam.

Nguyen et al. (2008) has a research paper on "Effects of the increasing of gasoline price: some initial quantitative analysis" estimated the effect of an increasing in gasoline price on the purchasing power of the population groups and the price levels of sectors in the economy. Through the study, the authors used the I/O table model, the consumption index CPI in the basket structure showed the direct impact of the increase in gasoline prices. For households that uses gasoline, their purchasing power falls by about 1%, but richer households tend to be affected more. In addition, the specific results on the impact of gasoline prices on the increase or pressure on the manufacturing industries in the study show that the average increase will be about 2.56%.

2.2.2. International studies

A group of Donald et al. (1978) studied "The impact of gasoline prices on urban bus ridership" in the city of Tucson, Arizona. The article focuses on testing the elasticity of gasoline price to the number of passengers of the bus system in the city through a regression model. It also provides an unbiased view of the interrelationships between federal energy policies and the effects of future gas prices and urban transportation choices.

In the study of Alford et al. (2006), they analyzed the adjustments in spending of university students due to changes in gasoline prices. The article focuses on studying the impact of continuously increasing petrol prices on average changes in discretionary spending, non-discretionary spending and commuting frequency of students. Through the study, the authors found that there were small changes in some areas of discretionary spending, and the group of university students in the study sample also changed some ways of commuting to adapt to fluctuating gasoline prices.

Raszap's study about "Petroleum Demand by Different Demographic Groups" (2007) examines the differences in gasoline consumption among three different age groups of the US population: students, workers, and retirees. The estimated elasticities show that retirees have the most elastic function for gasoline and working people have a significantly less elastic function than retirees.

Nowark et al. (2013) calculated the cross-elasticity between gas prices and transit passengers in Chicago using monthly data from January 1999 to December 2010. Separate estimates are performed for city rail, city bus, commuter rail and suburban bus service. Thereby the authors found that when gas prices were less than \$3 a gallon the cross elasticities were small and in the range of 0.02 to 0.05. When prices were in the \$3 to \$3.99 range per gallon, the elasticities increased for the rail-based modes to 0.12 to 0.14. Additionally, when gas exceeds \$4 a gallon, the elasticity is estimated to be 0.28 to 0.3 for bus service and 0.37 for commuter rail. Besides, had prices remained high for a lengthy period, some of the people who had switched from auto to transit may have found an alternative mode (such as a carpool) or changed their employment or found an alternative trip destination.

Michael (2014) has explained and analyzed the relationship between the cost of petrol and the willingness to invest public money in improving public transport. The results show that in the face of volatile gasoline prices, American consumers are willing to support public transportation. Therefore, these findings serve as a suggestion for policymakers when exploiting public transport.

In the study of Ming-Che et al. (2015), the authors applied the asymmetric threshold cointegration test developed by Enders et al. (2001) to examine the asymmetric cointegration relationship between gasoline price and usage of public transport in Taiwan. In it, the author clarified three main issues. Firstly, the price of gasoline has a big influence on the use of public transport. Secondly, Metro ridership is more sensitive than bus and rail ridership to gasoline price and income. And finally, gasoline price can be seen as a signal for transportation agencies to adjust their operating strategies more quickly during periods of price increases.

Zolnik (2015) pointed out that in macroeconomic conditions with higher gasoline prices, there are benefits for carpooling, but largely the change of carpooling across the country. This is due to differences in the economic, demographic, and sociological characteristics of the people sharing the same vehicle.

Mrrouch et al. (2019) applied automatic vector regression analysis to model the different choices of consumers among three options: fuel-efficient cars, midsize cars, and midsize cars. Cars are less efficient when affected by gasoline prices in Lebanon. Through the study, the authors show evidence against the hypothesis that rising gasoline prices will change consumer demand for the most fuel-efficient cars.

From previous studies, our team found that each study had certain limitations and that the results of the studies could vary from subject to subject. In general, domestic and foreign studies have shown that changes in gasoline prices have an impact on people's transportation behaviors from many angles: from spending and demographic groups to the choice of transportation. In addition, a number of studies have analyzed the effects of gasoline prices on the use of public transport. However, there has not been any research that fully analyzes the impacts of gasoline prices on the changing means of transportation of students in Vietnam on most means of transportation. Therefore, the article contributes to filling the aforementioned gaps in Vietnam. Not only that, but the study also has theoretical and practical significance in order to fully identify and fully realize the different impacts leading to the change of means of transportation for Vietnamese students in the new context.

3. Research method

Data of this research was collected through a survey of university students in Ho Chi Minh City during May, 2022. We carry out the survey through messenger, zalo, viber and telegram. As a result, there were a total of 500 questionnaires distributed and 428 questionnaires returned in our data collection.

The aim of the research is to examine whether the rising price of gas online affects shifts to bus or electric motorbike from motorbike. Besides, we also considered the impact of age, gender, rate of spending on transport, students' monthly spending, students' household book on the shift to bus or electric motorbike. To develop this model, we applied a logistic model and linear regression.

The model can be illustrated as:

$$\begin{aligned} \text{LOGIT}(P(Y_1 = 1)) = & \beta_0 + \beta_1.P_GASOLINE + \beta_2.AGE + GENDER \\ & + \beta_3.HH_BOOK + \beta_4.SPENDING + \beta_5.SPENDING RATE \end{aligned} \quad (1)$$

$$\begin{aligned} \text{LOGIT}(P(Y_2 = 1)) = & \beta_0 + \beta_1.P_GASOLINE + \beta_2.AGE + GENDER \\ & + \beta_3.HH_BOOK + \beta_4.SPENDING + \beta_5.SPENDING RATE \end{aligned} \quad (2)$$

In which:

Y_1 - Binary variable (Y=0: not shift to bus; Y=1: shift to bus)

Y_2 - Binary variable (Y=0: not shift to electric motorbike; Y=1: shift to electric motorbike)

$P_GASOLINE$ - Rate of gasoline price increase;

HH_BOOK - Household book;

AGE - Age;

$GENDER$ - Gender;

$SPENDING$ - Monthly spending;

$SPENDING RATE$ - Rate of Monthly spending on transport

β_0 - a constant

4. Empirical results and discussion

4.1. Characteristics of respondents

As mentioned above, the survey investigating perspectives of universities' students in Ho Chi Minh City was conducted during 09 May 2022. Through snowball sampling, a total of 500 questionnaires were distributed to respondents, among which 428 responses were received, achieving a 85,6% response rate.

However, 28 responses were not fully completed. To ensure that the evaluation is reliable, the 28 odd questionnaires were eliminated. As a result, the remaining 400 responses were utilized to make analysis for this study, which accounts for 80% of the total sample.

Table 1 describes the characteristics of respondents. As can be seen, there were 265 female students attending the survey, which represented more than 66% of the total. Additionally, there were 132 respondents being female and 2 respondents with other gender, accounting for 33.25% and 0.5% respectively.

Up to 75.5% of participants have household registration in the South of Vietnam. While there were only 15% participants with household registration in the North of Vietnam. In addition, the participants with household registration in the Middle of Vietnam were 32 participants, only half of the number of participants with household registration in the North, corresponding to 8% of the total sample. Alternatively, 6 participants have household registration in the other regions, representing 1.5%.

There were 186 participants who are in second-year, representing 46.5% of the total sample. Number of participants being first-year students and third-year students are 64 and 70 students, representing 16% and 17.5% respectively. The number of fourth-year students is 55, achieving about 14%. Approximately the remaining 6% was the percentage of participants who were students of other years.

Table 1. Characteristics of respondents

| Characteristics (n=400) | | Frequency (Person) | Percentage (%) |
|-------------------------|---------------------|--------------------|----------------|
| Gender | Male | 133 | 33.25 |
| | Female | 265 | 66.25 |
| | Other | 2 | 0.5 |
| Household book | South | 302 | 75.5 |
| | North | 60 | 15 |
| | Middle | 32 | 8 |
| | Other | 6 | 1.5 |
| Student years | First-year student | 64 | 16 |
| | Second-year student | 186 | 46.5 |
| | Third-year student | 70 | 17.5 |
| | Fourth-year student | 55 | 13.75 |
| | Other | 25 | 6.25 |

Source: Compiled from the research team's statistics

4.2. Descriptive analysis

This section describes the mean, minimum, maximum and standard deviation of students' monthly spending, rate of their monthly spending on transport and rate of gasoline price increase making students shifting to bus and Electric Motorcycle.

As illustrated in Table 2, the average monthly spending by students in Ho Chi Minh city is 2,820,025 VND. The mean rate of their spending on transport is 17.475%. The rate of gasoline price increase encourages students to shift to Electric Motorcycles, on average of 0.226%.

Table 2. Descriptive statistics

| | Minimum | Maximum | Mean | Standard deviation |
|---------------------------------|---------|-----------|-----------|--------------------|
| Monthly spending | 400,000 | 7,500,000 | 2,820,025 | 1,409,400.7 |
| Rate of spending on transport | 5.00 | 60.00 | 17.475 | 8.5453 |
| Rate of gasoline price increase | 0.04 | 1.23 | 0.2261 | 0.1878 |

Source: Authors' calculation

4.3. Logistic regression analysis

This section discusses the results on association between dependent variable and independent variables in the function (1) and (2).

Each of the independent variables was tested for relationship with the dependent variable. We used the likelihood ratio (G^2) tests of association. Table 3 shows the Tests of association between dependent variables and independent variables. In particular, shifting to bus and Shifting to Electric Motorcycle were considered as dependent variables, while rate of gasoline price increase, age, gender, students' household book, their monthly spending, and rate of spending on traveling were as independent variables. The P- value for the result of the model on shifting to bus is 0.484 which was higher than the required significance level of 0.1. Therefore, we can conclude the model is not statistically significant. The finding opposed to the research result of Ladin et al. (2015). They found that the rising fuel price influenced users' own private vehicles to shift to public transports.

Additionally, the P-value for model result on shifting to Electric Motorcycle was 0.056 which is smaller than the P-value of 0.1. Hence, the model is statistically significant.

The regression results for Shifting to Electric Motorcycle revealed that correlation coefficient for Household book and Spending are statistically significant. That is, household books and spending have a positive impact on Shifting to Electric Motorcycles. Meanwhile, Rate of gasoline price increase, gender, age, and rate of spending on traveling did not affect Shifting to Electric Motorcycle.

Based on the results in Table 2, the logistic regression equation becomes:

$$LOGIT(\text{shifting to Electric Motorcycle}) = 0.38 + 0.03xHOUSEHOLD BOOK + 0.073xSPENDING$$

As can be seen in Table 4, Exp(B) for spending is 0.073 which means that a student with higher monthly spending is more likely to shift to Electric Motorcycle than a student with lower monthly spending. Alternatively, Exp(B) for household books is 1.462 which indicates that a student whose household book is in North of Vietnam is more likely to shift to Electric Motorcycle than the one whose household is in the South of Vietnam and Middle of Vietnam.

As described in Table 5, the probability of shifting to Electric Motorcycle is forecasted 64.3%.It means that there is 64.3% confidence level that students who own motorbikes will shift to Electric Motorcycle in relation to the monthly spending and household books.

Table 3. Tests of association between dependent variable and independent variables

| Variables | Shifting to bus | | Shifting to Electric Motorcycle | |
|---------------------------------|-----------------|---------|---------------------------------|---------|
| | Value | P-value | Value | P-value |
| Constant | 0.864 | 0.864 | 0.380 | 0.380 |
| Rate of gasoline price increase | 0.353 | 0.353 | 0.883 | 0.883 |
| Age | 0.846 | 0.846 | 0.358 | 0.358 |
| Gender | 0.057 | 0.057 | 0.238 | 0.238 |
| Household book | 0.970 | 0.970 | 0.030 | 0.030 |
| Spending | 0.446 | 0.446 | 0.073 | 0.073 |
| % Spending on traveling | 0.958 | 0.958 | 0.936 | 0.936 |
| -2 log likelihood | 552.740 | | 511.585 | |
| P-value | 0.484 | 0.484 | 0.056 | 0.056 |

Source: Authors' calculation

Table 4. Variables in Equation for model on Shifting to Electric Motorcycle

| | B | S.E | Wald | df | Sig. | Exp(B) |
|------------------|-------|-------|-------|----|-------|--------|
| Household Book | 0.38 | 0.175 | 4.714 | 1 | 0.030 | 1.462 |
| Monthly Spending | 0.000 | 0.000 | 3.223 | 1 | 0.073 | 1.000 |

Source: Authors' calculation

Table 5. Classification Table

| Observed | | | Predicted | | |
|----------|---------------------|-----|---------------------|----|--------------------|
| | | | Electric Motorcycle | | Percentage Correct |
| | | | Yes | No | |
| Step 1 | Electric Motorcycle | Yes | 252 | 3 | 98.8 |
| | | No | 140 | 5 | 3.4 |
| | Overall Percentage | | | | 64.3 |

Source: Authors' calculation

5. Conclusion

The aim of the study is to test whether rising gasoline prices affect the shifts in selection on means of transportation of students in Viet Nam. We conducted a survey of 400 university students in Ho Chi Minh city during May, 2022. The research applied logic regression and linear regression with the use of Statistical Package for the Social Sciences (SPSS) 20 to measure the effect of rising gasoline prices on shift in selection of transportation means.

The study findings found that the rising gasoline prices did not significantly affect the shift to bus or electric motorbike from motorbike. However, our outcome revealed that students' monthly spending and household books had a significant relationship with the shift to electric motorbike from motorbike. In particular, a student with higher monthly spending is more likely to shift to Electric Motorcycle than a student with lower monthly spending. Alternatively, a student whose household book is in the North of Vietnam is more likely to shift to Electric Motorcycle than the one whose household is in the South of Vietnam and the Middle of Vietnam. Furthermore, we found that there was a 64.3% probability that students who own motorbikes will shift to Electric Motorcycles in relation to the monthly spending and household books.

This research has implications for academics and practical industry. Regarding academics, this research is one of few studies that has focused on the examination of the impact of gasoline price increase on the shift to public transport and electric motorbikes. With respect to industry, the research is expected to be significant reference for electric motorbikes firms in making business strategy

The limitations of our research is to focus on getting perspectives of university students in Ho Chi Minh city. For future study, we will expand the survey scale in the North and Central regions, then make comparison of pointview of students across the North, the South and the Centre in Vietnam

6. Appendix

6.1. Logistic regression result using SPSS software - Variable: Electric Motorcycle

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

| | Chi-square | df | Sig. |
|--------------|------------|----|-------|
| Step | 12.290 | 6 | 0.056 |
| Step 1 Block | 12.290 | 6 | 0.056 |
| Model | 12.290 | 6 | 0.056 |

Model Summary

| Step | -2 Log likelihood | Cox & Snell R Square | Nagelkerke R Square |
|------|----------------------|----------------------|---------------------|
| 1 | 511.585 ^a | 0.030 | 0.041 |

Classification Tables

| Observed | | Predicted | | |
|--------------------|-------------------------|---------------------|-----|--------------------|
| | | Electric Motorcycle | | Percentage Correct |
| | | No | Yes | |
| Step 1 | Electric Motorcycle No | 5 | 140 | 3.4 |
| | Electric Motorcycle Yes | 3 | 252 | 98.8 |
| Overall Percentage | | | | 64.3 |

Variables in the Equation

| | B | S.E. | Wald | df | Sig. | Exp(B) |
|------------------------------|--------|-------|-------|----|-------|--------|
| Age | 0.054 | 0.058 | 0.846 | 1 | 0.358 | 1.055 |
| Sex | -0.256 | 0.217 | 1.393 | 1 | 0.238 | 0.774 |
| HHbook | 0.380 | 0.175 | 4.715 | 1 | 0.030 | 1.462 |
| Step 1 ^a Spending | 0.000 | 0.000 | 3.223 | 1 | 0.073 | 1.000 |
| Rate Of Spending | -0.001 | 0.012 | 0.006 | 1 | 0.936 | 0.999 |
| Rate Of Gasoline | 0.084 | 0.568 | 0.022 | 1 | 0.883 | 1.088 |
| Constant | -1.093 | 1.244 | 0.771 | 1 | 0.380 | 0.335 |

6.2. Logistic regression result using SPSS software - Variable: Bus

Block 1: Method = Enter

Omnibus Tests of Model Coefficients

| | Chi-square | df | Sig. |
|--------------|------------|----|-------|
| Step | 5.478 | 6 | 0.484 |
| Step 1 Block | 5.478 | 6 | 0.484 |
| Model | 5.478 | 6 | 0.484 |

Model Summary

| Step | -2 Log likelihood | Cox & Snell R Square | Nagelkerke Square | R |
|------|----------------------|----------------------|-------------------|---|
| 1 | 522.740 ^a | 0.014 | 0.019 | |

Classification Tables

| Observed | Predicted | Bus | | Percentage Correct | |
|----------|--------------------|--------|-----|--------------------|-------|
| | | NO | YES | | |
| | | Step 1 | Bus | NO | 0 |
| | | YES | 0 | 251 | 100.0 |
| | Overall Percentage | | | | 62.8 |

Variables in the Equation

| | B | S.E. | Wald | df | Sig. | Exp(B) |
|------------------------------|-------|-------|-------|----|-------|--------|
| Age | -.010 | 0.054 | 0.038 | 1 | 0.846 | 0.990 |
| Sex | 0.422 | 0.222 | 3.629 | 1 | 0.057 | 1.525 |
| HHbook | 0.006 | 0.153 | 0.001 | 1 | 0.970 | 1.006 |
| Step 1 ^a Spending | 0.000 | 0.000 | 0.580 | 1 | 0.446 | 1.000 |
| Rate Of Spending | 0.001 | 0.013 | 0.003 | 1 | 0.958 | 1.001 |
| Rate Of Gasoline | 0.545 | 0.587 | 0.861 | 1 | 0.353 | 1.724 |
| Constant | 0.198 | 1.157 | 0.029 | 1 | 0.864 | 1.219 |

Descriptive Statistics

| | N | Minimum | Maximum | Mean | Std. Deviation |
|--------------------|-----|-----------|------------|--------------|----------------|
| Spending | 400 | 400000.00 | 7500000.00 | 2820025.0000 | 1409400.67939 |
| Rate Of Spending | 400 | 5.00 | 60.00 | 17.4750 | 8.54529 |
| Rate Of Gasoline | 400 | 0.04 | 1.23 | 0.2261 | 0.18783 |
| Valid N (listwise) | 400 | | | | |

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SOCIO-ECONOMIC IMPACT OF THE COVID-19 PANDEMIC ON TOURISM: PRELIMINARY EVIDENCE FROM LABORS WORKING IN HUE CITY

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ABSTRACT

During the time of the Covid-19 pandemic, social distancing, travel bans, as well as community blocks had profound impacts on economic activities, including tourism. This study applied the DFID framework to assess the social-economic impact of the pandemic on livelihoods of workers in tourism in Hue city. We randomly selected 346 people working in different tourist activities, such as souvenir sellers, hotel/homestay owners, cyclo and bicycle riders, small restaurant owners for the analysis. The findings show that the pandemic has posed significant burdens on the livelihoods or labors in tourism sector. Clear declines in their human, social, natural, financial capitals were observed. For livelihood outcomes, the number of tourists and the operating time decreased, led to a decrease in income. The findings also imply that the tourism sector should prepare various action plans to help their labor force better deal with similar global challenges in the future.

Keywords: Covid-19 pandemic; social-economic impact; labors; tourism.

1. Introduction

COVID-19 has caused unprecedented impacts on many economies and the global economy. Social distancing, travel bans, as well as community blocks had profound impacts on economic activities, including tourism, which is one of the most vulnerable sectors (Sigala, 2020). The consequences of the pandemic on tourism are currently the focus of research and policy (Gossling, Scott; Hall, 2020; Nicola et al., 2020).

Vietnam long ago became a destination that tourists can not overlook. The tourism sector has a significant meaning in economic and social aspects because of the fact that the livelihoods of millions of people depend directly on this smokeless industry as the primary source of income. However, the whole country in general and Hue City, in particular, are witnessing a sharp decrease in the number of domestic and foreign tourists. Therefore, the tourism sector estimated that the country would lose 5 billion USD in the second quarter of 2020 (Vietnam Times, 2020).

In Hue, among 13,000 direct and indirect workers in the field of tourism, about 90% lost their employment temporarily. This was significantly threatening the existence of all tourism businesses and the life of labor groups (JER, 2020). These groups include souvenir sellers, homestay owners, cyclo drivers, and motorbike drivers, which are highly vulnerable groups.

However, the majority of impact problems of COVID-19 on tourism have been mainly discussed from a macroeconomic perspective (Dat, 2020; Gossling et al., 2020; Nicola et al., 2020). Thus, there are still shortcomings in the information about the pandemic impacts on vulnerable groups of people. The lack of clear knowledge of the consequences for these groups and their recovery capacity makes community and government efforts cannot meet the expectations (Nicola and partners, 2020). Therefore, this study provides an additional bottom-up view to improve current interventions and prepare to better respond to future pandemic challenges.

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2. Overview of the COVID-19 outbreaks and its impact

2.1. The COVID-19 outbreaks

The first case of SARS-CoV-2 death occurred in Wuhan on January 9, 2020. On March 11, 2020, the World Health Organization (WHO) issued a statement calling "COVID-19" a "Global Pandemic". From the epicenter of Wuhan, SARS-CoV-2 appeared in more than 220 countries and territories with 118.5 million people infected with COVID-19, of which 2.63 million died. Two years after WHO declared COVID-19 a global pandemic, by the end of March 10, 2022, the world had more than 450 million cases, 6.01 million deaths.

Governments around the world have responded to protect the health of people and communities around the world, including restricting travel, declaring a state of emergency. The worldwide effects of the current COVID-19 pandemic include: loss of life, economic and social instability, xenophobia and racism, disinformation online bias, and biological weapons.

Vietnam is among countries that have suffered the COVID-19 pandemic, but has successfully prevented the transmission since the early days with no deaths for months. However, the latest wave of the COVID-19 pandemic (the fourth wave) has been damaging Vietnam since then. As of September 12, 2021, 6,01,349 cases and 15,018 deaths were reported in Vietnam. The CFR was 2.50%, higher than the average number of 2.06% globally. The Government has had many timely policies, gradually supporting businesses and people to overcome the difficulties of the COVID-19 pandemic. Vietnam has become a bright spot in realizing the dual goals of disease prevention and control and socio-economic development.

2.2. Impacts of the COVID-19 pandemic on the economy and tourism industry

The COVID-19 pandemic is having a strong impact on the global value chain through its hubs. During the COVID-19 pandemic, hard-hit countries are also the hubs of the global production network such as China, Japan, South Korea, and the US. When the pandemic broke out, social distancing measures were implemented, many production activities halted. The supply chain is interrupted, affecting investment and global trade activities, thereby reducing the growth of the world economy in general and many countries and regions in particular.

In Vietnam, the impact of Covid-19 on the tourism industry is also extremely serious. The number of international visitors to Vietnam in the whole year of 2020 reached only 3.8 million, down 78.7% compared to the previous year. It can be said that the COVID-19 epidemic has had an impact on the entire economy (La et al., 2020), especially on tourism businesses in Vietnam (Huynh et al., 2021). Up to 98.3% of businesses surveyed said that the COVID-19 epidemic is affecting their tourism business. Challenges that businesses face include: Organizing business activities during the epidemic period, customers cancelling contracts, changing personnel... In 2020, 90% of travel businesses will temporarily suspend operations. active, 10% of enterprises operate in moderation. Currently, there are only about 2,200 businesses with travel business licenses nationwide, with most of them switching to domestic travel businesses. Tourism workers are forced to change jobs to earn a living, leading to the risk of a shortage of human resources when tourism recovers.

Thua Thien Hue Province, it is estimated that by 2020, 10/14 main targets will be achieved, with 04 targets not achieved, including Growth rate of gross domestic product (GRDP), export value, total investment capital of the whole society, creating new jobs. Tourism here has been severely affected by the Covid-19 pandemic. Tourism revenue is estimated at 3,800 - 4,000 billion VND, equal to 32% of the plan and down 64%; in which the revenue of accommodation establishments is about 800 billion dong, accounting for 20% of revenue. Loss of tourism revenue is estimated at 8,000 billion VND (TTH, 2021).

3. Data and analytical methods

3.1. Theoretical framework

The DFID framework has been applied widely in assessing the livelihood of workers in tourism in the context of the Covid-19 pandemic. The sustainable livelihood approach emerged partly as a result of poverty

alleviation strategies relating to poverty-environment linkages (Baumann, 2002). Workers in the tourism sector are mainly dependent on natural resources and ecosystem services for their livelihoods with regard to the tourism industry. The sudden outbreak of the Covid-19 pandemic brought the tourism industry to a halt. The status of social distancing, isolation, restrictions on movement between areas, and temporary suspension or closure of tourist businesses has made life more difficult for those working in the tourism industry. In the context of the complicated Covid-19 pandemic, the sustainable livelihoods approach allows us to understand how this has affected the vulnerability and livelihood issues of those who work in the tourism industry. It is also important to explore how their livelihoods in tourism can be enhanced by improved tourism management.

This social-economic evaluation is based on the sustainable livelihood's framework, which has been widely applied to assess people's livelihood changes in different contexts (Ellis & Freeman, 2004; Lambini & Nguyen 2014; Sultana & Mallick, 2015; Reed et al., 2019). In the context of the Covid-19 pandemic, SLF is used to analyze data and assess the livelihoods of workers in the tourism sector.

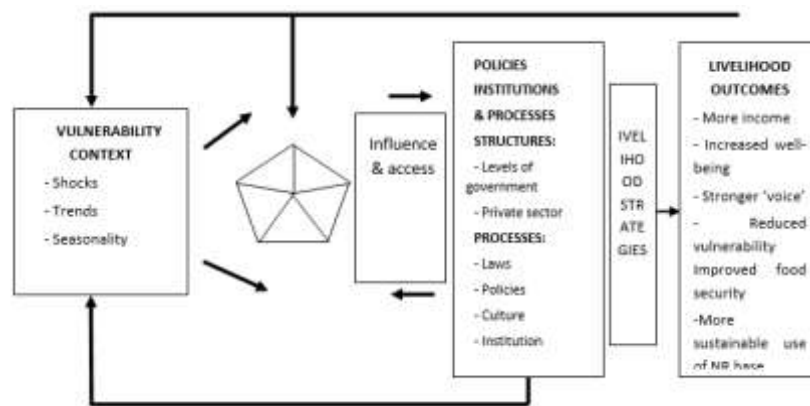


Figure 1. Sustainable Livelihoods Framework (DFID, 1998)

The vulnerability context: Refers to the external environment in which workers in tourism live.

Livelihood assets are considered the 5 capitals:

Natural Capital: Access to historical sites, Access to natural sites, Landscape sightseeing, Participate into events.

Physical Capital: Houses, Facilities, Tools and equipment, Tourism - specialized facilities, Fuels and inputs.

Human Capital: Number of Labors, Working time, Levels of stress, Meal, Nutrition.

Social Capital: Criminal exposures, Relationships with suppliers, Relationships with customers, Relationships with local authorities.

Financial Capital: Investment, Saving, Debts, Food expenses, Healthy expenses.

Policies and Institutions: Processes embrace the laws, regulations, policies, operational arrangements, agreements, societal norms, and practices that, in turn, determine the way in which structures operate.

Livelihood Strategies and Outcomes: Potential livelihood outcomes can include more income, increased well-being, reduced vulnerability, improved food security, more sustainable use of the natural resource base, and recovered human dignity, between which there may again also be conflict.

3.2. Data

For secondary data, the data is collected from the Department of Culture, Sports and Tourism of Hue city. Data sources from newspapers, magazines, the Internet and documents related to the field of tourism. For, primary data collection. The structure of the questionnaire consists of 3 parts. The first part collects demographic information. Part 2 explores the impact of the pandemic on livelihood assets (including human capital, financial capital, natural capital, physical capital, and social capital) and their coping strategies. The final part asked participants about Government Support and their opinions on vaccines. The questionnaire

collects data using a variety of measurement techniques, including multiple-choice questions, a 5-point Likert scale, and open-ended questions to collect qualitative data. For sampling method, we used convenience sampling to choose respondents for the survey. To collect data, I went to tourist sites, walking streets, business establishments and tourism management in Hue city to conduct interviews with souvenir sellers, hotel/ homestay owners, cyclo and bicycle riders, small restaurant owners, those who were experienced in the impacts of Covid-19, and response strategies to reduce the impacts of Covid-19. These marginalized groups of people are selected based on results from consultation with local authorities and experts at Hue University. Participants were randomly selected. Specifically, 350 questionnaires were distributed, and 346 were used for further analysis.

4. Empirical results and discussions

4.1. Overall impact of the pandemic on tourism industry in Hue city

The development of the tourism industry in Hue city offered more than 13,000 jobs in 2019. Tourism is considered the "goose that lays golden eggs" of Hue, so recently, the epidemic "attacked" caused almost the entire tourism system here to stop working. During the pandemic, almost all travel businesses and ancillary services in Hue have closed or temporarily stopped operating. The number of visitors to Hue decreased sharply, estimated at 1.8-2 million arrivals for the whole year, down 60% compared to the same period last year. In which, international visitors decreased significantly, by 65% (Figure 1).

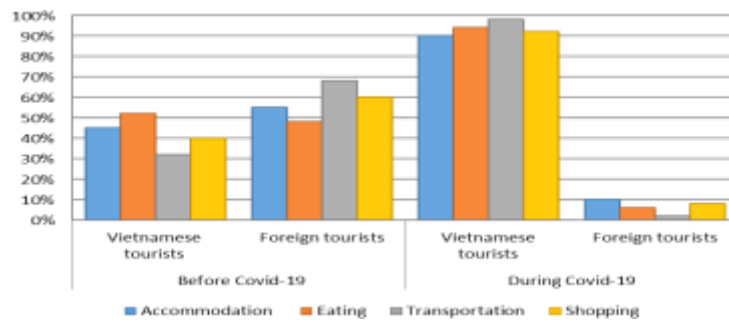


Figure 1. Percentage change in the structure of tourists to Hue.

(Source: Own' calculation)

According to the data provided directly from the Department of Culture, Sports and Tourism of Hue city, the revenue of businesses has decreased significantly compared to the same period in 2019, estimated at 3,800 - 4,000 billion VND, down 64%. More specifically, the revenue of accommodation establishments decreased on average from 50% to 90%, which is about 800 billion VND. Whereas the revenues of travel agencies and dining establishments decreased by 90% and around 60-90%, respectively.

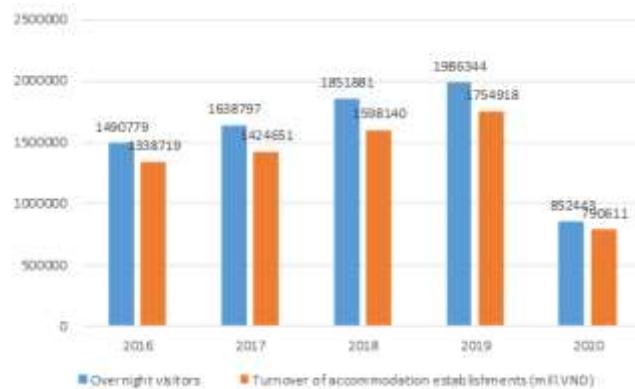


Figure 2. Overnight visitors and turnover of accommodation services in Hue city

(Source: Own' calculation)

The drop in visitors also causes the number of existing workers to lose their jobs in the tourism industry. Most local tourism businesses have had to cut staff to reduce costs. It is estimated that 13,000 people working in tourism-related fields have been affected by the Covid 19 pandemic.

4.2. *Impact s of the pandemic on surveyed groups in Hue city*

4.2.1. *Characteristics of participants in the survey*

We have conducted a survey of 346 respondents who are employees in the field of Hue tourism, including: hotel/homestay owners, cyclo and bicycle riders, small-scale restaurant owners and souvenir shop owners. Participants are classified by travel service groups: Accommodation, Eating, Transportation and Shopping. The final result showed 346 valid survey data and 4 invalid data were removed. Below is the table of characteristics of the participants.

In general, hotel and homestay owners have a lower average age than the other three groups (32.8 years old) and also have the highest educational level with 83.3% having a university degree or higher, while the other three groups usually graduated from high school. Hue is famous as a land imbued with national cultural identity. Taking advantage of the famous national and international cuisine, people open restaurants to serve tourists. The average age of this group of workers is 42.5, mainly doing business in the form of mobile food sales and small restaurants because of low initial investment and high profit margin. This form of development has created a diverse, quality and cheap Hue Street food culture, attracting domestic and foreign tourists. For transportation, due to the characteristics of the job, the gender ratio of workers is quite large, male accounts for 67.7% while female is 32.3%. Along with the highest average age among the 4 groups, the cyclo and motorbike taxi riders are also seasoned with 16.5 years of experience in the industry. Compared to the three groups mentioned above, the business of souvenirs in Hue has not really developed. The reason is that the market lacks souvenir products bearing Hue's cultural identity; Hue souvenir production has not received attention and investment to expand production, leading to scarcity of goods and high prices. Instead of simply selling products, souvenir shop owners will often combine organizing entertainment games with prizes to attract tourists.

Table 1. *Characteristics of participants in the survey*

| Group | Unit | Accommodation (n=66) | Eating (n=171) | Transportatio n (n= 36) | Shopping (n=73) | Total (n=346) |
|------------------------------------------------|--------|-------------------------|-------------------|-------------------------------|--------------------|------------------|
| Age | Year | 32.8 | 42.5 | 49.1 | 41.5 | 41.5 |
| Gender | | | | | | |
| - Male | % | 53.1 | 57.3 | 67.7 | 60.3 | 58.1 |
| - Female | % | 46.9 | 42.7 | 33.3 | 39.7 | 41.9 |
| Experience | Year | 8.6 | 7.5 | 16.5 | 9.7 | 9.1 |
| Education | | | | | | |
| - Primary school | % | 1.5 | 7.0 | 2.8 | 6.9 | 5.5 |
| - Secondary school | % | 0.0 | 27.5 | 38.9 | 24.9 | 22.8 |
| - High school | % | 15.2 | 29.8 | 55.5 | 40.1 | 31.8 |
| - University and higher | % | 83.3 | 35.7 | 2.8 | 28.1 | 39.9 |
| Family size | People | 4 | 5 | 5 | 5 | 5 |
| Number of labor | People | 2 | 3 | 3 | 3 | 3 |
| Number of full-time labor in tourism sector | People | 1 | 1 | 1 | 1 | 1 |

(Source: Own' calculation)

4.2.2. Impact of Covid-19 on the livelihoods assets of Hue tourism industry by groups

a) **Human capital**

Human capital suffers the most negative impacts from the Covid pandemic compared to other types of capital. More than half of survey respondents said their working hours had been reduced due to the pandemic. The number of visitors decreased, the working time decreased, about 35% of business owners had to reduce their labor to suit the situation at that time. However, the meals or nutrition of the surveyed households did not change too much. In addition to people worried about the health and economic threats, there are also a few people who feel optimistic during the pandemic. They adapt to the slow pace of life and learn to appreciate what they have and the people around them after witnessing heartbreaking events during the pandemic.

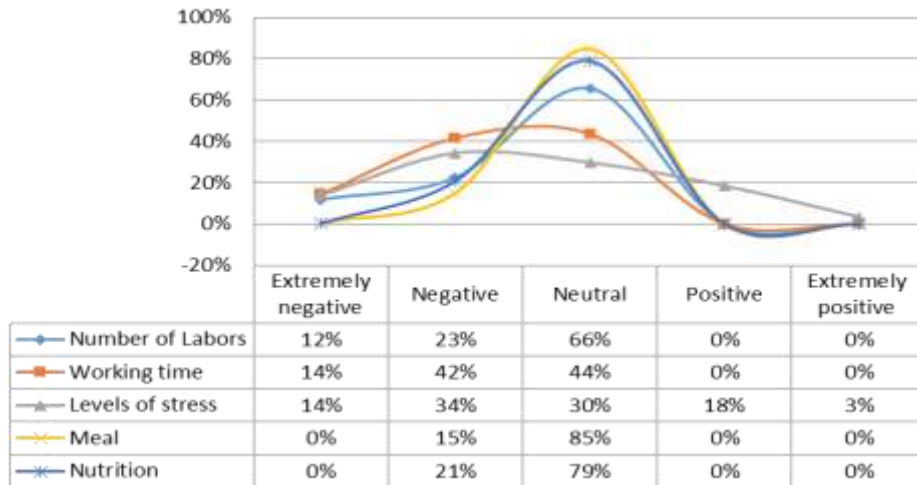


Figure 3. Impact of the pandemic on human capital

(Source: Own' calculation)

b) **Physical capital**

Based on the survey results, in general, people think that Covid does not affect their physical capital too seriously. Only about 7% of people said that their home and living facilities were slightly reduced, while the remaining 93% said they were not affected. Tools for living and tourism, fuel, input materials for production and service provision all decreased but not too seriously, mainly because to reduce unnecessary costs.



Figure 4. Impact of the pandemic on Physical capital

(Source: Own' calculation)

c) Natural Capital

Natural capital fluctuates largely because of the government's distancing and closure policies. Tourist and sightseeing places are temporarily closed to welcome guests, and events have been canceled to avoid mass gatherings and ensure effective epidemic prevention and control.

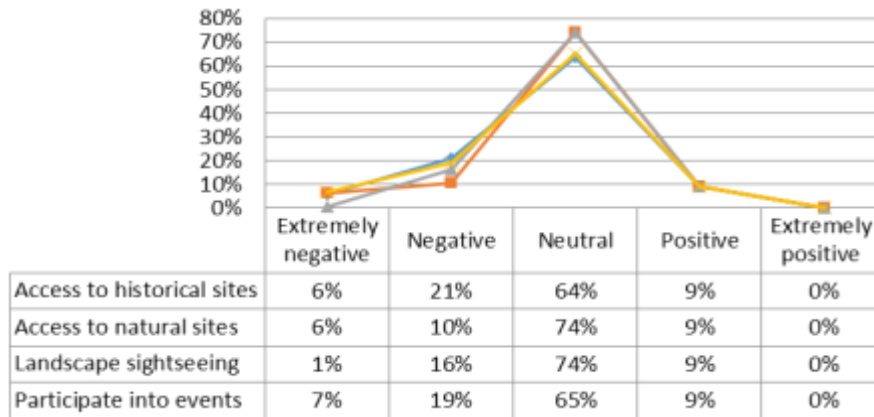


Figure 5. Impact of the pandemic on Natural Capital

(Source: Own' calculation)

d) Financial Capital

Along with human capital, financial capital is also severely negatively affected. Nearly 50% of participants reported a drop in their savings. During the outbreak of the pandemic, Hue city experienced strict regulations on travel restrictions and openings, people were banned from leaving their homes, public websites were closed, restricting access on destinations and events. Working hours and income plummeted. People even have to withdraw the available savings to manage their immediate lives, let alone save money or invest. Many people have to reduce costs by reducing food consumption or especially have to borrow to get cash, which lead to further stress on interest rates.

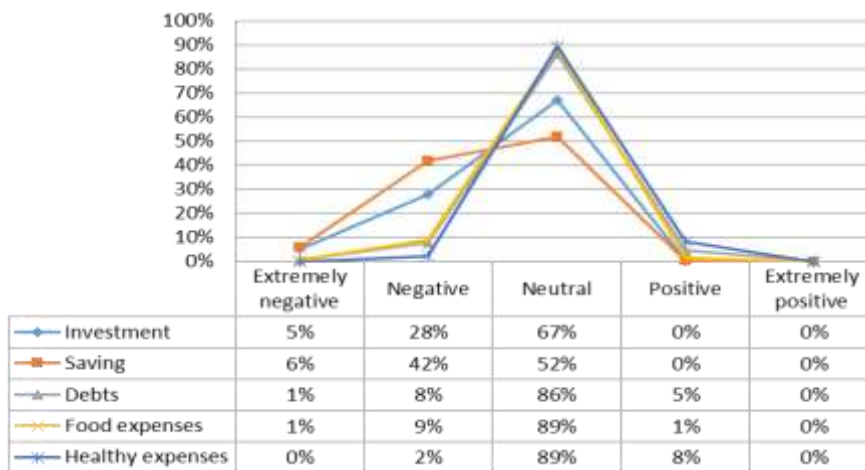


Figure 6. Impact of the pandemic on Financial Capital

(Source: Own' calculation)

e) Social Capital

The majority of survey respondents rated their social capital as not much of a threat. About 18% of people reported that crime had slightly worsened due to theft. The reason is the lack of money in the context of the pandemic. However, there are also 7% of people who think that the crime situation is getting better. This is a side effect of local management and police agencies when patrolling and setting up epidemic prevention checkpoints. In addition, nearly everyone maintains good social relations with surrounding people and local agencies.

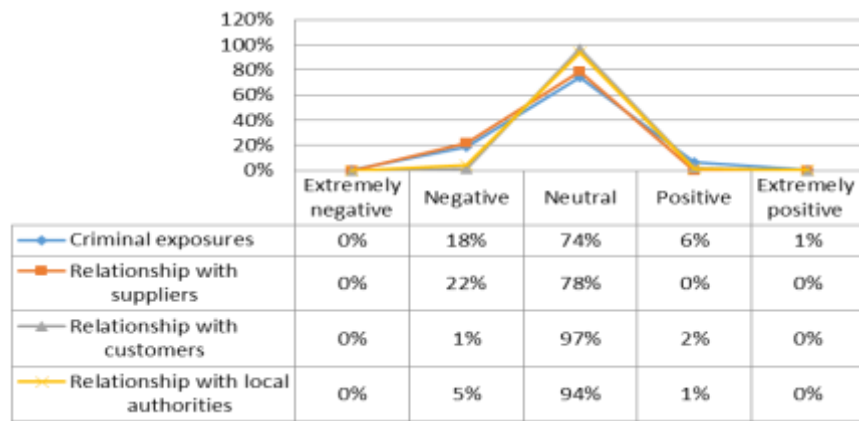


Figure 7. Impact of the pandemic on social capital

(Source: Own' calculation)

4.2.3. Livelihood strategies to cope with the Covid-19 epidemic

Over a period of time, everyone became aware of the importance of self-adaptation and coping with the consequences of the pandemic. Many strategies have been proposed and applied.

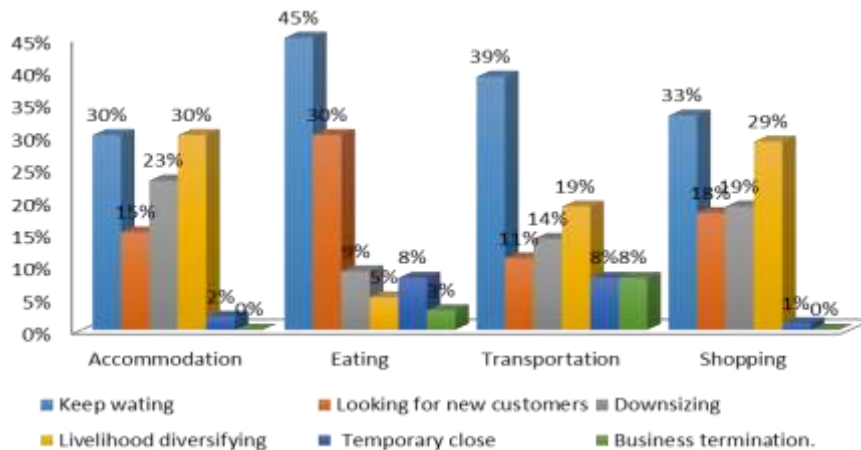


Figure 82. Livelihood strategies to cope with the Covid-19 epidemic

(Source: Own' calculation)

The majority of survey respondents said they would wait for the pandemic to end and continue working in the tourism industry, most notably the Eating group with 45% agreeing. To be able to maintain until things return to normal, they choose to downsize the business by reducing opening times and laying off workers.

Others are aimed at new markets and customers. The general trend is to focus on serving domestic and local tourists instead of foreign tourists until the border gates and flight routes are reopened. The period of social distancing is also when all activities gradually shift from offline to online, so online customers are also the target audience of travel service providers. Here eating group has the most advantage. Many people actively diversify their livelihoods while maintaining the tourism business while working in other occupations. These can be mentioned as selling clothes - cosmetics online, leasing premises, lending money, opening pawn shops, and investing in stocks and currencies...

However, it is undeniable that the heavy impact of the pandemic, about 5% of survey respondents could not stand it, had to suspend operations or even go bankrupt. They face difficulties in finding new livelihoods when their finances have been heavily consumed and jobs are scarce in society. This result makes a large number of workers become unemployed; the socio-economic burden increases rapidly.

4.2.4. Income changes of surveyed groups in Hue city

The outbreak of a pandemic threatens health and disrupts people's daily life. The number of infected people increased, people limited going out, the government's distancing and closure policies were tightened, causing the number of tourists to decrease. Business establishments have to reduce working days or suspend operations, and incomes decrease.

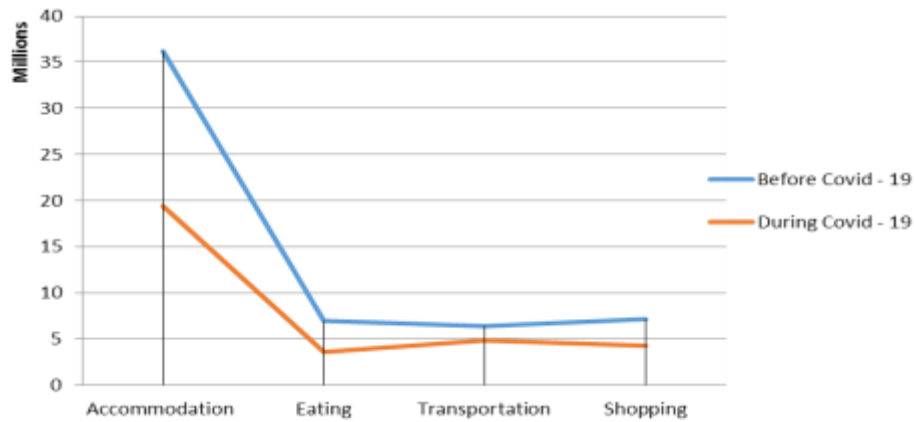


Figure 9. The income of surveyed groups in Hue city

(Source: Own' calculation)

The number of tourists decreases, and the operating time decreases, leading to a decrease in income. Homestays/hotels have less flexible cost structures, causing owners to bear more loss costs than other groups. Looking at the monthly income figures, it can be seen that the income during the epidemic outbreak of the accommodation group has nearly halved compared to before. Meanwhile, the monthly income of the Eating, Transportation and Shopping groups decreased less. These groups have flexible cost structures (materials, fuels and inputs) that help them reduce unnecessary costs proactively.

5. Concluding remarks

The COVID-19 pandemic has impacted the livelihoods of disadvantaged groups in Hue city. All assets and livelihoods of disadvantaged people are affected by the Covid-19 pandemic. The participants were quite worried about the reduction of working time leading to financial pressure on the family. In response to the pandemic, most participants tried to keep their businesses open for as long as possible. Strategies include promoting the exploitation of the domestic tourist market, developing new livelihoods, reducing service prices, downsizing and temporarily shutting down operations.

Human capital suffers the most negative impacts from the Covid-19 pandemic. The number of workers and working days is nearly halved compared to normal. For, physical capital is not severely affected. Housing and living facilities are slightly reduced. Meanwhile, labor tools, input fuels and materials are adjusted to be more suitable when customer demand decreases. Financial capital is also a capital that is seriously affected. Savings and investments fell sharply while debt increased. Food and health expenses also take a hit. Additionally, social capital doesn't pose too much of a threat. Crime does happen, but it's not serious. Social relationships are also maintained quite well. tourism workers take the initiative in dealing with epidemics. Most of them maintain the tourism business, diversify their livelihoods and reduce unnecessary expenses in life.

This study provides practical implications for marginalized people in the tourism industry under the pressure of the COVID-19 crisis. First of all, it provides them with a better understanding of strategic management to respond to the effects of the pandemic and to tailor potential measures to reduce crisis consequences. In this regard, they need to be more aware of the difficulties ahead. Therefore, travel service providers should adapt to the impacts of the pandemic by restructuring their tourism products and target markets to survive multiple waves of COVID-19. In addition, tourism businesses should actively take measures to achieve a post-crisis revival instead of passively depending on government support. Because

research shows that government support has not really helped the interviewees. The findings in this study also imply that the tourism system should have various action plans prepared to deal with similar global disasters in the future.

Confirmation: This paper is original, unpublished, and does not under consideration for publication elsewhere.

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INVESTIGATE THE IMPACT OF COVID-19 ON COMMERCIAL AND SERVICE SECTORS IN DA NANG

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ABSTRACT

Appearing since the end of 2019, COVID-19 epidemic has caused many negative impacts on the economy of the whole world in general and that of Viet Nam in particular. COVID-19 epidemic has seriously affected the economy of Da Nang city, especially the field of trade - services which is a field accounting for a large proportion of the GDP structure of Da Nang. This paper focuses on the investigation of the impact of COVID-19 epidemic on the service-commercial sectors in Da Nang using the monthly data from January 2020 to December 2021 collected from the Da Nang Statistical Office, the Viet Nameese Ministry of Health and the Oxford COVID-19 Government Response Tracker (OxCGRT). The data comprises the total COVID-19 cases in Viet Nam, the total deaths in Viet Nam, the stringency index in Viet Nam, the total COVID-19 cases in Da Nang, the total deaths in Da Nang and the service-commercial data including the number of guests serving, the revenue from accommodation and catering services, the revenue from other consumption, the revenue from retail, the export turnover and the import turnover. The econometric simple regression method is utilized. It is found that, although the COVID-19 epidemic has negatively effected on the number of guests serving, the revenue from accommodation and catering services, the revenue from other consumption, the revenue from retail, it has positive impacts on the export and import turnover. The research results suggest that the local government in Da Nang should focus on investing in the import and export sectors, and at the same time restore the industries negatively affected by COVID-19 to recover and develop Danang's economy.

Keywords: Da Nang city; commerce - services; COVID-19.

1. Introduction

The COVID-19 pandemic, starting from the end of December 2019 after nearly 2 years of the first mutation, has caused profound effects on our world. With the corona virus's rapid spread, people's physical and mental health was seriously affected. The number of daily new confirmed cases increasing rapidly has made the health systems to be overloaded. Factories and companies have been forced to suspend activities and consumer demand has also changed.

Viet Nam's economy has also suffered serious damage under the impact of the Covid 19 pandemic. Regarding the external economy, the balance of trade in goods is in deficit, and the supply chain and industrial zones are also affected. The disruption caused by the widespread resurgence of COVID-19 appears to have forced exporters to temporarily close factories or suspend production. On the other hand, controlling and limiting the epidemic by restricting travel has also created a big wound for the country's economy.

COVID-19 has also caused many negative impacts on the entire economy of Da Nang city, especially the service sector. When two disease outbreaks occurred, Da Nang's government had taken many measures with the goal of preventing and extinguishing the epidemic to protect public health, such as closing restaurants, hotels, tourist attractions, and so on. This policy has caused the economy to decline. On the other hand, Service-commercial sectors are the spearhead of the economic sector of Da Nang. They contribute to economic restructuring, attract investment, create many jobs, and enhance people's quality of life. These

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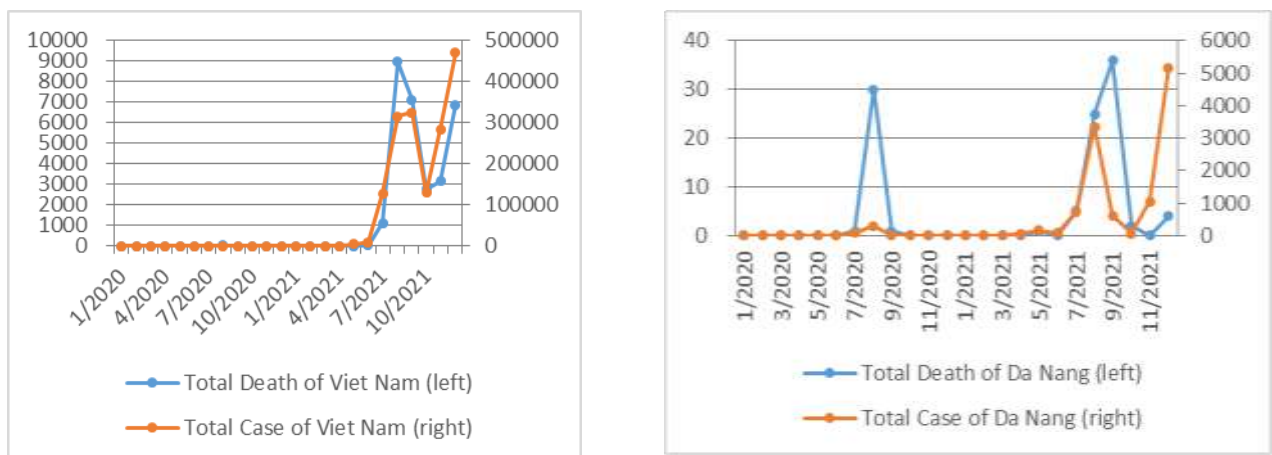
[#] Contributed equally

economic sectors hit strongly and affect not only the structure of the tourism industry but also the entire economy of Da Nang. That is the motivation for investigating the impact of the COVID-19 epidemic on Da Nang's service commerce industry.

The rest of the paper is divided into the following sections: part 2 deals with the of COVID-19 situation in Viet Nam and Da Nang, together with the context of commercial and service sectors in Da Nang, while the section 3 provides the literature review. The section 4 gives the methodology and data and finally, the results and findings discussion are provided in the section 5. The conclusion is showed in the section 6.

2. The commercial and service sectors in Da Nang in the COVID-19 pandemic chronology

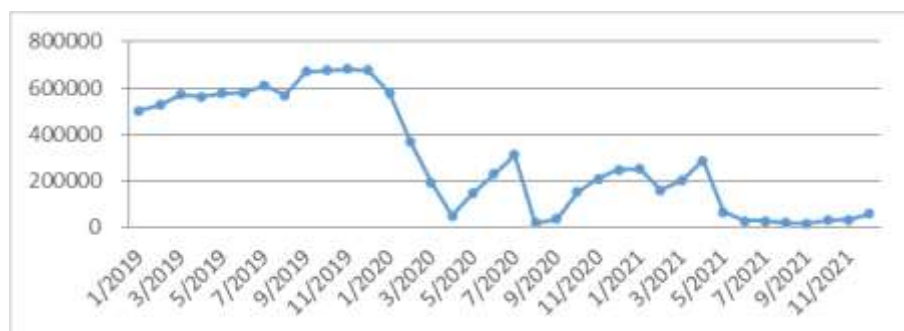
It is clear that the number of total cases and deaths in Da Nang and Viet Nam from January 2020 to December 2021 in [Figure 1] were expected to increase during the research period. The number of total cases and deaths in Viet Nam was especially high from May 2021 to the end of the year. About Da Nang, the number of total cases and deaths rose markedly between May 2020 and September 2020 and from May 2021 to the end of the year.



Source: Authors' own elaboration based on the Ministry of Health of Viet Nam

Figure 1: The number of total cases and the number of deaths in Viet Nam (the left chart) and the numbers of total cases and deaths in Da Nang (the right chart) from January 2020 to December 2021.

The COVID-19 is outbreak epidemic in early 2020 severely affected many activities of the commercial and service sectors, leading to the revenue of many industries being severely affected. The number of guests served to Da Nang city has decreased sharply due to the complicated changes of the COVID-19 pandemic, the number of visitors over the years has decreased, especially in the second, third and fourth quarters. the lowest in 2021, the average decrease of visitors in 3 quarters is 96.1% compared to the same period in 2019 [see Figure 2].



Source: Authors' own elaboration based on the Da Nang Statistics Office

Figure 2: The number of guest served from January 2020 to December 2021

From the Figure 3, it can be seen that the revenue from retail sales in 2020 increased in the first quarter, the remaining three quarters decreased, of which the third quarter saw the sharpest decrease of 12% due to the outbreak of the disease again in late July-early August 2020. In 2021, the third-quarter, revenue

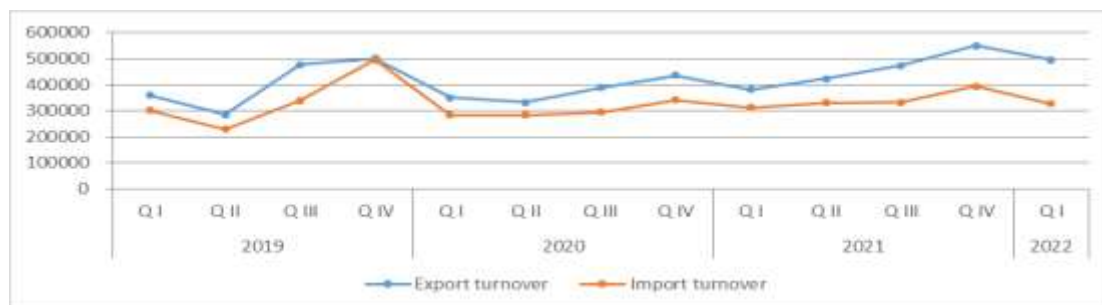
from retail decreased by 27% compared to the same period in 2019, but total revenue of the remaining quarters of 2021 increased compared to the same period in 2019. Meanwhile, revenue from accommodation and catering services, food and beverage revenue gradually decreased in all quarters in the period 2020-2021. Revenue fell the most in the third quarter of 2021, specifically, down 79% compared to 2019 mainly due to the 3rd outbreak of the epidemic, the Da Nang government continued to implement social distancing policies. In the similar pattern, the revenue from other consumption sales in 2020 decreased from about 15% to 50% compared to the same period in 2019. Revenue from other consumer goods in the first quarter of 2021 has increased due to many exploitation and stimulus policies implemented to attract tourists, increasing by 16% over the same period last year 2019. However, in the remaining quarters of the year, revenue decreased due to the strong outbreak of the COVID-19 epidemic in Da Nang.



Source: Authors' own elaboration based on the Da Nang Statistics Office

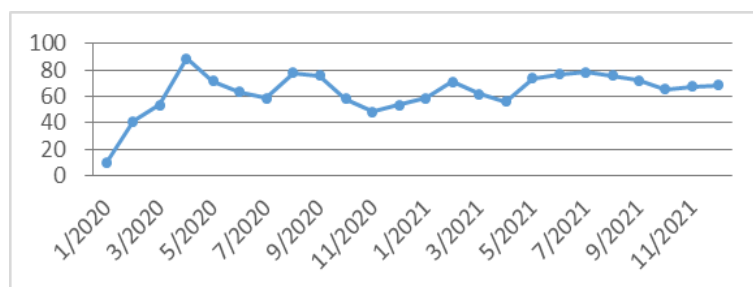
Figure 3: The graph presented the revenue from retail, other consumption and accommodation and catering in 2019-2021

Next, in 2020 the export turnover and Import turnover activities decreased compared to the same period in 2019, but at the end of the second quarter, enterprises had resumed production activities, causing import and export turnover to increase times. 17% and 24% respectively over the same period last year. The import and export situation has shown more positive signs in 2021, especially in the third quarter, import and export turnover was seriously reduced due to the outbreak of the disease again. [see Figure 4].



Source: Authors' own elaboration based on the Da Nang Statistics Office

Figure 4: The chart depicted import and export turnover between 2019 and 2021.



Source: Authors' own elaboration based on the Oxford COVID-19 Government Response Tracker

Figure 5: The chart showed stringency index of Viet Nam from 1/2020 to 12/2021

In the period 2020 - 2021, the COVID-19 pandemic broke out strongly and spread rapidly across the country, to control the epidemic situation, the government issued many policies on social distancing. Many

socio-economic activities had to be halted, causing the economy of Viet Nam in general and Da Nang in particular to be in a difficult situation. [see Figure 5]

3. Literature review

There are an increasing number of research papers on the impact of Covid -19 on economics at the both global context and the country level. Among recent studies, Akbulaev et al (2020) found that COVID-19 affects people - societies around the world and will have a long-term impact on the global economy. These authors also showed that the degree of vulnerability will depend on each country's economy, COVID-19 puts heavy pressure on the economies of many countries, import and export rates decrease, many products are also affected, many large companies also had to stop operating and many people were unemployed and had their wages cut. Prince Asare Vitenu-Sackey and Richard Barfi (2021) found that the COVID-19 Pandemic has a long-term impact on economic growth and poverty alleviation in their "research on the impact of Covid on poverty reduction poverty and economic growth". The study quantified the impact of Covid on human development indicators (HDI), gross domestic product (GDP), and severity index (STI). However, the number of deaths from COVID-19 has a positive impact on poverty reduction and economic growth, which shows that population growth will hinder poverty reduction and economic growth.

Among authors studying the impact of COVID-19 pandemic on commerce-service sectors, Xinyu Hu (2020) investigated the case in China. Authors found that COVID-19 causes a large impact on China's trade in goods and services analyzed in the article "research on the impact and significance of COVID-19 on China's trade and services". The author has also pointed out that COVID-19 will cause a recession in the economy, but it also provides a new opportunity for digital economic development and digital commerce. Asif Javed (2020), found that COVID-19 causes many impacts on services, in which the transportation industry also suffers heavily due to the delay in foreign and domestic movement, causing heavy damage to the transport industry is analyzed in the article "Study on the impact of COVID-19 on the service sector of Pakistan".

In the Vietnam context, most of researchs focus on Vietnam's economy and other industries. Among them, Nguyen Quyet (2021) showed that COVID-19 did not affect Viet Nam's rice export turnover in the article "research on the impact of the COVID-19 pandemic on rice export turnover in Viet Nam". The complicated developments of the global COVID-19 pandemic have led to an increase in household consumption and food reserves, causing countries to increase rice imports. In Tran Xuan Quy and Nguyen Le Dinh Quy (2021), the retail industry in Viet Nam is greatly affected by the pandemic while its contribution to Viet Nam's GDP is increasing. Nguyen Hoang Nam (2022) found that the impact of the COVID-19 epidemic on economic activities in Viet Nam. It can be seen that COVID-19 has a negative impact on gold prices, oil prices and vice versa COVID-19 has a positive impact on exchange rates, silver prices, and copper prices analyzed.

For the Da Nang case, there is a limited number of researches on the COVID-19 effects on commercial service sectors. Le Duc Tho (2020) studied the impact of COVID-19 on Danang Logistic using secondary data collection method for analysis showed that the negative impact of COVID-19 on Import and export activities of Da Nang, this sector was strongly affected during the beginning of epidemic epidemic through August 2020. The reason pointed out by the author is the strengthening of disease control by partners. Viet Nam's trade affects import and export activities much.

Those authors focus on the investigation of COVID-19 pandemic on economy in the global and country context and on a few individual industries. COVID-19 's action-19 to the locality is very important. It helps each locality have an overview of the impact of the COVID-19 industry on its main sector, from which the government is able to find the ways to serve for per local. Besides, in the methodological research perspective, most of them use data collection methods, system description. There are also some post-studies using econometric models, but mainly the model uses the entire economy. In this paper, we fill the gap of local evaluation of COVID-19 pandemic effects on the commerce and service sector in Da Nang by providing a simple regression model using the montly.

4. Methodology and data

4.1. Methodology

Some recent studies have assessed the impact of COVID-19 on the economy from national to global. Specifically by applying econometric models. In another study (Nguyen Hoang 2020) using an OLS regression econometric model with the independent variable being the number of infections; The number of deaths represents the impact of COVID-19 on the Viet Nameese economy through the price of gold, silver price, copper price, oil price, exchange rate and INDEX index. What these studies have in common is that they use a representative number of deaths and infections from COVID-19 to assess the impact on the economy. In addition, studies using qualitative methods have shown that COVID-19 has had different impacts on each sector of the service industry in each region. (Asif Javed 2020) employs the descriptive analysis with secondary data sources taken from Pakistan. Based on the theoretical framework of previous studies, this study uses OSL econometric methods and simple regression to assess the impact of COVID-19 on each sector of the service industry in the Da Nang economy. By using the model below to analyze the evaluation.

$$Y_t = \beta_0 + \beta_1 X_t + \varepsilon_t,$$

where X represents for independent variables including the numbers of confirmed cases (Viet Nam/ Da Nang), the the numbers of deaths (Viet Nam/ Da Nang) and the tringency index which is a composite measure developed by researcher in the OxCGRT project to evaluate the countries' policy responses to the COVID-19 pandemic. Dependent variables are the number of guests serving, the revenue from accommodation and catering services, the revenue from other consumption, the revenue from retail, the export turnover and the import turnover, respectively. ε_t is used to model the disturbance, while t is the time index.

4.2. Data

In this paper, we employ the monthly data during the period 1/2020 to 12/2021 which was elaborated by authors based on the Da Nang Statistics office, the Ministry of Public Health of Viet Nam and the Oxford Coronavirus Government Response Tracker (OxCGRT). The epidemic spans from the end of 2019 until now, but we only use data from 2020 to 2021 to run the the model this is the period when the epidemic broke out strongly and caused a lot of damage to the economy. Due to economic impact, the selection of this period contributed to the clarification of Covid-19 that both directly and indirectly affects through the policy of the gap, causing the activities to stall, leading to many consequences for the economy. In addition, we do not use data in 2022 because during this period the government of Viet Nam in general, Da Nang in particular has implemented new normal policies, so even though the number of cases has increased, the economy is also gradually stabilizes and more or less returns to normal orbit, so using 2022 data to run the model can cause errors in the results.

The notation of the dependent variables and the data source are described in the Table 1.

Table 1: Table of summary the model's variables

| STT | Variable Name | Symbol | Source | Expectation mark |
|-----|--------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| 1 | Total Deaths of Viet Nam | TDVN | https://Covid19.gov.vn/big-story/cap-nhat-dien-bien-dich-COVID-19-moi-nhat-hom-nay-171210901111435028.htm | |
| 2 | Total Deaths of Da Nang | TDDN | | |
| 3 | Total Case of Viet Nam | TCVN | | |

| | | | | |
|----|--------------------------------------------------|------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|
| 4 | Total Case of Da Nang | TCDN | | |
| 5 | Stringency index | SI | https://www.bsg.ox.ac.uk/research/research-projects/covid-19-government-response-tracker | |
| 6 | Number of guest serving | GS | https://cucthongke.danang.gov.vn/ | - |
| 7 | Revenue from accommodation and catering services | RAC | | - |
| 8 | Revenue from other consumption | RC | | - |
| 9 | Revenue from retail | RSG | | - |
| 10 | Export turnover | ET | | - |
| 11 | Import turnover | IT | | - |

5. Results and discussion

5.1. Results

5.1.1. Summary Statistics

Table 2 presents the results of the summary statistics of the variables. The average monthly value of Total Deaths of Viet Nam, Total Deaths of Da Nang, Total Case of Viet Nam, Total Case of Da Nang, Number of guest serving: 69639.29, 488.42, 1257.04, 4.38, 153869.2 people, revenue from accommodation and catering services, revenue from other consumption, revenue from retail had the mean value of each month times is 4832028.21, 999352.25, 1133564.71, 1291004.58 (million dong); Export turnover and import turnover each month averaged 139138.92; 107142.67 (Thousand USD).

Table 2: Descriptive Statistics

| Descriptive Statistics | | | | | | | | | | |
|------------------------|----------|--------|------------|----------|------------|------------|------------|------------|-----------|-----------|
| | TDVN | TDDN | TCVN | TCDN | AS | RAC | RC | RSG | ET | IT |
| Mean | 1257.04 | 4.38 | 69639.29 | 488.42 | 153869.21 | 4832028.21 | 999352.25 | 1133564.71 | 139138.92 | 107142.67 |
| Median | 0.00 | 0.00 | 258.00 | 11.00 | 148872.00 | 5038742.00 | 1001014.00 | 1116847.50 | 131807.50 | 109189.00 |
| Std. Deviation | 2638.952 | 10.236 | 135939.848 | 1223.498 | 141706.739 | 840786.055 | 438840.447 | 339321.835 | 29332.056 | 18021.610 |
| Skewness | 2.112 | 2.470 | 1.899 | 3.224 | 1.261 | -0.764 | 0.044 | -0.068 | 0.961 | 0.300 |
| Kurtosis | 3.357 | 4.890 | 2.578 | 10.378 | 2.002 | 0.087 | -0.980 | -0.695 | 1.465 | -0.185 |
| Minimum | 0 | 0 | 0 | 0 | 16023 | 2875161 | 314216 | 491395 | 92333 | 77947 |
| Maximum | 8994 | 36 | 470693 | 5167 | 580497 | 6170707 | 1783657 | 1783681 | 215250 | 147677 |

5.1.2. The impact of covid 19 on commerce and services in Da Nang

Table 3: The impact of total Deaths of Viet Nam

| Model | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. | VIF | R | R Square | Adjusted R Square |
|-------|-----------------------------|------------|---------------------------|--------|-------|-------|-------|----------|-------------------|
| | B | Std. Error | Beta | | | | | | |
| AS | -23,603 | 10,283 | -0,44 | -2,295 | 0,032 | 1,000 | 0,440 | 0,193 | 0,157 |
| RAC | -67,797 | 32,374 | -0,408 | -2,094 | 0,049 | 1,000 | 0,408 | 0,166 | 0,128 |
| RC | -69,619 | 23,048 | -0,541 | -3,021 | 0,006 | 1,000 | 0,541 | 0,293 | 0,261 |
| RSG | -97,739 | 64,652 | -0,307 | -1,512 | 0,145 | 1,000 | 0,307 | 0,94 | 0,53 |
| ET | 4,314 | 2,184 | 0,388 | 1,976 | 0,61 | 1,000 | 0,388 | 0,151 | 0,112 |
| IT | 1,760 | 1,407 | 0,258 | 1,251 | 0,224 | 1,000 | 0,258 | 0,066 | 0,024 |

The table 3 shows that total Deaths of Viet Nam caused by Covid-19 in Viet Nam negatively impacted factors: number of guest serving, revenue from accommodation and catering services, revenue from other consumption from the specific level of impact, especially when the number of deaths in Viet Nam increase by 1 shift, the number of guest serving decreased 24 people, revenue from accommodation and catering services decreased respectively: 67,797 million dong, 69,619 million dong. The remaining variables are: revenue from retail, exports turnover and imports turnover are unaffected.

Table 4: The impact of total deaths of Da Nang

| Model | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. | VIF | R | R Square | Adjusted R Square |
|-------|-----------------------------|------------|---------------------------|---------|-------|-------|-------|----------|-------------------|
| | B | Std. Error | Beta | | | | | | |
| AS | -5720,587 | 2687,912 | -0,413 | -2,128 | 0,045 | 1,000 | 0,413 | 0,171 | 0,133 |
| RAC | -23917,000 | 7586,389 | -0,558 | -3,153 | 0,005 | 1,000 | 0,558 | 0,311 | 0,280 |
| RC | -19945,453 | 5645,553 | -0,602 | -3,533 | 0,002 | 1,000 | 0,602 | 0,362 | 0,333 |
| RSG | -56948,682 | 12621,137 | -0,693 | -4,5152 | 0,000 | 1,000 | 0,693 | 0,481 | 0,457 |
| ET | 43,763 | 610,889 | 0,015 | 0,072 | 0,944 | 1,000 | 0,015 | 0,000 | -0,045 |
| IT | -220,292 | 372,431 | -0,125 | -0,591 | 0,560 | 1,000 | 0,125 | 0,016 | -0,029 |

The table 4 shows that total Deaths of Da Nang caused by Covid-19 in Viet Nam negatively impacted factors: number of guest serving, revenue from accommodation and catering services, revenue from other consumption and revenue from retail from the specific level of impact, especially when the number of deaths in Da Nang increase by 1 shift, the number of guest serving decreased by 5721 people, revenue from accommodation and catering services, revenue from other consumption and revenue from retail decreased respectively: 23917 million dong, 19945.453 million dong, 56948,682 million dong. The remaining variables are: exports turnover and imports turnover are unaffected.

Table 5: The impact of total Case of Viet Nam

| Model | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. | VIF | R | R Square | Adjusted R Square |
|-------|-----------------------------|------------|---------------------------|--------|-------|-------|-------|----------|-------------------|
| | B | Std. Error | Beta | | | | | | |
| AS | -0,478 | 0,198 | -0,458 | -2,419 | 0,024 | 1,000 | 0,458 | 0,210 | 0,174 |
| RAC | -1,128 | 0,645 | -0,349 | -1,749 | 0,094 | 1,000 | 0,349 | 0,122 | 0,082 |
| RC | -1,145 | 0,473 | -0,459 | -2,420 | 0,024 | 1,000 | 0,459 | 0,210 | 0,174 |
| RSG | -0,461 | 1,315 | -0,075 | -0,350 | 0,729 | 1,000 | 0,075 | 0,006 | -0,040 |
| ET | 0,125 | 0,038 | 0,578 | 3,319 | 0,003 | 1,000 | 0,578 | 0,334 | 0,303 |
| IT | 0,062 | 0,025 | 0,468 | 2,481 | 0,021 | 1,000 | 0,468 | 0,219 | 0,183 |

The table 5 shows the number of Covid -19 cases in Viet Nam that negatively impact factors: number of guest serving and, revenue from other consumption, but positively affects export turnover and import turnover with the specific impact the number of cases in Viet Nam increased by 1 case, number of guest serving decreased by 1 turn, revenue from other consumption decreased by 1,145 million dong, while export turnover increased by 0.125 thousand USD, import turnover increased by 0.062 thousand USD. The

remaining variables are: revenue from accommodation and catering services, revenue from retail are unaffected.

Table 6: The impact of total Case of Da Nang

| Mode l | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. | VIF | R | R Square | Adjusted R Square |
|--------|-----------------------------|------------|---------------------------|--------|-------|-------|-------|----------|-------------------|
| | B | Std. Error | Beta | | | | | | |
| AS | -38,467 | 23,291 | -0,332 | -1,652 | 0,113 | 1,000 | 0,332 | 0,110 | 0,070 |
| RAC | -74,614 | 74,797 | -0,208 | -0,998 | 0,329 | 1,000 | 0,208 | 0,043 | 0,000 |
| RC | -81,860 | 56,494 | -0,295 | -1,449 | 0,161 | 1,000 | 0,295 | 0,087 | 0,046 |
| RSG | 1,799 | 146,511 | 0,003 | 0,012 | 0,990 | 1,000 | 0,003 | 0,000 | -0,045 |
| ET | 12,701 | 4,335 | 0,53 | 2,930 | 0,008 | 1,000 | 0,530 | 0,281 | 0,248 |
| IT | 6,329 | 2,836 | 0,430 | 2,232 | 0,036 | 1,000 | 0,430 | 0,185 | 0,148 |

The table 6 shows that the number of Covid - 19 case of Da Nang positively affects factors: import turnover and export turnover with a specific impact that when the number of deaths increase by 1 case, the export turnover increased by 12,701 thousand USD and import turnover increased by 6,329 thousand USD. The remaining variables are: number of guest serving, revenue from accommodation and catering services, revenue from retail, revenue from other consumption are unaffected.

Table 7: The impact of Stringency index of Viet Nam

| Mode l | Unstandardized Coefficients | | Standardized Coefficients | T | Sig. | VIF | R | R Square | Adjust ed R Square |
|--------|-----------------------------|------------|---------------------------|--------|-------|-------|--------|----------|--------------------|
| | B | Std. Error | Beta | | | | | | |
| AS | -8004,544 | 813,081 | -0,903 | -9,845 | 0,000 | 1,000 | -0,903 | 0,815 | 0,807 |
| RAC | -18306,299 | 4363,274 | -0,667 | -4,196 | 0,000 | 1,000 | 0,667 | 0,444 | 0,419 |
| RC | -8652,000 | 4133,657 | -0,408 | -2,093 | 0,048 | 1,000 | 0,408 | 0,166 | 0,128 |
| RSG | -19661,641 | 10403,315 | -0,374 | -1,890 | 0,072 | 1,000 | 0,374 | 0,140 | 0,101 |
| ET | 418,034 | 381,005 | 0,228 | 1,097 | 0,284 | 1,000 | 0,228 | 0,052 | 0,009 |
| IT | 170,374 | 237,648 | 0,151 | 0,717 | 0,481 | 1,000 | 0,151 | 0,023 | -0,022 |

Based on the table of the impact of Stringency index of Viet Nam, stringency index of Viet Nam caused by Covid - 19 in Viet Nam negatively impacted factors: number of guest serving, revenue from accommodation and catering services, revenue from other consumption from the specific level of impact, the stringent index has the strongest impact on the variable guests served, followed by accommodation and other consumption especially when the number of deaths in Viet Nam increase by 1 shift, the number of guest serving decreased 8005 people, Revenue from accommodation and catering services decreased respectively: 18306,299 million dong, 8652,000 million dong. The remaining variables are: Revenue from retail, exports turnover and imports turnover are unaffected.

In general, the sig coefficient is ensured in the models of interrelated variables. <0.05 but the average R coefficient of the variables is small, so the suitability of the model is not high, the independent variables can only explain a small part of the dependence of the dependent variable.

The total deaths of Viet Nam and Da Nang in the whole country and in Da Nang have had a negative impact on Number of guest serving, Revenue from accommodation and catering services and Revenue from other consumption. In which, Revenue from other consumption are the most affectest. revenue from retail ail was only impacted by the total deaths of Da Nang. Based on the analyzed data table, it can be easily seen that the impact of the total death variable is stronger than the impact of the total case variable on the fields of commerce and services in Da Nang.

5.2. Discussion

According to the results, the COVID-19 situation has negatively affected the number of guests serving, accommodation and catering service and other consumption. These results are consistent with the results of previous studies. However, import and export activities recorded a positive impact, the results of the study differ from those of Nguyen Quyet and Akbulaev et al (2020) and Le Duc Tho (2020). Nguyen

Quyet's research paper shows that the COVID-19 epidemic wave in the period 9 / 2019-12 / 2022 did not affect the import and export of rice, the research paper by Akbulaev et al. (2020) showed that the COVID-19 has a negative impact on imports and exports, this difference may be due to the sources of data collected from different periods and regions, and the subject of different studies, leading to the lack of heterogeneity among the research results, but for Le Duc Tho's paper (2020), although this article studies Danang activities, the subject of this article is the global epidemic and Data collected only from the start of translation to August 2020 may lead to different results from our research.

5.2.1. Negative impact of COVID-19 on the commerce and service sector in Da Nang

a) The impact of the Covid situation - 19 Viet Nam

Through using methodologies, it can be seen that the Covid - 19 developments in Viet Nam have adversely affected some sectors of the trade and service sector in Da Nang.

Simultaneously, the development of Covid - 19 in Viet Nam also has a negative psychological effect on people, causing them to fear the disease and suspend tourism activities. At one stage, the Da Nang city government closed the city to limit the spread of the disease from other provinces. As a tourist city that attracts many tourists, during times of high death toll, it affected visitors negatively.

Regarding other consumption, the implementation of social distancing policies, the closure of schools and amusement parks... can be an important cause of the decrease in revenue of these sectors which also explains the other consumption sectors that were affected the most in the three areas. Although people's purchasing power has increased by online forms, the recovery rate of consumer revenue is still slow and facing many difficulties. In addition, COVID-19 has negatively affected the whole economy, making people in general and workers in particular suffered many bad influences, most people's incomes were reduced, making shopping and consumption demands significantly reduced.

In addition, in terms of the number of deaths in Viet Nam had a negative impact on accommodation and catering services, which cause by the decrease in tourists makes accommodation and catering services and other consumption activities also decrease leading to hotels and restaurants providing services being forced to close and stand on the verge of bankruptcy, causing a decrease in total revenue in this area.

The increase in the stringent level of the government gap policy will negatively impact the development of sectors in Da Nang's trade and service sector. When applying distance policies to limit the travel demand of people in the main country, this has a great impact on the number of tourists coming to Da Nang. In addition, a country with a high stringency index means that international visitors will be concerned about coming to travel.

b) The impact of the Covid situation - 19 Da Nang

According to the analysis results, the total deaths in Da Nang variable had negatively affected the number of guest serving, revenue from accommodation and catering services, retail and other consumption.

It can be seen that the total of deaths in Da Nang had impacted on customers stronger than the total of case variable in Viet Nam. In fact, when the total number of deaths in Da Nang increases the city government will issue policies which indirectly affected people's psychology to limit choosing Da Nang as a destination for tourism then made tourists Da Nang's service decreased led to a decrease in the revenue of accommodation and catering services. Among sectors, retail was the most hit hardest. The implementation of social distancing has indirectly affected the production of goods and transportation which may explain the negative impact of COVID-19 on this sector. In addition, it also negatively affects people's psychology, making the demand for goods and other consumption decrease. On the other hand, people's saving mentality is also a factor affecting this field.

5.2.2. Positive effects of COVID-19 on trade and service sector in Da Nang

Interestingly, the import and export of Da Nang city recorded a positive impact from the influence of COVID-19. To explain this reason, we have given the following reasons

The first, Viet Nam has diversified its export markets to reduce dependence on the Chinese market (closed during the beginning of epidemic outbreaks). The signing of trade agreements such as: European-Viet Nam Free Trade Agreement (EVFTA); Regional Comprehensive Economic Partnership (RCEP) and UK- Viet Nam Free Trade Agreement (UKVFTA). Besides, the opening of direct flights from Viet Nam to the United States (Viet Nam's major trading partner) also contributes to the growth of import and export of Viet Nam in general and Da Nang in particular.

The second, although the COVID-19 epidemic broke out, with the efforts of companies and the flexible adaptation of the city of Da Nang, Da Nang's exports in the period of 2021 maintained growth.

Finally, industrial zones in the city are mainly affected by the shortage of labor. Besides, during the time of the epidemic, the government and the city have many policies and support packages for businesses about in terms of capital and labor, that is why the industrial zones where export products are manufactured are maintained.

5.2.3. Compare the epidemic situation of the whole Viet Nam and Da Nang

Other consumer sectors include financial activities; education; entertainment... were severely affected when the epidemic broke out, largely due to the government's distancing policies that forced businesses in this field to close.

When the epidemic breaks out in Viet Nam and Da Nang, local authorities will issue social distancing policies for many financial activities; education; entertainment,... which were severely affected, many business establishments had to temporarily suspend operations, while the accommodation and catering sector was also negatively affected. About accommodation and catering, although no revenue was earned from the service segment, but still receive a part of revenue from the fact that many customers are stuck in the city and due to the needs of the people, revenue from accommodation and catering services still earns a little revenue, so although affected, the extent is still lighter than other consumption.

The total deaths of Da Nang had an impact stronger than the total deaths of Viet Nam because when the number of infections in Viet Nam increases, the entire Viet Nameese economy will be affected, including Da Nang. This impact only has a small impact because the epidemic often breaks out in some provinces and cities, so the province that has the epidemic will be affected more strongly, so when the epidemic in Da Nang increases, the city government will having to suspend many activities makes the factors hit harder

Merchandise retailing: Revenue from the city's retail sales mostly comes from commercial activities of the city's residents. small part. This explains why only Da Nang's death toll affects retail and the whole country does not. In addition, when the epidemic breaks out in Da Nang, the city will be affected by the government's distancing policies, so the source of goods will be difficult to circulate, affecting the retail sales of goods.

5.2.4. Implications

The study correctly assessed the impact of COVID-19 on the commercial and service sector, specifically COVID-19 had a negative impact on the elements of this area such as: Guests serving, staying and dining, retailing goods, other consumption, besides it has had a positive impact on exports and imports. This result is objective and consistent with reality, so based on the research results, the Da Nang city government can refer to and consider for decision making policies in the future when incidents occur unsystematically like COVID-19 occurs.

5.2.5. Recommendations

Most of the research data is collected from the Da Nang Statistical Office, some data are just estimates not exact data so the results of statistical analysis may be biased. Model data is filtered by month for two years 2020-2021, so the number of samples is small. The research model may not fully quantify the factors affected by trade and services. The topic is new and there are few previous studies, so the reference source is limited. The research article does not explain “Why does the COVID-19 situation not affect some elements of trade and services?”.

5.2.6. Limitations

Da Nang's government needs more policies to contribute to the recovery and development of the commercial and service sector. They need to create conditions and solutions to support the import and export sector, focus on developing industries with great potential in this field, and strengthen solutions to export a variety of products.

The government should take appropriate distancing measures to realize the dual goal of both fighting the epidemic and developing the economy, especially other local consumption, because this area is most strongly affected by the distancing policies.

When there is an outbreak, the government should quickly localize the epidemic areas to avoid the epidemic spreading, affecting the whole economy.

After COVID-19, it can be seen that an unsystematic incident which is the disease will cause damage in many aspects of the economy, specifically, the total deaths from the disease had a stronger impact than the total case. Therefore, in order to minimize economic losses due to the pandemic, it is necessary to invest in additional development in health care when other diseases appear, the number of deaths will be minimized.

Continue to perfect the model to match the actual conditions of each region, try to add more variables of the model to many fields to have a broader view of the whole economy. Research has shown the extent of the impact of Covid-19 on trade and services in Da Nang, so other researchers can use this study as a reference and as a basis for their other studies on Da Nang.

6. Conclusion

To conclude, the complicated development of Covid-19 in Viet Nam and Da Nang has negatively impacted the commerce and service sector of Da Nang city. Moreover, the extent of the impact of the disease development in Da Nang is bigger than Viet Nam. Research has also shown that the total deaths has a stronger impact than the total case. On the other hand, the increasing severity of government policies has negatively impacted the development of industries in the commerce and service sectors of Danang. Although Covid-19 has negatively impacted most industries in this region, it has also had a positive impact on Da Nang's import and export turn over. This result is based on the research results and objective assessment of the group. Therefore, in the future, the government of Da Nang city can consult, consider and make appropriate policies when an incident similar to Covid-19 occurs.

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PROMOTING THE THEORETICAL AND PRACTICAL VALUE OF THE PRICE – SALARY – MONEY REFORM

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ABSTRACT

This research aims to look at the failed 1985 Price – Salary - Money reform and the current state of price-salary-money differences. This research shows why it is necessary to promote the value of an economic reform that has failed in the past, and at the same time propose a number of solutions to take advantage of the opportunity of this era to promote the theoretical and practical value of the Price - Salary - Money reform. The paper also concludes that wage policy, price stability policy and currency control are inseparable, on the contrary, need to be implemented synchronously and consistently towards a common goal.

Keywords: money, price, reform, salary.

1. Introduction

The Price – Salary - Money reformation was occurred with the aim at bringing the prices of commodities as close as the cost of production, the price in the market; implementing a price in the pricing system, at the same time executing salary increment and controlling the amount of money in circulation to help consumers live mainly on wages which is a major policy of the Party set forth in the 8th Plenum of the 5th Central Committee in 1985 in order to solve urgent problems in production and business activities of the planned economy before innovation. The aim of this reformation was magnificent, but for many reasons, both objective and subjective, this reformation failed, causing various serious consequences for the economy, becoming the premise for the Renovation that took place in 1986.

Although this reformation failed, it also left valuable lessons and experiences with very rich theoretical and practical value about the relationship between price management, wage policy balance and currency control towards the goal of stabilizing and improving the quality of life of employees.

2. Literature review

2.1. *The reasons why we should promote the value of an economic reformation failing in the past*

One of the main reasons for the failure of the aforementioned reformation is that the level of development of our economy in the 80s of the last century is limited, while facing many difficulties due to dealing with the heavy consequences of wars. The process of implementing reformations is still hasty, leading to mistakes in various stages of reformations. Nowadays, after nearly 4 decades of renovation, the development level of Vietnam's economy is a far cry from the period of reformation. The current strength and force of our country allows and desperately needs a mechanism to address the dialectical relationship between price management and wage adjustment in association with stable monetary value, in order to harmoniously distribute the interests of producers, businesses and consumers, while ensuring well market operating rules. Ensuring the balance between prices and wages in a stable currency period will enable consumers to live on salaries earned from genuine labor and business activities contribute to limiting negative corruption, preventing fraud and smuggling.

In addition, if the state builds and nicely resolves the relationship of Price - Salary - Money in the current socialist-oriented market economy, the administration of monetary policy and the control of inflation, mitigation and deflation will also become more proactive, flexible and systematic effective. At the same

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time, if prices are kept at a close level to costs that can be paid by workers' wages but do not cause losses to producers and businesses, it will help Vietnam make good use of opportunities to mobilize and attract foreign investment.

2.2. Current situation and difference in Price - Salary - Money today

About Price: Currently, in the market economy, prices were formed based on many factors, are directly influenced by the law of supply and demand and the law of competition. Therefore, the prices of goods often differ from the cost of production, resulting in high profits, or causing losses for production and business units, indirectly generating revenue sources for the state through the collection of corporate income tax and VAT.

In case the price is higher than the actual value of the goods, it will affect the life of the worker, especially in the context where essential items, due to the scarcity of supply that the prices is being pushed up. On the other hand, if the price is lower than the cost of production, it will also cause financial harm to the businessman. That is why the state's intervention in the market to stabilize prices is really necessary and in Clause 2, Article 15 of the Price Law 2012, it also stipulates that the goods and services that the State will stabilize prices are essential goods and services for production and life including: Gasoline, finished oil; Electricity; Liquefied petroleum gas; Vaccines for prevention of diseases for cattle and poultry; Milk for children under 6 years of age; Grain, ordinary rice; Preventive medicine.

However, in addition to the items prescribed by the 2012 Price Law, many other goods and services for the material life, especially the spirit of the people, are still pushed to a high level, causing for many low-income workers who are difficult to access, shopping to improve and improve their quality of life (e.g. household appliances, electronics, room rates, medical visits at private hospitals, tuition fees at non-public schools, etc.)

About Salary: In the past years of implementing the path of reformation under the socialist-oriented market mechanism, our State Party has implemented many salary increment, focusing on perfecting the mechanism for regulating the regional minimum wage and the salary regime of the enterprise sector according to the requirements of market economic development under the management of the State. Excluding the gradually implemented 2021 salary reformation policy, up to now, our country has undergone 4 salary reformations in 1960, 1985, 1993 and 2003. Since the 2003 salary reformation, the State has made 12 adjustments to the base salary from 270,000VND to 1,490,000VND/month. However, this amount of increasing has not yet met the actual demand and has not caught up with the price increment. Notably, at the beginning of 2022, some surveys in Ho Chi Minh City showed that up to 90% of factories paid only slightly more than the regional minimum. The survey on employment and life of workers by the Ho Chi Minh City Labor Federation also said that 42% of workers think that with the current income level, they are struggling, squeezing to pay for the life of their families and themselves, almost impossible to accumulating, saving to protect themselves or send back to their families. This is also one of the reasons why they fall into debt and become more needy.

The current reality shows that workers are unable to live primarily on salary. For employees working in public agencies and units, this situation is one of the reasons why a large number of state employees have arisen from embezzlement, bribery, petty corruption, especially leaders who hold important positions have a lot of power and temptation. Therefore, it is necessary to prevent and protect negative corruption thoroughly, in addition to promoting propaganda, inspection - auditing and discipline to improve public service ethics so that workers do not want to be corrupted, there should also be a reasonable paying policy so that employees can live on salaries without corruption and negativity.

About money: Unlike the period of wage reformation, the value of the Vietnamese currency today is quite stable. In the period of 2008-2011, there were sharp fluctuations in inflation, interest rates and exchange rates in Vietnam causing mass bankruptcy, increasing bad debts. This led to a negative influence on the national financial security. However, the inflation rate in the last ten years from 2012 to 2021 has been controlled, below 7%. The policies to curb inflation, stabilize interest rates, and the exchange rate of the state bank have effectively brought relative stability and security to the country's financial and monetary system. In addition, the administrative capacity and national finance is increasing, meeting international and regional

standards. It is proved that monetary policy is actively and flexibly managed. The banking system is constantly developing towards specialization and professionalization. This is one of the favorable conditions to help the reformation in wages and prices works and prevents past mistakes.

3. Implications

Firstly, focusing on macroeconomics stabilization and budget balancing during the post-Covid-19. The government's fiscal policy and the State Bank of Vietnam's monetary policy have to coordinate closely and flexibly to control exchange rate, curb inflation and keep interest rates at a reasonable level in the context of the growth.

Secondly, the government need to take the lead and collaborate closely with senior management, add more products in the price stabilization category. Using the price fixing with price floor and price ceiling to ensure that the profit after tax does not significantly exceed production costs.

Thirdly, Vietnam Directorate of Market Surveillance and localities have to coordinate with Directorate for Standards, Metrology and Quality in increasing their role as price protectors; promoting to appraise the quality of goods and services in order to eliminate low-grade products. It is necessary to strictly handle fraudsters who raise prices higher than the price ceiling.

Fourthly, making the efforts on developing a value-added tax calculation framework that ranged from 8- 12%, as well as how to apply payment to customers of various income levels. The poor will have to pay a smaller charge to acquire products and services that are identical to those purchased by the rich, avoiding an equalization situation in the VAT computation. To do this, the management system must be perfected. The digital database system should properly show the current income levels of residents.

Fifthly, the government needs to consider issues such as inflation, increment in prices of goods and services in order to make adjustments to raise the basic salary to an acceptable level. First of all, it is necessary to meet the daily demand of their families and themselves to sustain life, then create a source of savings so that they may acquire assets to protect themselves, towards long-term goals such as buying a house and living a more prosperous life in mind. Specifically, in the public sector, the government needs to adopt a deserving compensation and incentive system for individuals who have high labor productivity and work efficiently. While it is also necessary to fine-tune the apparatus of administration to eliminate those who are lack of capacity, decline in quality and failure to maintain public service ethics in order to save budget to raise wages. In the private sector, businesses need to adopt businesses policies such as dormitories, the construction of a kindergarten to care for workers' children for free directly on the premises, or the provision of meals for employees to keep them focus on work and save costs.

4. Conclusion

With the purpose of achieving economic growth while maintaining social stability, resolutions of the Party congresses affirm: People are the most precious capital, taking care of human happiness is the highest striving goal of our regime. Therefore, the wage policy, the price stability policy and the monetary management are all inseparable. On the contrary, they need to be implemented synchronously and consistently towards a common goal of making business more effective. As a result, the government have a source of revenue, workers can make a living and accumulate assets thanks to the main source of income, which is salary.

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ENTERPRISE DIGITAL TRANSFORMATION AND LABOR PRODUCTIVITY: AN EMPIRICAL STUDY IN VIETNAM

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ABSTRACT

The digital transformation (DT), which takes information technology and data as the key elements, is booming and has become the new driving force of economic growth. Therefore, the attempt of this study is to provide empirical evidence on this issue. Based on panel data from 2352 Vietnamese enterprises from 2015 to 2019, the paper employs the Difference - GMM method (D-GMM) to examine the impact of Vietnamese enterprises' digital transformation on labor productivity growth. In this paper, the authors utilize a new approach to measure digital transformation from the three dimensions of digital organization, digital society, and digital technology. The results show a positive relationship between the digital organization, digital society, and labor productivity. Whereas, digital technology has a negative effect on labor productivity. Thus, the influence of digital transformation on labor productivity is vague. Our outcomes indicate that the number of enterprises related to digital transformation activities is limited in this period. Furthermore, the paper provides a theoretical basis and practical support for business managers and policymakers in the coming period to better exploit the digital transformation for the development of firms' labor productivity growth in Vietnam.

Keywords: *digital transformation, firms' digital transformation, digital technology, labor productivity.*

1. Introduction

The digital economy is one of the most important driving forces of economic growth in Vietnam. According to Thanh (2019), "Digital transformation will change the future of Vietnam drastically". So, digital transformation is an undeniable global trend and a precious opportunity for Vietnam to achieve its mighty aspiration. In spite of the prospects and bustling development of the digital economy, Vietnam's labor productivity has not caught up with other countries in the region such as Thailand, Malaysia, and Japan (APO, 2020). In recent years, Vietnam's economy has become vibrant, and small and medium enterprises (SMEs) play a crucial role. As the driving force of the economy with the mission of improving labor productivity in enterprises, the private sector is decisive in promoting labor productivity in the entire economy.

However, previous studies in Vietnam only broadly evaluate the level of digital transformation without a deep understanding of its nature and its elements. In a study titled "The impacts of digital transformation of economic growth in provinces in Vietnam's Southern Key Economic Region" Ngan et al. (2021) discuss digital transformation at a local level. In addition, there are only two studies demonstrating the impact of the digital economy and information and communication technology (ICT) at the enterprise level on labor productivity. For instance, Thanh et al. (2020) with the article "Impacts of the digital economy on labor productivity of Vietnam's economic sectors" and Duc & Nguyen (2019) with the article "The Nexus of ICT, Manufacturing Productivity and Economic Restructuring in Vietnam". Clearly, the digital transformation of Vietnamese businesses has not yet been researched thoroughly. More importantly, enterprise labor productivity constitutes and determines the improvement of national labor productivity. Therefore, digital transformation is an urgent issue that needs special awareness.

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In this study, we analyze the impact of digital transformation on the labor productivity of Vietnamese enterprises with new contributions that build upon previous studies. Firstly, we study Vietnam's digital transformation at the enterprise level whereas the previous studies by Thanh et al. (2020), Duc & Nguyen (2019), and Ngan et al. (2021) research at the local level. Enterprises play a more decisive role among all the factors and the transformation of each one will contribute to the overall development of the economy. Second, we explore the digital transformation in enterprises based on aspects that previous studies have not mentioned, such as technology, organization, and society. The study not only discusses in detail the internal characteristics of enterprises, but also the external factors in the digital transformation process that affect labor productivity growth, namely the quality of institutions represented by the Competitiveness Index (PCI). In this way, the study of management factors of local authority analyzes the current situation in-depth and offers more meaningful improvement measures.

2. Theoretical framework

This study explores the impact of digital transformation on understanding the Vietnamese firms' performance and reveals aspects related to digital transformation from previous empirical studies. The main factors that dominate as well as the evolution of this process may then be clarified. Among them are the following concepts that need attention:

Digital transformation is a new concept with a variety of definitions. Vial (2019) and Giao (2020) argue it is a process that aims to improve an entity by making significant changes to its properties through the combination of information technology, computers, communication, and connectivity (Vial., 2019, Giao., 2020).

From there, it is clear that firms' digital transformation is defined as "integrating digital technology into and leads to changes in enterprise operations providing value to customers which promotes better operational performance" (Hess et al., 2016; Vial, 2019).

The study is based on many theories to support the arguments and propose a research model, the most important of which are the theories of growth and technology. First, the author constructs the research using Joseph Cortright's growth theory (2001). This theory regards technological progress as a byproduct of economic activity distinguished by increasing profits. It also promotes and elucidates the fundamental questions of economic growth. Then, Dosi (1982) used the theory of technology patterns to explain the unavoidable development of some technologies. This theory is intended to aid the research team in the further development and testing of the proposed hypotheses and research model. Finally, Richard et al. (2006) proposed the general-purpose technology theory that asserts technology has had a significant impact on society due to its three characteristics and focuses on the function of technology.

The digital transformation process has improved labor productivity by utilizing digital technology or information and communication technology to improve production and business activities (Giao, 2020). As a result, the author reviewed previous studies on digital technology to clearly understand its role in digital transformation, specifically as follows: Chakpitak et al. (2017) analyze the impact of digital technology on the Thai economy using economic growth theory and combining it with the GME method, the SFM model, and the Cobb-Douglas production function to examine the country from 1975 to 2015 and found that digital technology has a positive impact on the national GDP growth rate. Lu et al. (2021) assessed the impact of information and communication technology (ICT) on labor productivity in the construction industry (CLP), examining the key factors that influence CLP, demonstrating technological advances, making a significant contribution to construction labor productivity growth.

Following a survey of digital technology aspects, the research team identified the need to investigate how individuals, organizations, and businesses use digital technology to create the digital economy, or, more specifically, the digital transformation: Tao et al. (2021) recommend that instead of many companies that rely heavily on buying advanced foreign equipment, those who build a digital innovation platform where R&D capabilities and common ground in the industry are focused. Concerning the province and region, Ngan et al. (2021) investigate the impact of digital transformation on economic growth in eight provinces in

the southern key economic region, using digital transformation measurement variables such as readiness index for application and development of information technology; information technology infrastructure index; human infrastructure index for information technology; and information technology application index. Besides, Bajgar et al. (2019) and Jun Jin, Lei Ma, & Xinwei Ye (2020) propose an analytical framework for future studies on the impact of digital transformation on production, which includes i) Enterprise technology component, ii) High-quality human resources, and iii) Digital transformation changes the way the market works based on the proportion of revenue from online sales (using the number of robots per hundreds of employees).

It can be seen that research in recent years on the digital economy and its impact on labor productivity has been diverse, but it is still relatively small in Vietnam, and the distinction between digital technology and digital transformation is questionable after the number. In which, the method of measuring the digital technology variable, in general, has not found any similarities; however, there are studies that measure it quite extensively, ignoring its limitations. However, the research team discovered that when developing an econometric model to evaluate this relationship, it is necessary to include a large number of control variables in order to reduce the endogeneity problem.

The authors hope that the research results will help agencies and departments develop policies and enterprise governance models to improve performance, as well as enrich practical documents for future research on the same topic.

3. Research method

3.1. Model construction

To test the influence of digital transformation on firms' labor productivity, the authors built a model based on the Cobb-Douglas:

$$Y = AL^{\alpha}K^{\beta}$$

Here: Y is total production; L and K are inputs of labor and capital; A is total factor productivity; α and β are the output elasticities of capital and labor.

From the Cobb-Douglas function, divide both sides by L and log both sides: $\ln(Y/L) = \ln(A) + \alpha \ln(K) + (\beta-1) \ln(L)$; (Y/L) is labor productivity based on output. In previous empirical and practical studies, the factor total productivity A includes many components such as digital economy, digital transformation, machinery and equipment, enterprise size, etc. Labor productivity is not only affected by capital, and labor but also by many other factors which include digital transformation.

We have built a research model of the impact of digital transformation on labor productivity based on inheriting related studies (Gogokhia & Berulava, 2020; Thanh et al., 2020; Vahid et al., 2020; Bertani et al., 2020; etc.). The model set is as shown in the formula:

$$Y_{it} = \beta X_{it} + v_i + \varepsilon_{it} \quad i=1, \dots, N; \quad t=1, \dots, T$$

Here:

Y_{it} _values of the dependent variable in the i enterprise in the t year;

X_{it} _vector of independent covariates in the i enterprise in the t year;

β _vector of parameters to be estimated;

v_i _unobserved individual-level effects;

ε_{it} _the observation-specific errors.

Digital transformation is approached from three dimensions, including digital organization (measured by Technology improvement and Research & development), digital society (measured by Customer relationship), and digital technology (measured by Technology purchase value). Taking into account the research needs, this article sets the control variable: labor and average assets of the enterprise.

Table 1. Summary of variables in the model.

| Variable | Symbol | Basic Meaning | Measure | Previous Researches |
|-----------------------|---------|----------------------------------|-------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------|
| Dependent variable | ln_pro | Labor productivity | Napierian logarithm of firm's labor productivity. Labor productivity is calculated as the net revenue/labor of the enterprise | Gogokhia & Berulava (2020), Thanh et al. (2020) |
| Independent variable | inno | Technology improvement | Does the enterprise innovate technology in production and business? 1.Yes, 0.No | Daft, 1978, Chen et al. (2019), Gogokhia & Berulava (2020) |
| | rd | Research & development | Does the enterprise carry out research and development activities? 1.Yes, 0.No | Gogokhia & Berulava (2020), Zhu et al. (2021), Pieri et al. (2018) |
| | cx | Customer relationship | Does the enterprise invest in technology to enhance the customer experience? 1.Yes, 0.No | Bertani et al. (2020), Joseph et al. (2016) |
| | ln_tech | Technology purchase value | Napierian logarithm of the total purchase value of technology, machinery and equipment | Bertani et al. (2020), Adarov & Stehrer (2019), Zhu et al. (2021) |
| Control variable | ln_k | Average of asset | Napierian logarithm of average firm's assets | Hao Lu(2021), Wei et al.(2020), Canh (2021) |
| | ln_lb | Labor | Napierian logarithm of the total number of employees of the enterprise | Duc et al.(2020), Thanh et al.(2020), Metlyakhin(2020), |
| Instrumental variable | pci | Provincial Competitiveness Index | Provincial Competitiveness Index | Thirtle et al. (2007), Rudiger et al.(2014) |
| | fdi | Foreign Direct Investment | Does the enterprise receive foreign direct investment? 1.Yes, 0.No | Le et al.(2019), Cameron(2019) |

Source: Compiled by the author

4. Results and discussion

4.1. Results

The variable labor productivity (pro) in the model has a mean value of 718.87 (million VND/person) with a standard deviation of 2286.36 (million VND/person); the maximum value is 83157 (million VND/person) and the lowest value is 0 (million VND/person). It shows that there is a great difference in labor productivity among firms, as well as fluctuations over the years. The statistics show that the Vietnamese firms which have R&D activities account for 5.85% of the total sample. Besides, more than half of the examined firms are considered to have innovation activities (53.15%). The number of firms that invest in digital platforms for optimizing customer experience accounts for 5.85% of the total firms. In the meantime, the mean value of the tech variable is 35406 (million VND), which means that firms will spend

35406 (million VND) of total revenue on technology investments. Besides, the average number of employees and firms' assets are high. There is a relatively large difference in maximum and minimum values that show the number of employees and firms' assets in the whole enterprise is relatively high, but there are differences and changes over the years.

Table 2. Descriptive statistics of the variables.

| Quantitative variables | | | | | |
|------------------------|--------|--------|---------|---------|----------|
| Variable | Obs | Mean | St.Dev | Min | Max |
| pro | 11,760 | 718.87 | 2286.36 | 0 | 83157 |
| tech | 11,535 | 35406 | 422863 | 10.2 | 19276850 |
| lb | 11,760 | 377.75 | 1088.94 | 2 | 29132 |
| k | 7,056 | 231236 | 765459 | 118.5 | 22684826 |
| pci | 11,760 | 62.66 | 4.03 | 48.96 | 73 |
| Qualitative variables | | | | | |
| Variable | Obs | Min | Max | Yes (%) | No (%) |
| inno | 11,760 | 0 | 1 | 53.15 | 46.85 |
| rd | 11,760 | 0 | 1 | 5.85 | 94.15 |
| cx | 11,760 | 0 | 1 | 88.76 | 11.24 |
| fdi | 7,056 | 0 | 1 | 38.29 | 61.71 |

Source: Authors' calculations

By using the method of Dynamic GMM (D-GMM), the impact of digital transformation on enterprises' labor productivity is observed, and the specific results are shown in Table3. Statistical analysis shows AR(1) has significance level less than 10% (p_value = 0) and AR(2) has significance level more than 10% (p_value = 0.314). Therefore, we conclude that there is only autocorrelation of order 2. In addition, F-test indicates p_value less than the significance level (10%), therefore, research model D-GMM ensures the high reliability to conduct research and analyze test results.

Table 3. Model estimation results.

| Factor | Variable | POOLED OLS | D-GMM1 | D-GMM2 |
|----------------------|----------|---------------------|-----------------------|-----------------------|
| Digital Organization | Inno | -0.323** (-3.29) | 1.230*** (9.31) | 5.554*** (9.68) |
| | Rd | 0.207 (1.64) | 63.08*** (12.43) | 40.52*** (9.95) |
| Digital Society | Cx | 0.00802 (0.08) | 4.559*** (10.04) | 4.480*** (7.01) |
| Digital Technology | In_tech | 0.0311* (2.20) | -0.872*** (-10.27) | -0.984*** (-15.02) |
| Control Variable | In_lb | 0.115*** (5.94) | | 1.169*** (9.61) |
| | In_ts | 0.148*** | | -0.353*** |

| | | | | |
|----------------------------------------------------------------|--------------|---------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | (18.57) | | (-7.60) |
| | _cons | 1.976*** (14.31) | 1.697*** (3.54) | -1.429* (-2.01) |
| | Index | | AR(1): z = -9.04 (0.00) AR(2) : z = 1.44 (0.151) Sargan test: chi2(57) =2156.16 (0.00) Hansen test chi2(40) =1046.19 (0.00) | AR(1): z = -9.25 (0.00) AR(2) : z = 1.01 (0.314) Sargan test: chi2(55) = 4065.98 (0.00) Hansen test chi2(38) = 1281.05 (0.00) |
| Note: *, **, *** represent 10%, 5% and 1% respectively. | | | | |

Source: Authors' calculations

4.2. Discussion

The results in table3 show that digital organization has a positive impact on enterprises' labor productivity. The corresponding numbers for inno and R&D variables are 5.55, and 40.52, respectively. All digital organization variables have an impact on labor productivity at a 1% significance level. Therefore, it can be seen that firms that advance technological and scientific projects have higher labor productivity than firms without these projects. Similar results were obtained by Daft (1978), Wang & Wang (2012) in the case of the inno variable, and Friesenbichler & Peneder (2016) in the case of the R&D variable. For example, firms implementing programs of technology renovation have 5.55 times higher labor productivity than firms not implementing these programs. Although applying advanced technology in all production and business activities helps to bring high labor productivity to businesses, the results show that there are only about 10% of businesses invest in technological innovation activities. Many SMEs have faced financial problems and a lack of government support. Besides, the ability to apply technology in management and organization is limited. Thus enterprises are still hesitant about transforming to new business models that integrate digital transformation processes. Similarly, firms implementing R&D activities have about 40 times higher labor productivity than firms not implementing these activities. However, there are about 5.85% of Vietnamese firms do not conduct R&D activities. One of the key causes is that Vietnamese enterprises face financial barriers. Besides, they are unaware of the benefits of R&D investments like South Korean SMEs. These enterprises are not only oriented to expanding the R&D investments but also devoted to building systems of monitoring and evaluating programs and projects.

As the results of the regression analysis in table3, the society digital factor measured by the customer relationship variable (cx) has a positive correlation coefficient and high statistical significance (1%). Therefore, the social aspect of digital transformation has strong support for firms' labor productivity (Joseph et al., 2016; Mithas et al., 2011 and Wang & Wang, 2012). Enterprises with specific technology investments related to customers bring about 4.48 times higher labor productivity growth than enterprises without these activities. In fact, increasing customer experience is seen as a motivation to boost digital transformation in businesses. However, some firms which do not provide digital platforms for ultimating customer satisfaction account for 11.24%. The reason is that the business owner's awareness of customer relationships is still limited, as well as promoting the customer values through regularly updating data, information, or investment in technology that does not receive insufficient attention.

In addition, the regression coefficient also shows that the value of technology purchases really has a clear impact on the growth rate of enterprise labor productivity in Vietnam in the period 2015-2019. Specifically, the correlation coefficient is negative (-0.98) and all digital organization variables have an

impact on labor productivity at a 1% statistical significance level. This indicates that when enterprises increase spending and investment in technology, labor productivity will decrease. The first thing that can explain the above results is that the technology purchase value variable is measured by the cost of purchasing machinery and technology. However, the cost of digital transformation technology in enterprises must include many other costs such as costs of acquiring, converting, and inventing new technologies (Hou, J & Mohsen, P. 2013). The second one is machinery & technological equipment that has a late impact on productivity. Therefore, it takes a certain amount of time to see the operating capacity of the equipment (Edquist, H., & Henrekson, M. 2017). Third, most of the enterprises in the sample are small in size and have extremely low investment costs for technology. Therefore, outdated machinery reduces labor productivity.

In fact, the labor productivity of our country increases annually but with low effectiveness and is still not comparable to the other Southeast Asian countries. In particular, according to ILO, the labor productivity of Vietnam in 2020 is 7 times lower compared to Malaysia, 4 times lower compared to China, 3 times compared to Thailand, 2 times compared to the Philippines, and 26 times compared to Singapore. In 2020, the report from The Asian Labor Productivity Organization recognized that the labor productivity of Vietnam fell behind Japan by 60 years, and needed 40 years to catch up with Malaysia and 10 years to catch up with Thailand. Tech-economy and tech transformation in businesses are expected to be the motivation to improve the effectiveness, from there, to narrow down the economic distance between Vietnam and the developed countries. To reach the goal, in November 2021, Vietnam officially opened the National Office about Technology Transformation. In the period 2021-2025, approaching 2030, the comprehensive tragedy system is simply created, included National technology transformation, to transform an electrical government into a tech-government. At the same time, the government also adjusted the law related to science improvement like intellectual property law, science and technology law, and the law of advanced technology... similar to the other related government decisions like No.118/QD- TTg, No.130/QD-TTg, No.157/QD-TTg, No.127/QD-TTg. Especially the Decision No.749/QD-TTg “ Introducing program for national digital transformation by 2025 with orientations towards 2030” with double purposes improving tech-government, tech-economy, tech- society, and creating tech-businesses that have the ability to grow globally. On the business side, Vietnamese businesses have a very initial step to begin in the transformation. In particular, tech- transformation in businesses speed up 3-4 years faster than expected before the pandemic. In 2020, there were 13.000 new businesses opened and until the end of 2020, the workforce in the technology industry reached 1,000,000 people, this is considered a possible sign of the transformation process of Vietnamese businesses.

In general, the tech-transformation has a positive effect on labor productivity, and affects quite little in the 2015-2019 period. The problem is the difficulty to approach the tech- transformation method of the businesses. Many businesses approach the advantages of the transformation, but there are also many businesses that were pushed away from the process because of the lack of funds, operation, and knowledge. Therefore, the Vietnamese businesses in the trial are still in the beginning step of the process to understand the transformation. Tech-transformation is expected to be a motivation to improve labor productivity, a factor to speed up the economy of the nation.

5. Conclusion

Quantitative results show that digital transformation has a positive impact on labor productivity growth in enterprises. The findings prove the current situation of digital transformation of Vietnamese enterprises in recent years. Small and medium-sized Vietnamese enterprises often face big barriers in terms of strategic awareness and financial capacity when digital transformation. Enterprises do not really have a clear digital transformation strategy to implement, so the following recommendations can be drawn for the next period.

First, Vietnamese businesses that want to undergo a comprehensive digital transformation need to encourage innovation and technology application, but before making decisions on technology adjustment, it is necessary to identify business strengths and business situations. Second, R&D activities have an extremely active role in helping to increase productivity. R&D investments are based on their needs and organizational

characteristics. Third, the most significant breakthrough is about people. It is advisable to start pushing technology adoption with the goal of increasing customer experience. Technology is the core factor of revolution 4.0, creating a direct digital transformation in businesses. Vietnamese enterprises often have the weak financial capacity, they must prior to identifying core technologies plan a reasonable budget for purchasing and investing in technology.

The government as a regulator and a motivator have to act to strongly support the private sector. Particularly, the government focuses on developing national breakthrough technologies such as 5G and ensuring national information safety and security systems. The next important thing is for the government speeds up the process of perfecting the legal environment for digital technology so that businesses can have a favorable digital transformation environment. Third, the government can proceed to reform quality education, focusing on developing digital human resources, especially the elite group. Finally, the government needs to clearly identify industries and fields to invest in science and technology at each stage of digital transformation such as industry restructuring in key economic regions towards high added value.

The main limitation of the study is that it has not mentioned employees in the digital society variable due to enterprise-level data restrictions. We think that the application of the employee factor will allow scholars to clarify this issue. In addition to this, the study has not analyzed the difference in business characteristics in a conversion such as business size, industry characteristics, and conversion reasons. Future studies may study directions such as studying each industry; each business level; the business environment reforms or studying digital transformation in individuals.

6. Appendix

Processing of data on Stata 15.1: https://docs.google.com/document/d/1xXHI_FNjqmVb-NKEHnhS4Ad5dL7tCa_8/edit

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THE ROLE OF FOREIGN SUPPLIER DIVERSIFICATION IN EXPORT PERFORMANCE: AN EMPIRICAL STUDY ON VIETNAM'S TEXTILE INDUSTRY

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ABSTRACT

This research pioneers in casting new light on the role of foreign supplier diversification in Vietnam's textile and apparel exports by using secondary data of Vietnam's trade flow of raw materials and finished goods in the sector during 2010-2021. To be specific, by means of stepwise regression approach accompanied with lagged variables and fixed effect technique, foreign supplier diversification is indicated to have a significant negative relationship with export value, while the diversity of foreign suppliers is pinpointed to mitigate the Covid-19's negative impact on textile and apparel export value. Furthermore, industrial production index and labor force are found to inconsiderably foster exports as opposed to the number of firms within the industry. The study contributes to the literature on foreign supplier diversification, supply chain disruption and supply chain robustness. Finally, several implications and recommendations are also proposed with an aim to enhance textile and apparel exports in the upcoming years.

Keywords: Covid-19 pandemic, foreign supplier diversification, Vietnam's textile and apparel exports.

1. Introduction

Vietnam's textile industry has made significant progress over the years and now plays an increasingly vital role in the country's economic growth. Up to now, the industry has gained net exports of about 5-7% of Vietnam's GDP, specifically reaching 6.25% in 2020 (GSO, 2020). Among all current export industrial products, the textile industry came first with a high export turnover and growth rate accompanied with Regional Value Content increasing more than six times. In particular, the average growth rate of the trade balance reached 5% in the period 2015-2017 before skyrocketing to 52% in 2019 and shrinking to -7% in 2020 under the impact of Covid-19 epidemic (GSO, 2020). Furthermore, the textile industry has employed a vast number of people, approximately three million, accounting for more than 20% of all industrial workers and nearly 5% of all employees in Vietnam (Le, 2017). In other words, the textile sector is an important contributor to Vietnam's socio-economic development.

Nevertheless, one prominent challenge of Vietnam's textile industry is the high proportion of imported materials. In particular, while textile exports exceeded 39 billion USD in 2019, imports of raw materials and accessories for export goods totaled 19.6 billion USD. These figures reached 35.29 billion USD and 18.1 billion USD respectively in 2020 (GSO, 2020). According to Vu Viet Hung (2017), textile value chain inputs must be imported at a rate of 70 to 8%, with 90% for raw cotton, 100% for synthetic fibers, 50% for cotton yarn and 100% for synthetic fibers, 80% for wide-format fabrics, 90% for intermediate products and accessories, yarns, textiles, and knitted fabrics for export processing. Notably, among four primary markets supplying textile materials to Vietnam, China, Korea, Taiwan, and the United States, China is the leading supplying market, accounting for 50.61% of the import value of raw materials for the Vietnamese textile sector, following by South Korea with 10.67% (Vietnam Industry and Trade Information Centre, 2021). Despite manufacturing a wide range of textile materials, the country mostly specialized in the low-value-added segment, whereas high-value-added phases like as yarn, dyeing aids, floral printing, and completed fabrics must be imported. This is a bottleneck in the domestic textile supply chain since any "incident," no

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matter how minor, with the supply of raw materials has a detrimental influence on textile enterprises' production and business activities (Nguyen, 2015).

In 2020, the textile sector was adversely affected by the Covid-19 epidemic. The textile and apparel production indexes plummeted by 0.5% and 4.9%, respectively as the pandemic hindered the availability of raw materials, narrowed the consuming demand for fashion commodities, and frightened the textile supply chain (Vietnam Industry and Trade Information Centre, 2021). Furthermore, the cost of input materials is on the rise, exposing enterprises' production processes, plans and orders at risk in the context of pandemic (Vu, 2021). Vu Duc Giang (2021) claimed that enterprises must look for solutions to lessen their reliance on imported resources, notably the Chinese market, when it comes to fluctuation in global prices. It is of importance to diversify import sources from a variety of backgrounds while also boosting domestic supply. In fact, at the beginning of 2020, companies such as Dinh Vu Fiber Factory, May 10, Dong Nai Garment Joint Stock Company began purchasing raw materials from partners in the United States, Australia, Japan, Germany besides Chinese, Taiwanese and Korean markets (Khai, 2021). Moreover, provincial agencies have directed the adoption of measures to assist enterprises in reducing their reliance on imported intermediates from China by collaborating with other material sources such as Thailand, Korea, and Indonesia, as well as India and Malaysia... However, according to Vu Duc Giang (2020), finding alternative sources for apparel exports is a dilemma for Vietnam as the phases, i.e, R&D, production, and delivery, take at least 50 days following a new material order, which means new sourcing is not a short-term solution. Also, contracts are frequently negotiated, and raw materials are accepted long before official importation in the fashion sector. Thus, when approved sources of supply are suspended, even if Vietnamese textile and garment enterprises want to alter the supply to ensure their production, they cannot implement immediately (Vu, 2020). As a result, sourcing new raw materials can only be a medium and long-term solution, and a range of questions regarding the mechanism between diversification of imported inputs and export activities remain unsolved.

Supplier diversification refers to purchasing the same input from two or more suppliers at the same time (Seshadri et al., 1991; Jain et al., 2021), whereas foreign supplier diversification is defined as the use of a variety of suppliers coming from foreign markets (Ando & Hayakawa, 2021). As claimed by Jain et al. (2021), while having a limited number of suppliers may provide volume leverage, better supplier selection, economies of scale, reduced costs and coordination complexity, supplier diversification can have benefits regarding sourcing alternatives and supplier competition. In other words, determining supplier diversification implies a trade-off between value chain efficiency and robustness (Ando & Hayakawa, 2021).

The academic community has extensively explored the role sourcing strategy on firm performance. In particular, Richard et al. (2015) and Yang & Wang (2021) pioneered in making a deep analysis on the relationship between supplier diversification and firm performance but led to paradoxical outcomes. Little research, however, has been conducted to show theoretical or empirical results in terms of effects of supplier diversification on export performance. Meanwhile, access to foreign suppliers has been expanded not only in production but also in exports (Hummels et al., 2001).

Furthermore, a number of longitudinal studies have reported shocks' detrimental impacts on supply chain operations and the role of supplier diversification during the crisis. Natural disasters, such as Great East Japan Earthquake (2011), Flood in Thailand (2011) or financial shocks, i.e. The Global Financial Crisis (2008), were pinpointed to negatively influence on export performance of many firms in Japan, the United States, Thailand, and elsewhere. Then, the outbreak of Covid-19 epidemic has swiftly directed the attention of many researchers due to its thorough influence on global economic development (Friedt & Zhang, 2020; Kejzar & Velic, 2020; Meier & Pinto, 2020; Z. Qin et al., 2020; Yu et al., 2021; Hayakawa & Mukunoki, 2021). However, unlike other natural disasters (i.e., earthquake or flood) and GFC which were indicated to damage the demand side, Covid-19 epidemic is supposed to cause not only demand-side interferences but also supply obstructions (Ando & Hayakawa, 2021). In addition, recently, literature has emerged that offered different findings about the role of supplier diversification in the crisis's negative impacts. Nevertheless, the emphasis has placed solely on the role of multiple sourcing approach in the perspective of resilience.

Meanwhile, Vietnam in the period 2019-2021 are still in the midst of a crisis, it is infeasible to use historical data to handle resilience-related issues. In other words, the role of foreign supplier diversification in the effect of Covid-19 on the textile value chain via robustness mechanism needs to be thoroughly reconsidered in this research.

Besides, prior studies mainly focus on the manufacturing industry as a whole, rather than on the textile and apparel industry in particular. Meanwhile, in Vietnam, compared to other manufacturing industries, the textile value chain relies heavily on imported inputs. Indeed, the electronics industry is believed to be less adversely affected by China's component supply as big manufacturers like Samsung, Foxconn, Nokia, LG, and others have established manufacturing and R&D facilities in Vietnam (Ministry of Industry and Trade, 2020). For example, Samsung now has six factories and one R&D center located in provinces, namely Bac Ninh, Thai Nguyen, Ha Noi, and Ho Chi Minh. As a result, the supply of components for electronic production is assured in the long term even in the event Covid-19 pandemic (Ministry of Industry and Trade, 2020). Meanwhile, the textile value chain depends on foreign sources of supply to a great extent, with the most important imported materials, i.e. cotton, contributing over 60% of export prices (Dang & Dinh, 2013). In fact, Vietnam is mainly involved in the sewing process which facilitates gaining the lowest profit margin in the global textile value chain, just 10-15% (Dang & Dinh, 2013). In other words, understanding the role of foreign supplier diversification in export performance is of great significance for the textile industry in general and Vietnam's textile businesses in particular.

In this regard, this paper aims to remedy these problems by tackle three main questions: (1) How foreign supplier diversification affects Vietnam's textile exports during the period 2010-2021?; (2) Does foreign supplier diversification diminish the pandemic's negative impact on Vietnam's textile value chain?; and (3) What implications and solutions could be suggested to intensify Vietnam's textile exports in the years to come?

2. Theoretical framework

2.1. Supplier diversification and firm performance

In general, regarding research analyzing the role of supplier diversification in firm performance, there are two main schools of supplier diversification which are analyzed as follows:

On the one hand, diversification strategy fosters competition among suppliers. This is primarily because buyers can access inputs with better quality, price, and delivery service or can take advantage of product innovation (Jain et al., 2021). Buyer's bargaining power over supplier's increases due to numerous buyer's selections. As a result, multiple sourcing hedges the risks of creating a monopolistic (sole source) supply base and boost firm performance (Newman, 1989). Furthermore, diversification strategy increases a firm's (industry) operational flexibility, which means whenever demand for products rises, diversification approach will better meet the increasing demand of production compared to maintaining a limited quantity of supplier (Costantino & Pellegrino, 2010). With this in mind, supplier diversification is indicated to maintain firm production as well as foster firm performance. By investigating implications of supplier diversification on firm performance, as well as the moderating role of environmental tolerance in this relationship, Richard et al. (2015) pinpointed the positive relationship between supplier diversification and performance in the setting of companies doing business in declining industries, whilst companies in major sectors were experiencing negative effects. As a result, supplier diversification is viewed as a valuable resource that probably assists businesses in gaining a long-term sustainable competitive advantage (Adobor & McMullen, 2007).

Supplier diversification, on the other hand, does not appear to have a favorable impact on firm performance. In fact, managing multiple sources is probably more cumbersome and complex than dealing with a single source. As a result, maintaining a diverse supplier portfolio means high operating costs including expenditure for a large number of orders, phone calls, documents, and supervision and hidden costs (the loss of scale economies). Additionally, negotiating with plenty of suppliers may involve longer negotiation times, resulting in delays or disruptions in production schedules (Jain et al., 2021). Meanwhile,

concentration approach facilitates cost reduction and economy of scale (Chung et al., 2010). To be specific, due to better knowledge of the manufacturing process, suppliers can achieve economies of scale via reducing production cost per input. Furthermore, firms can take advantage of quantity discounts from order consolidation, reduced lead times, and logistical cost (Hahn et al., 1986; Bozarth et al., 1998). This conclusion was figured out in a research of Yang & Wang (2021) where supplier concentration had a considerable favorable effect on firm's financial performance.

Hence, the choice of purchasing strategy considers the trade-off between the robustness gained from supplier diversification and cost efficiency of supplier concentration.

2.2. Supplier diversification and supply chain disruptions

Regarding the role of supplier diversification in the event of adverse shocks, there are two common terms to describe the effects that negative shocks have on supply chains, namely *resilience* and *robustness*. Whereas resilience is interpreted as the ability to return to regular operations after a disruption in a specified time, robustness is the capability to maintain operations throughout a crisis (Brandon-Jones et al., 2014). Supplier diversification, in particular, can be seen as a feasible approach to improve the robustness of supply chains while ensuring smooth production flows (Ando & Hayakawa, 2021). Supplier diversification, according to Jain et al. (2021), can provide benefits in terms of sourcing alternatives as well as supplier competition. The contribution of supplier alternatives in the context of supply chain volatility can indeed be emphasized. In the event of supply chain disruption, the excess supply allows purchasers to quickly switch between alternative sources of supply (Jain et al., 2021). Miroudot (2020) concurred with this idea, stating that manufacturers should diversify their sources of supply in order to avoid industrial manufacturing disruptions. Supplier diversification lowers the impact of negative shocks on profitability while also shortening the time it takes to remedy such problems (Mizgier et al., 2015). Because of the potential for domestic economic disaster, fully local sourcing and production is considered unsustainable and discouraged. Take Samsung Electronics as an example. The firm produced most of its new smartphone lines in Korea, with the primary facility being located near Daegu. The Covid-19 boomed in Korea near the end of February 2020, prompting the country's industry to shut down for several days (Song, 2020). Hence, Samsung's production process was disrupted by relying solely on domestic suppliers. To tackle this issue, the company opted for shifting several mobile phone component productions to Vietnam in order to diversify its supply sources. That is to say, the more resources entities have, the better equipped they are to endure and respond to disruptions (Page, 2014).

2.3. Industrial characteristics and export performance

The study employs industrial characteristics as control variables to ensure that test results are fair and not skewed. To be specific, industry-level features are determined based on Micheal Porter's diamond model which enables to identify determinants for industry's competitiveness, and thereby is associated with business outcome, particularly a product's export performance (Porter, 1985). Porter dealt with four major dimensions in the external environment, including factor input conditions, demand conditions, related and supporting industries, and firm strategy, structure and rivalry. As this study concentrates on backward linkages of the value chains, two dimensions, namely factor input conditions, and firm strategy, structure and rivalry will be taken into consideration.

Factors of production comprises basic conditions (i.e., labor, capital, and nature resources) and advanced factors (i.e., skills and expertise of labor force, infrastructure and technological innovations) (Porter, 1985). Firstly, Index of Industrial production (IIP) indicates the rate at which industrial production develops over a certain time period, which represents an overview of the whole industry as well as a rate of development of each product and product line in particular (GSO, 2020). IIP was taken into account to capture domestic input factors' capacity effects in the studies of Al Mamun & Nath (2005), Sertić et al. (2015), Sugiharti et al. (2020). Secondly, workforce is examined to play a vital role in the competitiveness of a particular industry. To be specific, a change in labor force can significantly influence outcomes of a sector, including export performance, with its effects being captured in previous studies of Majeed & Ahmad

(2006), Artuc et al. (2014), and Uysal & Mohamoud (2018). Another stimulus to development is the extent and pattern of competition, which is measured by the number of firms. Domestic competition is considered to make a contribution to the success of a typical industry as once encountering fierce and strong rivals, enterprises are forced to enhance quality, productivity, foster innovation to create novel products (Porter, 1985). As a result, they themselves develop their necessary skills to gain achievements and profits, which was confirmed in the research of Zaclicever (2019). In stark contrast, tough competition was also indicated to hinder export performance. Indeed, companies had to cover a great deal of costs and fees incurred to encounter the market competitive intensity to increase the added value of the company over its rivals, and hence reducing production efficiency, and firm profitability, which was determined in Purnama & Subroto's (2016) study.

3. Research method

3.1. Quantitative research method

This paper adopts the quantitative research approach to address the research questions for several reasons. To begin, quantitative research allows for the analysis of large samples and the application of generalizations to a larger population (Richard & Elwood, 2005). Secondly, quantitative research entails the use of numbers, logic, and historical data to reach objective and accurate conclusions (Babbie, 2010). Thirdly, this method makes it easier to establish causal linkages between independent factors (supplier diversification and Covid-19 cases, deaths) and dependent factor (export value), to explain a specific phenomenon or to discover interpretations, and to define new problems (Babbie, 2010; Creswell, 2013).

3.2. Data collection

Data were collected based on purposive sampling method (also called selective or subjective sampling). In particular, researchers focus on their own judgment when selecting subjects of sample to participate in the study (Richard & Elwood, 2005). The sample contains trade statistics for products in the textile sector, with each product line being classified as an input or output in the supply chain. Inputs are primarily raw materials, parts and components at the HS two-digit level (32, 39, 40, 43, 48, 50-60, 83, 96), whereas outputs are largely finished apparel commodities at the HS two-digit level (61-67). In addition, the study uses secondary data obtained for the period 2010-2021 which is then presented in a panel table to compare across two dimensions: product line and time. Import and export statistics comprising total value of product lines (HS 2 digits) imported by Vietnam, and total apparel export value by Vietnam are gathered from Trade Map - ITC. Total cases or deaths are recorded annually by the Ministry of Health Portal, whereas control variables are published in the General Statistics Office's annual statistical yearbook.

3.3. Foreign supplier diversification index

Previous studies have used the Herfindahl-Hirschman Index (HHI) to capture supplier diversification. In particular, Richard et al. (2015) and Lin et al. (2021) applied firm-level diversity, while Ando & Hayakawa (2021) used country-product-level index to capture the diversification of suppliers. In this paper, diversification index gives the level of diversification of imports at the product level, which its value ranges between -1 and 0 , with higher values indicating more diversified suppliers of intermediates. Furthermore, a supplier is viewed as a country that provides inputs to another country's production process. Actually, firms can diversify their input sources by obtaining intermediates from a number of different companies inside a country (Ando & Hayakawa, 2021). As for this type of supplier diversification, this measure assigns a low value. Covid-19 pandemic, nevertheless, has an impact on manufacturing and trade in multiple nations, it would be more vital to examine variation of source countries rather than supplier firms within a country (Ando & Hayakawa, 2021). With this in mind, the terms 'foreign supplier diversification' and 'origin country diversification' can be used interchangeably. The foreign supplier diversification of product p (HS - 2 digits) is calculated as follows:

$$Diversity_{pt} = - \sum_p (S_{ct})^2 = - \sum_p \left(\frac{x_{ct}}{\sum_c x_{ct}} \right)^2 \quad (1)$$

Where S_{ct} : the share of origin country c in total imports of product p in year t

x_{ct} : the import value of product p from country c in year t

3.4. Heteroskedasticity test

Heteroskedasticity is defined as circumstances where the variance of the residuals is not equal throughout a range of measured values (Hayes & Westfall, 2020). Regressions utilizing ordinary least squares (OLS) imply that the residuals are obtained from a population having constant variance, whereas heteroskedasticity causes an unequal spread of residuals (i.e. error term). In other words, it is regarded as an issue which makes the results become invalid (Hayes & Westfall, 2020). Furthermore, the data is presented in a panel table, meaning values vary not only over time but also among product lines. Specifically, it is vital to conduct heteroskedasticity test, particularly via Breusch-Pagan/Cook-Weisberg technique, to examine which type of regression technique is appropriate.

3.5. Stepwise regression model

The development of a regression model using the stepwise regression approach involves repeating each step in the selection of the independent variable in the model (Hayes, 2022). To assess the model's statistical validity, explanatory variables can be added or removed, and statistical significance is always calculated after each repetition. The forward selection strategy begins with no initial variables, then, one by one, variables will be added to the model and statistical significance will be determined. When none of the remaining variables are important, the process stops. Moreover, this research applies AIC, BIC index beside R-Square to determine the most appropriate model. Proposed research model is established based on econometric model which is similar to Zaclicever's (2019), as follows:

$$y_{it} = \alpha + \beta_x x_{i,t-1} + \sum_t \beta_z Z_{i,t-1} + \sum_t \beta_t T_t + \theta_i + \varepsilon_{it}$$

In particular, i and t , accordingly, stand for product line and year. y indicates dependent variable, whilst m denotes independent variables. Z stands for control variables, T for year dummies, θ for fixed effects that control for unobserved time-invariant factors, whereas ε for error term. In this paper, export performance is measured as *Export value_t*, total export value of apparel finished goods (HS61-67) from Vietnam in year t . Foreign supplier diversification is measured in terms of diversification of origin countries of product p (*Diversity_{pt}*) using HHI index (1). Covid-19 damage is examined in terms of the number of Vietnam accumulated cases or deaths on a yearly basis, while three control variables involves firm numbers (i.e. number of acting enterprises having business outcomes as of annual 31st December), workforce (i.e. annual employed population at 15 years of age and above) and Index of Industrial production are sampled in three industrial activities, namely Manufacture of textiles, Manufacture of wearing apparel, and Manufacture of leather and related products. Therefore, the equation being formulated as follows:

$$\ln(\text{Export value}_t) = \beta_0 + \beta_1 \text{Diversity}_{pt-1} + \beta_2 \ln(1 + \text{COVID}_{t-1}) + \beta_3 \ln(1 + \text{COVID}_{t-1}) \cdot \text{Diversity}_{pt-1} + \beta_4 \text{control}_{t-1} + \varepsilon_t$$

4. Results and discussion

4.1. Results

Based on Breusch-Pagan/Cook-Weisberg test for heteroskedasticity, it can be seen that there is heteroskedasticity in the independent variables. Furthermore, even if control variables are included in the research, endogeneity concerns may exist. With this in mind, it makes sense to employ control variables, lagged variables and fixed effects to reduce heteroskedasticity and endogeneity.

Table 1. Breusch-Pagan/Cook-Weisberg test for heteroskedasticity

| Variable | Chi2(1) | Prob > Chi2 | Heteroskedasticity |
|----------------------|---------|-------------|--------------------|
| Independent variable | 0.27 | 0.6043 | No |
| Dependent variables | 52.88 | 0.0000 | Yes |

Source: Author's calculation

The table 2 and 3 show a decrease in AIC and BIC, an increase in R-square, which means the latter model can explain better than the former. When the variables are added, the AIC and BIC coefficients drop from 187.44 and 194.18 to -335.56 and -312.58, respectively. In addition, the R-square coefficient improves from 0.030 (very low) to 0.923 (very high). As a result, adding variables to the rational model enhances the model's explanatory power.

Table 2. Foreign supplier diversification and its impact in the Covid-19 pandemic (as measured by cases)

| Variable | (1) | (2) | (3) | (4) | (5) | (6) |
|-------------------------------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| Diversity _{t-1} | -0.707** (0.014) | -1.610*** (0.000) | -3.297*** (0.000) | -0.494** (0.022) | -0.439** (0.021) | -0.173 (0.287) |
| Ln(cases+1) _{t-1} | | -0.045*** (0.000) | 0.044*** (0.184) | -0.149*** (0.000) | -0.129*** (0.000) | -0.106*** (0.000) |
| Diversity _{t-1} . ln(cases+1) _{t-1} | | | 0.274*** (0.000) | 0.085* (0.076) | 0.076* (0.073) | 0.03 (0.406) |
| Labor _{t-1} | | | | 0.000*** (0.000) | 0.000*** (0.000) | 0.000*** (0.000) |
| Firm _{t-1} | | | | | -0.000*** (0.000) | -0.000*** (0.000) |
| IIP _{t-1} | | | | | | 0.022*** (0.000) |
| Constant | 17.150*** (0.000) | 16.978*** (0.000) | 16.537*** (0.000) | 15.724*** (0.000) | 15.189*** (0.000) | 12.618*** (0.000) |
| N | 215 | 215 | 215 | 197 | 197 | 197 |
| R-sq | 0.030 | 0.235 | 0.385 | 0.857 | 0.890 | 0.923 |
| adj. R-sq | -0.059 | 0.161 | 0.322 | 0.84 | 0.876 | 0.912 |
| df | 2 | 3 | 4 | 5 | 6 | 7 |
| AIC | 187.4386 | 138.4797 | 93.56048 | -218.9801 | -267.8424 | -335.5594 |
| BIC | 194.1798 | 148.5916 | 107.043 | -202.5641 | -248.1431 | -312.577 |

Source: Author's calculation

Table 3. Foreign supplier diversification and its impact in the Covid-19 pandemic (as measured by deaths)

| Variable | (1) | (2) | (3) | (4) | (5) | (6) |
|--------------------------------------------------------|--------------------------|------------------------------|------------------------------|----------------------|----------------------|----------------------|
| Diversity _{t-1} | - 0.707** (0.014) | - 1.705** * (0.000) | - 3.357** * (0.000) | -0.494** (0.022) | -0.439** (0.021) | -0.173 (0.287) |
| Ln(deaths+1) _{t-1} | | - 0.124** * (0.000) | 0.057** * (0.004) | -0.303*** (0.000) | -0.263*** (0.000) | -0.216*** (0.000) |
| Diversity _{t-1} . ln(deaths+1) _{t-1} | | | 0.403** * (0.000) | 0.173* (0.076) | 0.154* (0.073) | 0.061 (0.406) |
| Labor _{t-1} | | | | 0.000*** (0.000) | 0.000*** (0.000) | 0.000*** (0.000) |
| Firm _{t-1} | | | | | -0.000*** (0.000) | -0.000*** (0.000) |
| IIP _{t-1} | | | | | | 0.022*** (0.000) |
| Constant | 17.150* ** (0.000) | 16.959* ** (0.000) | 16.524* ** (0.000) | 15.724*** (0.000) | 15.189*** (0.000) | 12.618*** (0.000) |
| N | 215 | 215 | 215 | 197 | 197 | 197 |
| R-sq | 0.030 | 0.317 | 0.471 | 0.857 | 0.890 | 0.923 |
| adj. R-sq | -0.059 | 0.250 | 0.416 | 0.84 | 0.876 | 0.912 |
| df | 2 | 3 | 4 | 5 | 6 | 7 |
| AIC | 187.438 | 114.157 | 61.5087 | -218.9801 | -267.8424 | -335.5594 |

| | | | | | | |
|-----|---------|---------|---------|-----------|-----------|----------|
| | 6 | 9 | 6 | | | |
| BIC | 194.179 | 124.269 | 74.9913 | -202.5641 | -248.1431 | -312.577 |
| | 8 | 8 | 1 | | | |

Source: Author's calculation

Although the explanatory power of foreign supplier diversification diminishes, it generally reveals a negative association for export value. To be more explicit, a 1% increase in the diversification index lowers the value of textile and apparel exports by 0.439% (at the significance of 5%). The findings show that Covid-19 has a negative impact on the value of finished goods exported by Vietnam's textile and apparel industry, and that such negative effect of deaths is stronger compared to infections. While the coefficients for the Covid-19 numbers are negative, the coefficients for their interaction term with foreign supplier diversification are positive and significant ($\beta = 0.247$, p value = 0.000). Besides, the coefficient of diversification with deaths is higher than that with cases, implying that diversification has a greater and more obvious impact in Covid-19 consequences (as measured by deaths). The IIP and workforce are indicated to have a favorable impact on Vietnam's textile and apparel exports period from 2010 to 2020 ($\beta=0.022$ and $\beta = 0.000$, respectively at 1% significance level), whereas there is a negative association between number of firms and export value, ($\beta=-0.000$ at the significance of 1%).

4.2. Discussion

Based on the findings shown in section 4.1, research results are discussed as follows:

Firstly, foreign supplier diversification is revealed to have a significantly negative association with Vietnam's textile and apparel export value, which confirms the findings in the research of Richard et al. (2015). In fact, diversifying sources of supply impedes taking advantage of quantity discounts from order consolidation and economies of scale. Furthermore, handling multiple sources is probably more difficult and time-consuming than dealing with a single source. As a result, firms have to cover considerable operating costs such as phone calls, records, papers, supervision etc., hindering export value of textile and apparel commodities.

Secondly, Covid-19 pandemic has a detrimental impact on the value of exported apparel goods, and such negative effects tend to be stronger when it comes to an increase of deaths. Indeed, the unprecedented spread of Covid-19 impelled governments to bring in a range of policies and measures that restrict business, production, and transportation activities (Teodoro & Rodriguez, 2020). Consequently, canceled orders, dwindling demand and input supply instability made Vietnam's textile and apparel industries encounter numerous challenges. In other words, the value of textile and clothing exports has declined dramatically due to the novelty Covid-19 outbreak.

Thirdly, foreign supplier diversification significantly mitigates the negative Covid-19's impact on textile and apparel export value. This finding is equivalent to that of Todo et al. (2015) and Ando & Hayakawa (2021), who found that diversifying input sources could help diminish the impact of shocks. To put it differently, diversifying foreign sources of supply has a better export value than those with less diversification during the Covid-19. It is attributed by the fact that time-and-country-based diverse influences of Covid-19 results in complexity and ambiguity of value chains, whereas supplier diversification allows companies to flexibly shift from more to less affected suppliers (Ando & Hayakawa, 2021). As a result, industrial activities are neither disrupted nor delayed, and the supply chain's source of inputs is maintained. In other words, foreign supplier diversification fosters supply chain's robustness, which thereby mitigates Covid-19's detrimental impact on Vietnam's textile and apparel export value.

Fourthly, index of industrial production and workforce are indicated to have a significantly favorable impact on Vietnam's textile and apparel exports from 2010 to 2020. These indications were also pinpointed in prior studies of Sertić et al. (2015), Sugiharti et al. (2020) for industrial production and Majeed & Ahmad (2006), Artuc et al. (2014), Uysal & Mohamoud (2018) for workforce. Strengthening industrial production and the scale of the labor force boosts domestic production capacity and firm productivity, which thereby enhances export value. Nevertheless, this paper figures out a negative association between the number of

firms and export value, which is in line with the findings of Purnama & Subroto (2016). As companies have to cover a lot of costs, which lowers production efficiency, firm profitability when they encounter the market competitive intensity, (Purnama & Subroto, 2016). In other words, the high number of firms fostering within-industry competition reduces export performance.

5. Conclusion

5.1. Implications and recommendations

This research achieves the goal of investigating the impact of foreign supplier diversification on export value and its role in the negative pandemic's impact on export value. Furthermore, the reliability of the regression model has been verified and the relevance of the research framework in the context of Vietnam's textile and apparel sector has been confirmed, implying the profound importance of supplier diversification in the face of unexpected supply chain disruptions. In particular, whereas foreign supplier diversification does not foster export performance, it mitigates the negative Covid-19's impact on apparel and textile export value. On that basis, several recommendations are drawn as follows:

For firms, managers need to reconsider their supply and revenue structures in light of the ever-changing business environment. Dealing with fewer suppliers can save firms' money in the long run because it allows them to benefit from economies of scale and close supplier relationships. Furthermore, firms can take advantage of FTAs in importing inputs, which dramatically lowers prices and trade obstacles. These businesses, on the other hand, are probably vulnerable if something goes wrong with their supply chain partners, which means managers must ensure the supply chains are robust by means of a backup supply. To be specific, supply chain managers should suggest diversifying their suppliers in order to prevent becoming over-dependent on a small number of vendors.

Regarding governments, due to the Covid-19's detrimental impact on export value, loans are necessary for enterprises whose supply chains have been disrupted. The governments can help firms by decreasing corporate income tax, extending corporation tax payments, and supporting employee policies, and more. Furthermore, on account of positive effects of supplier diversification in the context of Covid-19, governments should encourage companies to possess redundant suppliers and markets. Governments, for example, can provide platforms for businesses to identify qualified suppliers, which makes supply-demand matching easier during times of disruption, or can support the growth of domestic textile, yarn, and fabric enterprises as a means of creating a market for backup supplies. Building infrastructure, creating quality workforce, and attracting investment capital are viable approaches for the governments to support local firms in producing raw materials, parts, and components, and mitigate the negative effects of input imports disruption.

5.2. Contributions

Via empirical findings, the research has established a research model on the impact of foreign supplier diversification on export performance and its significance towards supply chain robustness, contributing a deeper understanding of the literature regarding export and supplier diversification. The topic is also relevant and appropriate in light of the present Covid-19 pandemic in Vietnam and other nations around the world, which can be extended from the fields of international business (from the perspective of a firm) to international economics (from the perspective of a country) using the same approach. In practical terms, the study has enhanced managers' awareness of the impact of purchasing strategy on business results in the textile and apparel industries. Regarding relevant authorities, within the research scope, governments can gain deeper understanding and essential knowledge in terms of supplier diversification and its significance in business operation and thereby brings in regulations fostering textile and apparel export performance.

5.3. Limitations and further research

This research has made efforts to improve the validity of its findings. However, there are still some flaws in this study that will need to be addressed in future research. Firstly, the research's scope was restricted by purposeful sampling, resulting in a relative and generalized outcome. In particular, the study

only samples items that are the primary input/output of textile products while ignoring some others. Future research may sample the entire set of data regarding inputs and outputs of the textile and apparel sector to provide more specific and accurate information and results. Secondly, the supplier diversification index is calculated based on the origin market diversification, where a country is considered as a supplier. This index has a low value in case a firm has multiple suppliers within a country. To address this issue, data from a company's perspective should be used to describe the differences in sourcing strategies among companies in a certain industry.

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INSTITUTIONAL QUALITY IN VIETNAM'S PROVINCES AND ECONOMIC GROWTH

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ABSTRACT

This study explores the local governance mechanism at the provincial level of Vietnam through the construction of the PGI index and places this index in relation to local economic development policies. Through the combination of statistical and regression methods, the author has discovered the following relationships: Firstly, it is possible to establish a causal relationship between the quality of governance institutions and effective income per worker. Secondly, using Arellano and Bond's (1991) GMM estimation method for dynamic data with endogenous variables, this study demonstrates that the quality of governance institutions contributes positively to the economic growth of companies, provinces, and cities over time, while also helping to partially explain the income disparity between localities. Thirdly, the influence of governance institutions' quality on effective per capita income differs according on institutional feature; for example, corruption control and policy quality have a positive linear relationship. while democracy and public policy have a U-shaped association with income level, the bottom point of the U is much lower than the average local score. Fourthly, the test results indicate that the growth effect of institutional quality differs by economic location

Keywords: Local governance, Spatial regression, public policy

1. Introduction

Over the last two decades, numerous researchers and politicians have focused on the importance of institutional quality in economic growth. Numerous previous research have demonstrated that both neoclassical (Solow, 1956; Swan, 1956) and endogenous growth models (Barro and Lee, 1994; Lucas, 1988; Romer) contain numerous unresolved aspects. These models, in particular, are believed to be unable to account for disparities in economic growth between countries due to capital accumulation or technical advancement (Asghar et al., 2015). As a result, when institutional economics was formed and evolved as a paradigm for explaining the origins of growth, scholars worldwide attempted to extend neoclassical or endogenous growth by studying the role of institutional factors on long-run growth (Acemoglu et al., 2001; Rodrik et al., 2004). Furubotn and Richter (2005) claim that research into economic growth institutions has gotten increasingly diverse over time.

In Vietnam, empirical research on economic growth has been conducted in a variety of sectors and across the economy. Klump and Nguyen Thi Tue Anh (2004), Scott and Truong Thi Kim Chuyen (2004), Chen (2005), Phan Minh Ngoc and Ramstetter (2006), Tran Tho Dat and Do Tuyet Nhung (2008)... all attempted to explain the origins of Vietnam's post-Doi Moi growth using modern growth models and socioeconomic indicators. The relationship between institutional quality and economic growth has received much attention in recent years from both academia and policymakers in the country. Numerous research have established that weak institutions generally act as a hindrance to economic growth (Le Quoc Ly, 2014; Nguyen Van Phuc, 2013; Tran Du Lich, 2013; Vo Tri Thanh, 2014).

Within Williamson's (1998) hierarchy of institutions, governance appears to be more intriguing to academics, owing to the significant policy consequences that study findings might have for countries and international organizations (Kaufmann and Kraay, 2003; Kurtz and Schrank, 2007; Wilson, 2016). Because this institutional level is inextricably linked to the state's function, it may be even more critical for economic

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progress in Vietnam, a country that adheres to the market mechanism but is heavily state-oriented. When identifying growth bottlenecks and game-changing solutions, the Vietnamese government stated that improving the quality of governance institutions (in particular, enhancing the State's capacity and accountability) is one of the three pillars of the policy framework aimed at transforming Vietnam into a middle-income country by 2035. (Ministry of Planning and Investment, 2018; World Bank and Ministry of Planning and Investment, 2016).

The preceding topics demonstrate the critical importance of the quality of governance institutions for economic growth in both economic theory and socioeconomic development practice in Vietnam. Additionally, it should be highlighted that Vietnam has undergone substantial reforms to its governance structures and has seen significant economic growth in recent decades, making Vietnam a model country in comparison to many other countries. The case is great for demonstrating how enhancing the quality of governance institutions contributes to economic development. Apart from the two studies by Le Quang Canh and Do Tuyet Nhung (2018) and Nguyen Viet Cuong et al. (2021), there are essentially no other research in Vietnam that directly quantify the relationship between the quality of governance institutions and economic growth. The majority of research assess the impact of governance institution quality on FDI attraction, labor productivity, and enterprise performance as a mechanism for communicating the influence of institutional quality on economic growth.

The study's overarching purpose is to ascertain the relationship between the quality of governance institutions and local economic growth at the provincial level in Vietnam, and thus to measure the impact of institutional quality on economic growth. The paper makes policy recommendations based on empirical research findings regarding the quality of governance institutions in order to enhance economic growth in Vietnam.

The topic's specific objectives are as follows:

- i. Developing a measure of the quality of local governance institutions at the provincial level that is appropriate for the Vietnamese context;
- ii. Establishing a causal relationship between governance institution quality and economic growth;
- iii. Evaluating the influence of governance institution quality on local economic growth at the provincial level in Vietnam;
- iv. Policy recommendations related to governance institution quality to promote economic growth in Vietnam.

2. Theoretical framework

2.1. The causal relationship between the quality of governance institutions and economic growth

2.1.1. At national level

Since the 1990s, academia has devoted considerable intellectual energy to determining the nature of the relationship between governance institutions and national economic growth (Sihag, 2007) pioneered the concept, suggesting that because the establishment of an institutional framework has historically sparked economic change in countries, it may be considered as a critical component of distinct growth, stagnation, or decline trajectories. Until recently, theoretical and experimental investigations have supported both directions of development of the causal relationship between the quality of governance institutions and economic growth.

The quality of governance institutions affects economic growth

According to the idea, institutional quality affects income levels through the allocation of political power, the protection of property rights, the creation of economic possibilities, the stimulation of innovation, and the promotion of physical and human capital accumulation.... Thus, past research has stressed the critical importance of institutions in economic development (Nakabashi and partners, 2013). Numerous empirical studies have examined the relationship between governance institution quality and economic growth, and most have discovered evidence that countries with better institutions will have higher levels and growth rates

than countries with poor institutions, when other variables in the research model are controlled for (Hall and Sobel, 2008).

Barro (1991) conducted the seminal empirical study in this area, concluding that, after adjusting for other variables in the standard growth model, political instability (measured by the frequency of coups, political assassinations, and revolutions) had a negative and statistically significant effect on GDP per capita growth between 1965 and 1985. However, Knack and Keefer (1995) are credited as being the first to incorporate the governance institution measure, which is a composite index derived from data sets (particularly, ICRG5) into the regression model. Using cross-country data, the authors discovered that this index is positive and statistically significant in the Barro-type growth equation.

Along with the difficulties inherent in gauging the quality of governance institutions, empirical research examining the relationship between the quality of governance institutions and growth have run across the issue of "simultaneousness." Aron (2000) states that because past research has "often failed to adequately address endogenous institutional measures," it is impossible to determine whether improved governance has resulted in increased growth or vice versa. This issue is not readily resolved, in part because there are inadequate statistics on the quality of governance institutions prior to the development period. Acemoglu and colleagues (2001) aimed to use a historical variable - the mortality rate of settlers in European colonies during the colonial period - as a proxy for the quality of current governance institutions, focusing on the "risk of expropriation." The authors evaluate a concurrent model in which (i) current per capita output growth is affected by risk of expropriation and other factors; and (ii) current danger of expropriation is dependent on settler mortality and other factors in the past.

The statistically significant influence of settler mortality on future growth supported the hypothesis that low mortality fostered a more crowded and active European settlement with a greater emphasis on the formation of property-rights-respecting institutions. These early institutions are still thought to exist and impact the modern economy, proving the link between the quality of governance institutions and growth indirectly. Rodrik and colleagues (2004) demonstrated these findings by utilizing settler mortality as a tool variable to account for exogenous fluctuations in the WGI composite index.

While instrumentalization of governance institution variables appears to alleviate the concurrency problem, it introduces the issue of attributing the effect of the instrumental variable(s), hence influencing the theoretical interpretation of causal links. Glaeser and colleagues (2004) suggest that the instrumental variable utilized (particularly, settler mortality) is really more closely related to contemporary human capital assessments than other variables. Institutions. As a result, the use of instrumental variables cannot resolve the causal dispute.

Economic growth affects governance institutions

While past research has emphasized the importance of the state improving the quality of institutions in order to maximize economic development efficiency, another view is that economic growth promotes institutional improvement, a causal direction that may be even more significant. Paldam and Gundlach (2008) empirically test both causal directions by using a democracy variable to represent the macro institution and a corruption variable to represent the micro institution in their respective models, which include institutional measures and economic growth as dependent variables. After careful consideration, the two scientists determined that forecasting a rise in income levels would result in an increase in institutional quality was more consistent with the facts than predicting the contrary. They caution against suggesting institutional adjustments to increase economic efficiency in the formulation of development programs in light of this conclusion. Reversing this causal link also has a theoretical foundation. Economic progress, according to institutional theory, can increase the relative efficacy of formal governing mechanisms (Dixit, 2003). Subsequent research has identified a variety of ways by which improved economic performance can result in improvements in the quality of a country's governance institutions. For instance, comprehensive governance reform is a costly and technically challenging endeavor, and many developing countries lack the financial resources and administrative capacity necessary to properly advocate and implement it. adopting such a reform package (Rodrik, 2007). Thus, proponents of a program of "good enough governance" (instead

of the multilateral development agencies' "good governance" approach) argue that growth can be achieved through relatively minor reforms aimed at encouraging investment (Hausmann and colleagues, 2005), and that this growth may provide developing countries with the time and resources necessary to establish higher-quality governance institutions at a later stage of economic development (Grindle, 2007). Wilson (2016) also cites several historical case studies, indicating that, in the early stages of development, it is not the quality of governance institutions that determines economic growth, but rather improved governance. Economic growth can result in improved governance. It is self-evident that if economic progress is the primary driver of historical institutional advancements, rather than vice versa, we should anticipate institutional improvements (which are not accompanied by significant transformation). social or political economy) is a byproduct of the pursuit of sound governance and economic progress (Kurtz and Schrank, 2007).

2.1.2. At local level

While examination of country-level data elucidates several elements of the relationship between governance quality and economic growth, there are numerous arguments today concerning the effect of governance quality on economic growth. Governance frameworks for a country's local income levels (Pande and Udry, 2005).

Scholars have highlighted the following benefits of focusing the investigation on a single country (using local/regional data):

- Studies on institutional development and economic growth conducted within a country can aid in the comprehension of topics mentioned in international data-driven studies (Pande and Udry, 2005).

- Institutional change agents can be discovered and compared more easily than at the country level, because the bias associated with a lack of variables in studies conducted inside a single country is typically lower than in cross-country research (Nakabashi et al., 2013).

- Comparing data within a country becomes less difficult than comparing data between countries. While comparing institutional characteristics across countries can be challenging due to the diversity of historical experiences, cultural norms, and political contexts, subnational data allow for greater control over those contexts and a focus on particular aspects of governance institutions and their temporal relationships with growth (Hasan et al., 2009).

Utilizing locality as a unit of analysis enables the application of more powerful array data methods than single time series approaches, particularly in the setting of developing countries with short time series (Wilson, 2016).

As a result, research examining the association between institutional quality and income levels tend to produce more trustworthy results when using domestic data (Nakabashi et al., 2013). On the basis of these principles, research on the relationship between the quality of governance institutions and economic growth at the local level has been conducted in both developed and developing countries, as illustrated below.

Hall and Sobel (2008) explore the effect of institutions on US state variations in entrepreneurship, income, and economic growth using the Economic Freedom Index of North America (EFNA). economics using a spatial autoregression (SAR) model of first order and a spatial error model (SEM). The findings of this study demonstrate that institutions congruent with free-market capitalism, or "economic liberty," promote more productive business activities, which result in better per capita income and economic growth.

Hasan and colleagues (2009) examine the effect of legal, financial, and political institutions in growth using array data from Chinese provinces. The authors build indicators for these institutions and incorporate growth regression models with regularly used control variables in growth studies (convergence effect, human capital investment, and openness of the local economy). The regulatory environment, perceptions of property rights, the development of financial markets, and political pluralism are all connected with better growth in China's provinces, according to research.

3. Research method

3.1. Method to test causality

Following the approach of Wilson (2016), heterogeneous panel Granger causality tests will be used to understand the causal relationship between governance institution quality and economic growth at the provincial level of Vietnam in the period 2011-2018.

The model used in the test is a heterogeneous array vector autoregression (VAR) model with provinces/cities $i = 1, \dots, N$ and time $t = 1, \dots, T$.

$$\begin{aligned} \ln(Y_{i,t}) &= \alpha_{1,i} + \sum_{g=1}^G \gamma^{(g)} \ln(Y_{i,t-g}) + \sum_{h=1}^H \beta^{(h)} \ln(P_{i,t-h}) + s_{1,i,t} \\ \ln(P_{i,t}) &= \alpha_{2,i} + \sum_{h=1}^H \gamma^{(h)} \ln(P_{i,t-h}) + \sum_{g=1}^G \beta^{(g)} \ln(Y_{i,t-g}) + s_{2,i,t} \end{aligned}$$

in which, $Y_{i,t}$ và $P_{i,t}$ respectively represent the income level and governance quality of the i province/city in year t , α_i is the provincial effect and $\epsilon_{i,t}$ is the residual independently and normally with mean 0 and finite heterogeneous variances in this study is σ^2 . The heterogeneity between provinces is introduced into the model by allowing the coefficients $\gamma(k)$ và $\beta(k)$ to vary between provinces/cities, G and H being the lag lengths of Y and P , respectively is taken in the test.

Before proceeding with Granger test, two initial tests need to be performed to determine the model format, including stationary test and co-integration test for the variables Y and P . Then, two hypotheses need to be tested as follows:

H1: The improvement of the quality of governance institutions has an impact on economic growth, corresponds to the hypothesis that the coefficients $\beta_{1,i} = (\beta(1), \dots, \beta(H))$ are zero for all province/city (contrary to hypothesis $\beta_{1,i}$ is non-zero for at least one province).

H2: Enhanced economic growth will lead to an improvement in the quality of governance institutions, corresponding to the hypothesis that the coefficients $\beta_{2,i} = (\beta(1), \dots, \beta(G))$ are equal to 0 for all provinces/cities (contrary to hypothesis $\beta_{2,i}$ is non-zero for at least one province).

Following the approach of Wilson (2016), Granger causality tests are performed for each spatial unit (province/city) one by one independently, and test statistics are constructed based on the mean of the Wald result statistics. This allows us to estimate the model in the above equation and test these two hypotheses more effectively and efficiently. We have two test statistics reports for each hypothesis that we are testing. The first is the Wald statistic, which is an approximation of the normalized mean. As the number of spatial units N approaches infinity, this statistic converges to the usual normal distribution, and p values are reported based on this asymptotic distribution. According to Dumitrescu and Hurlin (2012), the second test is based on the mean (non-normalized) Wald statistic, and it presents values from a block bootstrap technique that allows for the accounting for spatial dependence. As a result of their excellent statistical features, these tests are well-suited for research involving short time periods.

Additionally, in order to corroborate the finding concerning the relationship between economic growth and the quality of governance institutions, the Durbin-Wu-Hausman endogeneity test procedure was carried out in conjunction with the Granger test. Based on the fact that many studies involving regression of instrumental variables (IV) require the Durbin-Wu-Hausman test in order to check for the presence of endogenous variables by comparing small squares estimates, these tests have been developed. (OLS) of the structural parameters in IV regression with two-stage least squares (2SLS). Following Davidson and MacKinnon (1993), the Durbin-Wu-Hausman test is frequently used to determine whether to utilize IV analysis instead of regular OLS analysis since IV analysis will have lower bias than OLS analysis. when there is an endogenous variable in regression IV, like in this case.

The following are examples of possible causative test results situations:

- A one-way causal relationship between the quality of governance institutions and growth: In this case, the research can continue to develop by deepening understanding of the impact of governance institution quality while controlling for normal sources of growth and accounting for heterogeneity between spatial units (provinces/cities) and temporal effects using fixed effects and random effects models.

- A two-way causal relationship between the quality of governance institutions and growth:

If there is a one-way causal relationship between growth and the quality of governance institutions, the study can go deeper into the growth dimensions by industry group, by geographical area, and so on to understand the impact of growth on each component index of the governance institution measure, following the approach of Wilson (2016).

It is possible to solve the endogeneity problem when estimating the impact of institutions on economic growth by using the GMM regression methods for dynamic array data model with instrumental variables developed by Arellano and Bond (1991) for two-way causal relationships (two endogenous variables and mutual influence). This strategy is particularly well suited to situations in which the array data contains a large number of temporal units that are significantly smaller than the number of spatial units.

3.2. Regression analysis

3.2.1. Estimated model

The foundation of the extended Neoclassical growth theory is used as the basis for most estimation models in research on the impact of institutional quality on economic growth, with the institutional variable serving as an influencing factor. Nakabashi and colleagues (2013) developed a model for the transition economy by incorporating a control variable group composed of transition economy unique structural factors (Ng and Leung, 2004; Tran Tho Dat and Do Tuyet Nhung, 2008). According to Le Quang Canh and Do Tuyet Nhung (2018), we have an enlarged linear Cobb-Dougllass production function that has taken logarithms on both sides of the equation. This production function is as follows:

$$\ln Y_{Lit} = \alpha_i + \beta K \ln K_{Lit} + \beta G \ln G_{Lit} + \delta \ln P_{it} + \gamma Z_{it} + u_{it}$$

In there:

YL is GRDP (gross product in the province) average effective labor

KL is the average effective level of physical capital of labor

GL is the effective labor per capita government spending

P is a vector of provincial-level local governance institutional quality indicators (PGI). Which is built according to the method in section 2.1.

Z is a vector of specific structural parameter variables of the transition economy, including: FDI is the openness of the economy, AGR is the share of the agricultural sector in the economy, GOV is the share of expenditures. local government budget expenditure on GRDP.

All variables vary by province/city (i) and by year (t).

Due to restrictions in the human capital measures available to Vietnamese provinces/cities over the period 2011-2018, this model substitutes the effective labor variable for both the number of employees and the degree of human capital in the original Nakabashi and partners model (2013). As Tran Tho Dat and Do Tuyet Nhung explain, the transition economy's distinctive structural features are critical for short-term growth (2008). Additionally, variable effective government expenditure per worker is included to help better limit short-term growth effects, particularly in tiny economies that rely heavily on the public sector, such as Vietnam (Le Quang Canh and Do Tuyet Nhung, 2018).

The research can be expanded by categorizing Vietnam's provinces/cities according to their size, economic area, etc., in order to have a deeper understanding of the impact of governance institution quality on local economic growth. Vietnam at the provincial level.

3.2.2. Variables and data sources

a) Economic growth

Economic growth is frequently defined as the increase in a country's, region's, or economic sector's real income. The variable Y is constructed in this study using the data series GRDP (gross product in the province), which was estimated at 2010 comparative prices for 63 provinces/cities during the research period, using data from the Year Statistical supervision of 63 Statistical Offices worldwide.

It should be noted that the General Statistics Office has revised the Gross Regional Domestic Product (GRDP) of provinces and cities for the period 2015-2018 in response to recent social reflections on the accuracy of GRDP statistics. This is in contrast to the figures published in provincial/city statistical yearbooks for the period prior to 2015, as well as with other macroeconomic variables (government expenditures, investment, labor, etc.) that were published annually in the Provincial Statistical Yearbooks during the time span studied. As a result, to ensure data consistency, this study continues to rely on publicly available data from the provinces'/cities' Statistical Yearbooks, which are released annually. However, the error computation for the Statistical Yearbook data for the provinces and cities of Vietnam is methodical and carried out in the framework of a trend research study, as is the case in most countries (converted from absolute to logarithmic data). In this particular study, the error factor had a minor impact on the study's outcomes.

b) Quality of governance institutions

As explained in Section 2.1.2, the PGI data series is constructed using the PAPI and PCI component indices for the years 2011-2018. The model's P-indices were developed using data from the official publication of the PAPI index from 2011 to 2018 and the PCI index from 2006 to 2018.6 These are reputable, official, and widely regarded data sources.

According to institutional economics theory, the quality of governance should have a beneficial effect on economic growth.

c) Physical capital

Physical capital is a critical component of economic growth. This study applies Tran Tho Dat and Do Tuyet Nhung's (2008) K construction approach to historical GRDP and investment data, specifically as follows: The initial K value is calculated to be double the GRDP level at baseline. GRDP 1995 was used to compute baseline K in this investigation (K₀). The physical capital level for each locality over time is computed using the formula from K₀ and the provinces'/cities' real annual investment:

$$K_t = (1 - \delta) K_{t-1} + \lambda I_t$$

In there $\delta = 5\%$ = depreciation rates, $\lambda = 95\%$ = the level of physical capital formation from investment, equivalent to the level of investment loss is 5%; I_t = real investment.

Actual investment data is the value of social investment made by Vietnamese provinces/cities between 1996 and 2018, as recorded in the province/city statistical yearbooks, converted to comparable values. Moreover, investment data is the value of social investment made by Vietnamese provinces/cities 2010 is denoted by the unit million VND.

Although the depreciation rate varies by province/city, for simplicity, this figure is set at 5% based on various research conducted in Vietnam on the sources of economic growth (Tran Tho Dat, 2002)

According to economic development theory, the estimation findings should show a positive association between Y and K.

d) Effective number of workers

$$HL_{it} = I_t (1 - H_t) + \frac{W_{\text{trained}}}{W_{\text{untrained}}} L_{it} H_{it}$$

In there: HL is the number of effective workers, H is the percentage of trained workers, L is the number of workers working in the economy. $W_{trained}$ is the average income of a trained worker and $W_{untrained}$ is the average income of an untrained worker (also known as unskilled labor).

This study only considers the number of working people, not the entire population or the unemployed force, because taking into account potential forces for economic growth is not appropriate for the short time series studied. According to the definition of Hanoi Statistics Office (2018), the number of employees working in the economy (L) is "people aged 15 years and over in the reference period (7 days before the time of observation) with doing anything (not prohibited by law) for 1 hour or more to create goods or provide services for the purpose of generating income for themselves and their families including those who did not work during the study week but have a job and are still closely attached to that job (still being) paid/wage during non-working time or will definitely return to work after a period of time no more than 1 month".

The ratio of trained laborers working in the economy (H) is the ratio of the number of trained workers to the total number of employees working in the period. "The number of trained laborers working in the economy includes those who satisfy both of the following conditions:

Having been trained in a school or a professional, technical or professional training institution belonging to the national education system for 3 months or more, has graduated, is granted a degree/certificate certifying that he has attained a professional, technical, or professional level. certain services, including primary vocational training, intermediate vocational training, vocational college, professional secondary school, professional college, university and post-graduate (master, doctoral)" (Hanoi Statistical Office, 2018).

According to Griliches (1997), a worker's compensation is not only determined by his human capital; rather, but the relative salary of each individual also directly reflects his or her relative human capital. Although Mulligan and Sala-i-Martin (1997) utilize median earnings as weights in their measure of human capital creation for the states of the United States, this study does not use the same approach. because self-employment employs the lion's share of individuals in Vietnam. As a result of Tran Tho Dat and Do Tuyet Nhung's (2008) approach, the W variables in the above formula are calculated from the household's total income using data from the household living standard survey (VHLSS). The following assumptions are used in the calculation:

(i) In a household, the training gap between members of the labor force is usually not too large, and the average income of each member of the household who is engaged in the labor force. The amount of labor is calculated by dividing the total income of the household by the number of workers in the household. This assumption is necessary because VHLSS data do not allow to separate household income into individual member's income, especially for self-employed workers.

(ii) The income of a household is calculated as the sum of (1) income from wages, salaries of members, (2) income from rental of land and houses, (3) income from agricultural production, (4) income from farm services, (5) income from aquaculture and fishing, (6) income from hunting and exploitation of forest products, (7) income from income from non-agricultural production and business activities, and (8) income from pensions, social insurance, bank interest...

(iii) Since the VHLSS is surveyed every two years, income data are only available for 2012, 2014, 2016 (within the study series length 2011-2018), so the final assumption is 2012 income is used for the years 2011, 2012; 2014 income level is used for 2013, 2014 and 2015; 2016 income levels are used for 2016, 2017 and 2018.

Although the above assumptions may lead to certain limitations in ensuring the accuracy of the data, they are acceptable because the average income of employees calculated here is used only as a type of weight in the above equation.

Finally, similar to the physical capital variable, growth theory allows to hypothesize a positive relationship between Y and HL.

e) Other macroeconomic variables

The remaining variables in the model are derived from 63 provinces/cities' statistical yearbooks during the research period, including:

G is the total annual government spending in each province/city, also expressed in constant 2010 values. As discussed previously, the purpose of including this variable in the model is to improve efficiency control. Government policy (e.g. stimulus) can trigger a short-term economic response, particularly in a small-scale economy like Vietnam that is heavily reliant on the public sector. G is projected to have a beneficial effect on economic growth as a factor of aggregate demand.

FDI is a variable that indicates the provincial economy's openness, as measured by the FDI sector's share of the local gross regional domestic product (GRDP) (at 2010 constant prices). Generally, domestic economic openness contributes to technological advancement by facilitating the entry of imported techniques and advanced technology, as well as foreign management expertise, into the local economy. (2006) (Kukeli and collaborators; Lucas, 1988). As a result, this study can forecast a favorable association between provinces/cities' openness and economic growth.

Government intervention is quantified by the share of government spending in each province's gross domestic product (GDP) (in 2010 constant prices). Barro (1997) asserts that government intervention frequently results in market inefficiencies and stymies technical advancement. This assertion is also supported by the findings of Ng and Leung (2004), as well as Tran Tho Dat and Do Tuyet Nhung (2008).. AGR is the economic contribution of agricultural output, as assessed by the share of agricultural, forestry, and fishing sectors in provinces/cities' GRDP (at 2010 constant prices). Expansion of non-agricultural economic activity is a critical step in promoting economic growth in emerging countries. Localities that are heavily reliant on agricultural output have less options to boost productivity than those that are heavily reliant on industrial production (Ng and Leung, 2004). In other words, a decline in the agriculture sector's percentage of GDP is expected to boost economic growth.

3.3. Building a measure of the quality of local governance institutions at the provincial level

3.3.1. Proposing aspects and scales for measuring the quality of local governance institutions at the provincial level in Vietnam

Based on the World Bank and UNDP ideas, as well as the structure of the most widely used governance indicators globally (particularly the WGI and IQI), as stated in Chapter 1, and based on the analysis In Section 3.1, the backdrop of governance institutions in Vietnam is discussed. Table 3.1 summarizes the elements of the provincial-level local

governance institutional quality indicator for Vietnam.

As you can see in table 3.1, there are 6 mains aspects:

- Participation of the resident,
- Accountability,
- Transparency,
- Control Corruption,
- Policy Quality, and
- Government efficiency.

These will be evaluated and reflected in the table 3.1 as below:

Table 3.1. Aspects of the institutional quality of local governance at the provincial level

| No. in | Aspects | Reflected |
|--------|-------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Participation of the resident | The degree to which citizens participate in governmental administration, the quality of elections |
| 2 | Accountability | The interaction and response to the needs of the people of the local government |
| 3 | Transparency | The level of information disclosure by local authorities |
| 4 | Control corruption | Local government officials' perceptions of the extent to which they regulate corruption |
| 5 | Policy quality | The government's dynamism and inventiveness in enacting regulations and policies, thereby fostering an atmosphere favorable to business and the private sector in general. |
| 6 | Government efficiency | Public service quality: comprising public administrative procedures and supply of medical services, education, vocational training, courts, infrastructure provision, and security and order maintenance... |

Source: Author's recommendation

Using the published time series conditions and the scale's dependability, the component indexes of PAPI and PCI for the period 2011-2018 are used to construct a provincial-level institutional measure of local government in Vietnam. *Nota bene*, Table 3.1 omits characteristics of political stability (as defined in the WGI) and the rule of law (found in WGI and IQI). There is little variation in political stability between localities, and Vietnamese data do not permit this type of data collecting. Although the rule of law is mentioned in the PCI, the index of legal institutions only measures private enterprise trust in the province/court city's and judicial system, and thus can be viewed as a form of public service rather than demonstrating the legal system's effectiveness across all dimensions such as contract enforcement quality, property rights, police force, and ministry activities. legal apparatus, criminal risk...

3.3.2. Check the reliability of the scale

Prior to doing the factor analysis, it is necessary to undertake tests to determine the eligibility of the data for the method of factor analysis (Cronbach's Alpha) and the circumstances for conducting the factor analysis (KMO and Bartlett tests). Cronbach's Alpha coefficients for groupings of variables are shown in Table 3.2 by aspect. Cronbach's Alpha is considered acceptable at values greater than 0.6, as is customary. Cronbach's Alpha is less than 0.6 for only the variable group of public service provision in this case.

Table 3.2. Cronbach's Alpha test for the appropriateness of the data

| NO. | Aspect | Indicators of PAPI and PCI are measured | Cronbach's Alpha |
|-----|--------------------------------|---------------------------------------------------------------------------------------|------------------|
| 1 | Participation of the residents | PAPI11, PAPI12, PAPI13, PAPI14 | 0,626 |
| 2 | Accountability | PAPI3 | |
| 3 | Transparent | PAPI21, PAPI22, PAPI23 | 0,624 |
| 4 | Corruption control | PAPI41, PAPI42, PAPI43, PAPI44 | 0,819 |
| 5 | Policy quality | PCI2, PCI4, PCI5, PCI7 | 0,759 |
| 6 | Government efficiency | Public administrative procedures: PCI1 PAPI51, PAPI52, PAPI53, PAPI54 | 0,621 |
| | | Public service provision PCI3, PCI8, PCI9, PCI10 PAPI61, PAPI62, PAPI63, PAPI64 | 0,582 |

Source: Author's calculations

However, when the index PAPI61-64 is excluded, the Cronbach's Alpha of the variable group of public service provision reaches the required level of 0.684. This content should be taken into account in the subsequent factor analysis.

3.4. Building a comprehensive local governance institutional index

The algorithm calculates and normalizes these five factors to restore them to a ten-point scale in accordance with the manner proposed by VCCI & USAID (2018):

$$P_{it} = 9 \times \frac{(F_{it} - \text{Min}F_{it})}{\text{Max}F_{it} - \text{Min}F_{it}} + 1$$

In there:

P is the administrative institution variable value of the province/city after normalization

F is the factor score calculated by factor analysis

$\text{Min}F$ is the lowest factor score in the data series

$\text{Max}F$ is the highest factor score in the data series

i represents the province and t represents the year.

Using the weights of factors in explaining the variation of the set of values (based on the Rotation Sums of Squared Loadings normalized to sum to 1 according to Table 3.7), The Provincial Governance Index (PGI) is calculated using the following formula:

$$\text{PGI} = 0,255 \times \text{Democracy} + 0,208 \times \text{Corruption control} + 0,192 \times \text{Public service} + 0,190 \times \text{Policy} + 0,155 \times \text{Public administration}$$

4. Results and discussion

4.1. Descriptive statistical analysis

This study comprises 504 observations, which is sufficient for econometric analysis, using an array data approach that mixes cross-sectional data from 63 provinces/cities and time series data over an eight-year period. Table 4.1 contains descriptive statistics about the macroeconomic data utilized in this study, while Table 4.2 contains descriptive statistics following logarithmic transformations.

Table 4.2. Descriptive statistics of research data after taking logarithms

| Variable | Number of observations | Mean | Std. Dev. | Min | Max |
|--------------|------------------------|--------|-----------|--------|--------|
| <u>LnYL</u> | 567 | 10,653 | 0,607 | 9,498 | 13,273 |
| <u>LnKL</u> | 504 | 11,760 | 0,534 | 10,557 | 13,373 |
| <u>LnGL</u> | 504 | 9,528 | 0,383 | 8,489 | 10,842 |
| FDI | 504 | 0,101 | 0,148 | 0,000 | 0,683 |
| GOV | 504 | 0,374 | 0,230 | 0,035 | 1,376 |
| AGR | 504 | 0,234 | 0,124 | 0,006 | 0,583 |
| <u>LnDEM</u> | 500 | 1,555 | 0,388 | 0,000 | 2,303 |
| <u>LnCOR</u> | 500 | 1,703 | 0,339 | 0,000 | 2,303 |
| <u>LnSER</u> | 500 | 1,875 | 0,222 | 0,000 | 2,303 |
| <u>LnPOL</u> | 500 | 1,459 | 0,356 | 0,000 | 2,303 |
| <u>LnPUB</u> | 500 | 1,856 | 0,247 | 0,000 | 2,303 |

Note: As shown in Table 3.8, the series of governance indicators includes only 500 observations instead of 504 observations as expected.

Source: Author's calculations

Table 4.1. Descriptive statistics of macroeconomic variables of Vietnamese provinces/cities in the period 2011-2018

| Variable | Number of observations | Mean | Std. Dev. | Min | Max |
|----------|------------------------|--------|-----------|-------|--------|
| YL | 567 | 53999 | 59403 | 13330 | 581523 |
| KL | 504 | 149863 | 97873 | 38451 | 642695 |
| GL | 504 | 19149 | 8100 | 5491 | 55382 |
| FDI | 504 | 0,101 | 0,148 | 0,000 | 0,683 |
| GOV | 504 | 0,374 | 0,230 | 0,035 | 1,376 |
| AGR | 504 | 0,234 | 0,124 | 0,006 | 0,583 |

Note: Since Arellano and Bond's (1991) GMM estimation model has to use Lagged variable of YL, the effective average GRDP data is obtained for the period 2010-2018, whereby the total number of observations of YL is 567.

Source: Author's calculations

4.2. Correlation between income level and other variables in the research model

As illustrated in Figure 4.1 below, the series of effective per capita GRDPs bear little resemblance to the series of governance institutional indexes. While the PGI and public service index trendlines clearly indicate a positive linear association between income levels and institutions, the relationship between income and the remaining institutional indicators appears to be nonlinear. This link is almost non-existent, particularly for the index of public administrative procedures.

In contrast to governance indicators, several macroeconomic variables in Figure clearly demonstrate a linear relationship with income level. If the effective level of physical capital per worker, the effective level of budget expenditure per worker, and the share of the foreign-invested sector in GRDP all have a positive linear relationship, then the ratio of budget expenditure to GRDP and the share of agriculture in GRDP are inversely linear with GRDP per effective worker.

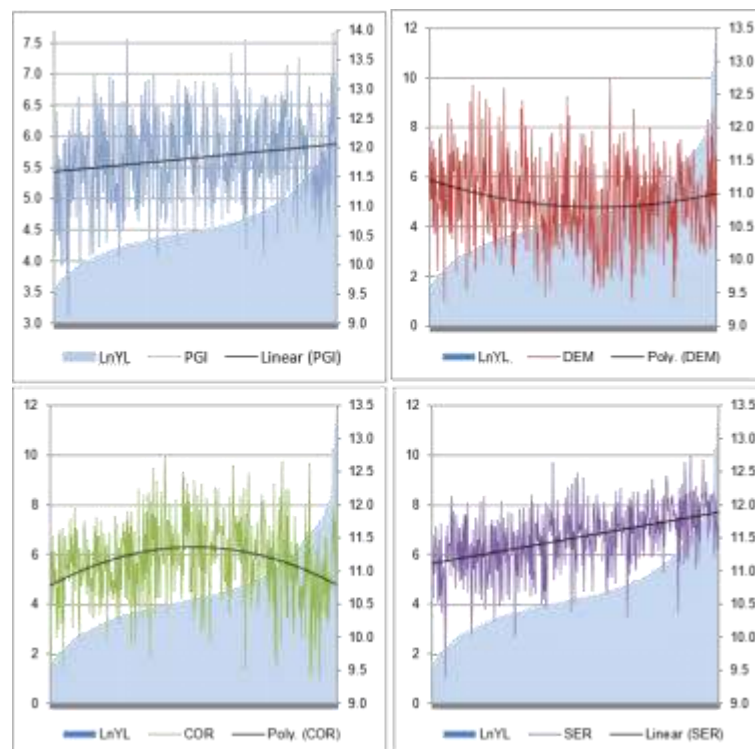


Figure 4.1. Income levels and governance indicators of Vietnamese provinces/cities in the period 2011-2018

4.3. Testing the causal relationship between governance institutions and local economic growth at the provincial level in Vietnam

As discussing, because the Granger test requires a sufficiently long time series, this analysis can only examine the causal relationship between governance institutions and provincial economic growth in Vietnam using the component indices of PCI. This is permissible because the PGI's two component indexes are constructed using the factor analysis approach, which covers up to eight components of the PCI. Section 4.2's findings serve as a guidance for future research on the relationship between the quality of governance institutions and economic growth.

This test was conducted using the GRDP data series and the eight PCI sub-indices for the period 2006-2018, as detailed in Chapter 2. The results indicate that:

- Both the stationarity and co-integration tests performed well
- In general, when the test model takes the variable with a delay of one to two periods, the Y (GRDP) and PCI indexes exhibit an association, as detailed in Table 4.3 below.

Table 4.3. Results of testing the causal relationship between GRDP and PCI

| | Z-bar | Z-bar tilde | Conclusion | Note |
|---------------|---------------------|---------------------|------------|-------|
| lnPCI2 à lnY | 1,5584 (0,1191) | -0,9277 (0,3536) | No impact | lag=2 |
| lnY à lnPCI2 | 11,4481 (0,0000) | 2,8789 (0,0040) | Impact | lag=2 |
| lnPCI3 à lnY | 4,3314 (0,0000) | 0,1396 (0,8889) | Impact | lag=2 |
| lnY à lnPCI3 | 17,234 (0,0000) | 9,6109 (0,0000) | Impact | lag=1 |
| lnPCI4 à lnY | 5,9307 (0,0000) | 2,6607 (0,0078) | Impact | lag=1 |
| lnY à lnPCI4 | 13,0162 (0,0000) | 7,0175 (0,0000) | Impact | lag=1 |
| lnPCI5 à lnY | 10,5827 (0,0000) | 5,5211 (0,0000) | Impact | lag=1 |
| | Z-bar | Z-bar tilde | Conclusion | Note |
| lnY à lnPCI5 | 9,1614 (0,0000) | 4,6472 (0,0000) | Impact | lag=1 |
| lnPCI7 à lnY | 6,1887 (0,0000) | 0,8545 (0,3928) | Impact | lag=2 |
| lnY à lnPCI7 | 10,8159 (0,0000) | 5,6645 (0,0000) | Impact | lag=1 |
| lnPCI8 à lnY | 6,1972 (0,0000) | 2,8246 (0,0047) | Impact | lag=1 |
| lnY à lnPCI8 | 15,9074 (0,0000) | 8,7952 (0,0000) | Impact | lag=1 |
| lnPCI9 à lnY | 9,7875 (0,0000) | 5,0322 (0,0000) | Impact | lag=1 |
| lnY à lnPCI9 | 29,3593 (0,0000) | 17,0667 (0,0000) | Impact | lag=1 |
| lnPCI10 à lnY | 4,5567 | 0,2263 | Impact | lag=2 |

| | | | | |
|---------------|----------|----------|--------|-------|
| | (0,0000) | (0,8209) | | |
| lnY à lnPCI10 | 18,9669 | 10,6765 | Impact | lag=1 |
| | (0,0000) | (0,0000) | | |

Note: The number in brackets is the p-value.

Source: Author's calculations

By comparing Table 4.3 to the findings of Wilson (2016), it is clear that there are some distinctions between Vietnam's and China's local economic growth. It appears that the growth effect of other factors (particularly capital) in China entirely outweighs the growth effect of institutions, implying that the direction of the institution's impact on growth is completely irrelevant. While the impact direction from growth to institutions is statistically significant and has a positive sign, the impact direction from growth to institutions is not statistically significant. In comparison, all other indicators, with the exception of PCI2, have at least one statistical indicator that has a bidirectional effect on GRDP. This conclusion, however, should be interpreted cautiously due to the disparity in institutional metrics between the two research.

4.4. Regression results on the influence of governance institution quality on local economic growth at the provincial level in Vietnam

When measuring the impact of institutions on economic growth, this estimation method can assist in resolving the endogeneity problem (Arellano and Bond, 1991). This method is also well-suited for analyzing local array data at the provincial level in Vietnam, where the number of time units (years) is frequently many times fewer than the number of spatial units (63 provinces/cities).

However, as shown in Table 4.4, the lagged variable of GRDP is not statistically significant. Additionally, the STATA statistical software warns that the findings of the two-step regression are skewed (gmm two-step standard errors are biased).

This necessitates adjusting the method by estimating dynamic array data with endogenous variable declarations; the instrumental variable is then the lagged variable of the dependent variable and the institutional variables developed in Chapter 3, as well as the difference of the remaining independent variables. This time, the results indicate that the macroeconomic variables (lagged variable of effective GRDP per worker, effective capital per worker, ratio of government spending to GRDP, share of agriculture in GRDP, and share of FDI sector in GRDP) are statistically significant, and the sign of the coefficient is consistent with the growth theory (as analyzed in section 2.4.2). The results in Table 4.4 demonstrate that the GMM regression method is appropriate when endogenous variables are present.

Only three of the institutional variables, corruption control, public service, and policy quality, are statistically significant, however the coefficient for public service is negative. The variables democracy and public administrative procedures do not have significant coefficients.

Table 4.4. Influence of Institutional aspects on economic growth

| | Two stage of GMM regression (1) | GMM regression with Endogenous variable (2) |
|-------------------------|---------------------------------|---------------------------------------------|
| Lagged variable of LnYL | 0,0193 (0,0325) | 0,1810*** (0,0310) |
| lnKL | 0,5650*** (0,0275) | 0,4240*** (0,0244) |
| lnGL | 0,2050*** (0,0242) | 0,2520*** (0,0218) |
| GOV | -0,4560*** (0,0672) | -0,4830*** (0,0528) |

| | | |
|---------------------------------------|------------------------|-----------------------|
| AGR | -0,4880*** (0,1450) | -0,3220** (0,1310) |
| FDI | 0,4660*** (0,0813) | 0,3800*** (0,0796) |
| lnDEM | 0,0019 (0,0034) | -0,0038 (0,0080) |
| lnCOR | 0,0033 (0,0044) | 0,0171* (0,0101) |
| lnSER | -0,0277*** (0,0064) | -0,0406** (0,0171) |
| lnPOL | 0,0235*** (0,0036) | 0,0345*** (0,0080) |
| lnPUB | -0,0169*** (0,0036) | -0,0200 (0,0122) |
| Intercept | 2,1680*** (0,3280) | 1,6190*** (0,2880) |
| Adjusted number of observations | 435 | 435 |

Note: The number in brackets is the standard error; * p -value < 0.10, ** p -value < 0.05, *** p -value < 0.01

Source: Author's calculations

Regression results after adjusting the model

Among the five institutional variables, the results in Table 4.4 indicate that the variable pertaining to public administrative procedures has a negligible effect on the provinces'/cities' economic growth. Returning to Chapter 3, we observe two issues:

- Public administrative procedures and public services are both representative variables of local government effectiveness;
- The disparity in public administrative procedure scores between localities is quite small in comparison to other institutional indicators.

These data suggest that it is possible to eliminate the public administrative procedure variable from the research model while maintaining a reasonably complete collection of institutional characteristics. As a result, the study model maintains four institutional variables: democracy (aspects of citizen engagement, openness, and accountability), corruption control, policy quality, and service quality (representing the efficiency aspect of government).

Additionally, the democracy and public service variables in model (2) of Table 4.5 have coefficients that are not statistically significant or have a negative sign, implying a nonlinear link between these institutional characteristics and growth. Additionally, given the Mekong Delta's low democracy level and the region's biggest agricultural contribution in GRDP, the AGR variable is deleted from the model to lessen the connection between the variations. mechanism and economic structural parameter variables.

The ultimate result is the model in Table 4.5, in which, with the exception of the democracy and corruption control coefficients, which are statistically significant at the 10% level, all the remaining coefficients are statistically significant at the 1% level.

4.5. The impact of the quality of governance institutions by six economic regions

Vietnam is organized into six economic zones at the moment, as mentioned in Chapter 3. When we include a dummy variable representing the economic region component (with values ranging from 1 to 6), the findings indicate that this variable is statistically significant and has a significant effect on economic growth. Time also plays a role in understanding the disparity in development between regions and cities. It is worth noting that the economic zone factor has no effect on the coefficients of other variables; rather, it influences the standard error and cancels out the value of the intercept coefficient. The study in Chapter 3 demonstrates that the quality of governance institutions varies significantly among the six economic areas, but the addition of dummy variables does not allow us to determine whether the quality of governance institutions has a discernible effect on growth. To address this topic, we estimate the model for each region, obtaining 12 regression equations for six economic regions (detailed results are presented in Appendix 19 and 20). It is clear that the reduction in the number of observations has a substantial effect on the estimation findings, as evidenced by the fact that the PGI remains positive but is no longer statistically significant in five economic regions. PGI is statistically significant but has a negative coefficient in the Southeast, indicating that this region's growth momentum appears to be totally determined by other causes rather than improved governance. Numerous institutional coefficients are also non-significant in each location while considering each institutional element. When just the significant coefficients are retained and the model is slightly changed (by deleting or adding squared institutional variables), the results in Table 4.5 paint a significantly different picture of the effect of institutional capacity on development across economic areas.

Only policy quality has a statistically significant effect on economic growth in the Red River Delta. This is a beneficial effect, but it is less significant than the national average (compared to the coefficient of $\ln\text{POL}$). Chapter 3 analysis reveals that this sector's policy quality ranks fourth among six economic areas. Even on average between 2011 and 2018, Hanoi scored last in national rankings for policy quality. As such, the Red River Delta region still has a great deal of work to do to strengthen its institutional foundation, which is beneficial because it will contribute to the region's economic progress.

When two statistically significant metrics, democracy and public services, are used, the Northern Midlands and Mountains region has a greater influence of the quality of government institutions on economic growth. If the impact of public services on growth in this region is comparable to the national average (a U-shaped curve with a bottom point of 6.2), democracy has a positive and linear effect on growth. These two institutional characteristics of the Northern Midlands and Mountains are ranked third and fourth among six economic regions, respectively, indicating that this region still has a great deal of incentive to improve governance institutions, particularly in the areas of democracy and public services, in order to promote economic growth.

For the North Central and Central Coast regions, regression results indicate only a statistically meaningful institutional index of democracy. This institutional dimension's association with income levels is as nonlinear as the regression model for 63 provinces/cities, with the bottom of the U at approximately 4.3 democracy points. As the North Central and Central Coast areas currently have an average democracy score of 5.44, we can likewise predict that an increase in the democracy index will have a beneficial effect on the country's economic growth in this region.

While the Central Highlands and Southeast areas have two to three statistically significant institutional indicators, the signs of several coefficients appear to deviate from predictions. In the Central Highlands, democracy has an inverted U effect on incomes, while corruption control and the quality of public services have a linear but negative effect on economic growth in the Southeast. However, the number of observations in these two regions is insufficient, and the non-statistically significant coefficient of the lagged variable $\ln\text{YL}$ indicates that the preceding results are unreliable.

Table 4.5. The influence of governance institution quality aspects on economic growth in each economic region

| | Red River Delta | Northern midland and mountainous | North Central and middle Coast | Central Highland | Southeast | Mekong River Delta |
|-------------------------|------------------------|----------------------------------|--------------------------------|------------------------|------------------------|------------------------|
| Lagged variable of LnYL | 0,1840*** (0,0558) | 0,1810*** (0,0407) | 0,2150*** (0,0355) | 0,0324 (0,0861) | -0,0208 (0,0711) | 0,1750*** (0,0492) |
| lnKL | 0,2870*** (0,0576) | 0,2620*** (0,0507) | 0,0732** (0,0287) | 0,3510*** (0,1150) | 0,5180*** (0,0614) | 0,1640*** (0,0351) |
| lnGL | 0,4340*** (0,0588) | 0,4750*** (0,0496) | 0,7330*** (0,0418) | 0,3300** (0,1290) | 0,2410*** (0,0696) | 0,5600*** (0,0530) |
| GOV | -1,6800*** (0,2180) | -0,7180*** (0,0748) | -1,3580*** (0,0887) | -0,5370* (0,2760) | -3,5640*** (0,6510) | -1,9700*** (0,2020) |
| FDI | 0,4380*** (0,1450) | 0,2300** (0,1050) | | | 2,0080*** (0,3900) | |
| lnDEM | | 0,0220* (0,0118) | -0,0693** (0,0278) | 0,5670*** (0,1790) | | |
| lnDEM square | | | 0,0238** (0,0114) | -0,1920*** (0,0616) | | |
| lnCOR | | | | | -0,0533*** (0,0180) | |
| lnSER | | -0,1500** (0,0654) | | -0,9830*** (0,2620) | -0,1250*** (0,0474) | -0,3260* (0,1900) |
| lnSER square | | 0,0410** (0,0209) | | 0,3090*** (0,0807) | | 0,1000* (0,0542) |
| lnPOL | 0,0366*** (0,0136) | | | | -0,3750** (0,1490) | -0,2740* (0,1450) |
| lnPOL square | | | | | 0,1210** (0,0505) | 0,0887** (0,0429) |
| Intercept | 1,6720*** (0,2730) | 1,3380*** (0,3980) | 0,9880*** (0,2060) | 3,5460*** (0,8190) | 3,6950*** (0,5680) | 2,6540*** (0,2990) |
| Numbers of observations | 76 | 96 | 98 | 35 | 42 | 88 |

Finally, for the Mekong Delta region, the regression results indicate the existence of two statistically relevant institutional indicators: public service and policy quality. As with the national regression, the link between public service and effective income per worker is nonlinear in this sector.

4.6. The impact of governance institution quality by key and non-key economic provinces

The regressions are constructed in the same manner as in Section 4.5 for each group of 24 provinces/cities in key economic regions and the remaining 39 provinces. Using factors with statistically significant coefficients, we obtain the results in Table 4.6.

Table 4.6. The influence of institutional aspects of governance on economic growth in key and non-key economic groups

| | Group of provinces in key economic regions | Group of provinces not in key economic regions |
|-------------------------|--------------------------------------------|------------------------------------------------|
| Lagged variable of LnYL | 0,1280*** (0,0404) | 0,1720*** (0,0367) |
| lnKL | 0,5390*** (0,0385) | 0,3760*** (0,0287) |
| lnGL | 0,2050*** (0,0324) | 0,3610*** (0,0305) |
| GOV | -0,7530*** (0,1220) | -0,6290*** (0,0573) |

| | | |
|---------------------------------|-----------------------|-----------------------|
| FDI | 0,5530*** (0,1790) | 0,2830*** (0,0903) |
| lnDEM | -0,1370** (0,0539) | |
| lnDEM square | 0,04870** (0,0192) | |
| lnCOR | | -0,2210** (0,0923) |
| lnCOR square | | 0,0566** (0,0285) |
| lnPOL | | 0,0205** (0,0098) |
| Intercept | 1,4140*** (0,2580) | 1,2890*** (0,1980) |
| Adjusted number of observations | 167 | 268 |

Note: The number in brackets is the standard error; * p -value < 0.10, ** p -value < 0.05, *** p -value < 0.01

Source: Author's calculations

Democracy is the only institutional variable that is statistically significant for the group of provinces/cities in key economic zones, and the association between democracy and income levels is identical to that found in the national regression (according to U-shaped, with a base of 4.1). The study in Chapter 3 reveals that while the important provincial group's democracy score is lower than that of the remaining 39 places, the average score is still 4.97 points greater than the letter U's bottom criterion. Ownership is what this group of provinces/cities must demonstrate in the coming term in order to foster economic progress.

Two measures, namely corruption control and policy quality, are statistically significant in the regression for provinces that do not belong to key economic regions. If policy quality stays linearly positively connected with income levels (as in the 63-province regression), accounting for corruption now results in a U-shaped nonlinear relationship between average labor GRDP effective action and average labor GRDP effective action. Similarly to the preceding, we may conclude that corruption control and policy quality have a favorable effect on long-term economic growth in this set of 39 provinces. Given that the group of non-core provinces scores lower on both of these institutional aspects than the focus group (although the difference in the corruption control index is not significant), enhancing corruption control is critical. These 39 municipalities must pay special attention to corruption and policy quality.

4.7. The impact of governance institution quality by income groups

When 63 provinces and cities are divided by income level (as described in Section 3.3.5) and regressions are run for each group, the findings likewise indicate that the coefficients of the PGI and several component indexes are not statistically significant Table 4.7 shows the final result when only variables with sufficient statistical significance coefficients are retained.

The calculated results indicate that the coefficients of corruption control and public services are statistically significant for the group of provinces with a high income level. While income levels remain favorably connected with corruption control, public services now have an inverse U-shaped association with GRDP per effective worker. This result contradicts the national estimate and deviates from the study's expectations. In Chapter 3, we intuitively concluded that public service is the most strongly correlated institutional variable with the level of local economic development; at the same time, the group of provinces with high income has raised the average public service score to 7.14, significantly higher than the other two groups. Thus, for the group of high-income provinces, public services are no longer a necessary institutional component. The similar conclusion was reached by Nguyen Viet Cuong and colleagues in their study (2021):

when governance institutions (particularly the quality of public services) improve, low-income provinces are likely to profit more than high-income provinces. Therefore, rather than continuing to invest in increasing the quality of public services, high-income local governments should focus their efforts on combating corruption in order to spur economic growth. Additionally, it should be highlighted that the group of high-income provinces/cities has a much worse corruption control score than the other two categories from 2011 to 2018.

Table 4.7. The influence of governance institutional aspects on economic growth by income groups

| | Group of provinces with high income | Group of provinces with middle income | Group of provinces with low income |
|---------------------------------|-------------------------------------|---------------------------------------|------------------------------------|
| Lagged variable of LnYL | 0,138*** (0,0419) | 0,252*** (0,0382) | 0,147*** (0,0418) |
| lnKL | 0,567*** (0,0457) | 0,131*** (0,0290) | 0,372*** (0,0328) |
| lnGL | 0,207*** (0,0424) | 0,541*** (0,0361) | 0,361*** (0,0385) |
| GOV | -0,892*** (0,1710) | -1,313*** (0,1070) | -0,593*** (0,0674) |
| FDI | 0,161* (0,0918) | | |
| lnDEM | | -0,0640** (0,0279) | 0,0252** (0,0112) |
| lnDEM square | | 0,0199* (0,0114) | |
| lnCOR | 0,0219* (0,0115) | | |
| lnSER | 0,892*** (0,2630) | | -0,226*** (0,0777) |
| lnSER square | -0,260*** (0,0737) | | 0,0682*** (0,0251) |
| lnPOL | | 0,0186* (0,0110) | |
| Intercept | | 1,766*** (0,2200) | 1,482*** (0,3390) |
| Adjusted number of observations | 139 | 149 | 147 |

Note: The number in brackets is the standard error; * p -value < 0.10, ** p -value < 0.05, *** p -value < 0.01

Source: Author's calculations

The regression results for the set of provinces with average income produce two statistically significant variables, democracy and policy quality, which have the same association with income level as the national regression. On the one hand, this group of provinces has the lowest democracy score in the table; on the other hand, despite being superior to the other two groups, the quality of policy remains low (5.08 points). As a result, provinces in the middle income bracket are more likely to strengthen these institutional pillars, providing a boost to economic growth.

Regression using low-income provinces reveals a positive linear link between democracy and income level, but a U-shaped relationship between public services and income level. Although the results in Table 4.8 are somewhat different from those in the national regression, individuals more clearly demonstrate the beneficial effect of these institutional factors on the economic growth of low-income localities, particularly in light of the group's significantly lower public service factor than the other two groups and a relatively low democracy score (5.3 points).

4.8. The impact of the quality of governance institutions on the level of budget expenditure

Le Quang Canh and Do Tuyet Nhung (2018) include an interacting variable of effective average labor expense with PGI to the regression model in Table 4.7. Additionally, we can run separate regressions for each institutional dimension and incorporate the interaction variable of effective per capita budgetary expenditure with the component institutional indices. Table 4.8 presents the estimated outcomes.

According to this finding, the interaction coefficient between institutions and budget expenditure is statistically significant in four out of five regression models. This variable exhibits a negative sign in the regression with the institutional variables PGI, corruption control, and policy quality, implying that the impact of institutions on growth will be greater in provinces with low budget expenditures than in places with higher budget expenditures. In other words, the more a province/city spends, the less institutional influence (positive) on growth there is.

Additionally, it should be emphasized that locales with a high effective per capita budget spending may not necessarily have a high effective per capita GRDP, as they may be provinces/cities that rely heavily on natural resources. Spending by the government to sustain economic growth. For example, when 63 provinces/cities are divided into three categories based on their effective average labor expense, provinces in the Red River Delta and the Southeast account for only 26% of the group with the highest average cost. Budget expenditure is substantial, despite the fact that these two areas account for 70% of high-income provinces/cities.

Table 4.8. The influence of the interaction variable between the level of budget expenditure and the institutional aspects of governance on economic growth

| Institutional variables | lnPGI | lnDEM | lnCOR | lnSER | lnPOL |
|--------------------------------------|------------------------|------------------------|------------------------|------------------------|------------------------|
| Lagged variable of LnYL | 0,1060*** (0,0311) | 0,0870*** (0,0306) | 0,1140*** (0,0325) | 0,0634** (0,0317) | 0,1600*** (0,0326) |
| lnKL | 0,5710*** (0,0277) | 0,4320*** (0,0250) | 0,5560*** (0,0272) | 0,4820*** (0,0252) | 0,5490*** (0,0276) |
| lnGL | 0,3800*** (0,0550) | 0,1530*** (0,0495) | 0,3520*** (0,0574) | 0,1770*** (0,0498) | 0,3190*** (0,0622) |
| GOV | -0,3870*** (0,0511) | -0,6160*** (0,0475) | -0,3980*** (0,0508) | -0,5670*** (0,0498) | -0,4060*** (0,0497) |
| FDI | 0,4750*** (0,0817) | 0,5170*** (0,0802) | 0,4600*** (0,0824) | 0,4670*** (0,0773) | |
| Ln(Institutional variables) | 0,2430*** (0,0610) | -0,1910*** (0,0549) | 0,1540** (0,0608) | -0,1260 (0,0787) | 0,1410** (0,0627) |
| Ln(Institutional variables) square | | 0,0317*** (0,0103) | | 0,0048 (0,0208) | |
| Ln(Institutional variables * Chi NS) | -0,1910*** (0,0562) | 0,1190** (0,0480) | -0,156*** (0,0590) | 0,0828 (0,0507) | -0,1230* (0,0640) |
| Intercept | 1,0860*** (0,2570) | 2,2610*** (0,2340) | 1,210*** (0,2710) | 2,0700*** (0,2830) | 0,8210*** (0,2600) |
| Adjusted number of observations | 435 | 435 | 435 | 435 | 435 |

Note: The number in brackets is the standard error; * p-value < 0.10, ** p-value < 0.05, *** p-value < 0.01

Source: Author's calculations

As a result of the data in Table 4.8, it is clear that in areas where the economy is less reliant on government spending, the local administrative machinery is frequently less onerous. Furthermore, economic governance and governance are frequently superior, promoting private sector investment and so increasing the institution's (positive) impact on growth relative to the provinces that rely significantly on it, particularly on budget spending (and entails a more complex administrative apparatus). Together with the GOV coefficient (the ratio of budget expenditure to GDP), which is always negative and statistically significant in all of the Chapter 4 estimates, the results of the interaction coefficient in Table 4.11 increase the likelihood that government spending on growth, including budget spending on development investment and budget spending on local government bureaucracy, is ineffective

5. Conclusion

According to the World Bank (2019), Vietnam improved the quality of its governance institutions significantly between 2011 and 2018. In 2018, Vietnam scored quite well on the six WGI criteria, including state effectiveness, political stability, and the rule of law, on par with high-middle-income nations. However, the level of corruption regulation and control remains low, particularly the voice of the people and accountability index, which are ranked 185th out of 214 countries and territories on the list ratings.

At the local level, the provincial governance index (PGI), which was constructed using the factor analysis method from the group of component indexes of PAPI and PCI, demonstrates that similar difficulties exist. On the one hand, local government efficacy, as measured by the quality of public services and administrative procedures, appears to be most valued in institutional terms, with an average score of greater than 6.5 on a 10-point scale. On the other side, policy quality and democracy (including citizen engagement, openness, and accountability) have an extremely low average score of 4.6 and 5.1 points, respectively. Corruption control, with an average score of roughly 5.8 points, is between these two extremes. Local governance institutions have generally improved, with the national average PGI growing by 0.4 point over the study period. However, it is obvious that the shifting tendencies in institutional features vary considerably over time and by region.

On the one hand, the quality of public service delivery and administrative procedures greatly increased between 2011 and 2018. This good improvement demonstrates the local government's commitment to assisting enterprises and citizens in achieving a more favorable business climate and a more service-oriented public administration. Additionally, the Chapter 3 analysis results indicate an upward trend in the effectiveness of corruption control. It appears as though recent anti-corruption initiatives at the federal and municipal levels have improved people's perceptions of this institutional component. Nonetheless, the average score on the corruption control index (about 5.8), as well as the declaration by CECODES and partners (2019) that the proportion of individuals concerned about corruption remains high, demonstrate that localities continue to be concerned about corruption. There is still a great deal of work to be done to enhance the effectiveness of anti-corruption efforts. On the other hand, the reform of the remaining facets of governance demonstrates that citizens expect the government to prioritize citizen involvement, openness, and accountability. Clearly, the democracy index is a source of concern, with a decreasing trend from 2011 to 2018. On the business side, a below-average policy quality score indicates a pressing need to strengthen this institutional component. Local governments will need to be more proactive, spend less time on inspection and inspection activities, cut unofficial costs, and strengthen regulations on land for production and business.

When examining the causal relationship between the quality of governance institutions and economic growth, it is possible to assess the unique influence of governance institution quality on economic growth and the development gap across countries. Chapter 4 draws the following conclusions for Vietnam provinces/cities from 2011 to 2018:

Firstly, it is possible to establish a causal relationship between the quality of governance institutions and effective income per worker. In other words, in a growth model, the quality of governing institutions is an endogenous variable.

Secondly, using Arellano and Bond's (1991) GMM estimation method for dynamic array data with endogenous variables, this study demonstrates that the quality of governance institutions contributes positively to the economic growth of companies, provinces, and cities over time, while also helping to partially explain the income disparity between localities. Notably, the results acquired through this study approach may be assured to be more accurate and reasonable than those obtained through prior studies, which frequently used estimate methods using fixed effects models such as Nguyen's. The model developed by Viet Cuong and colleagues (2021) or the GMM model does not account for endogenous factors such as Le Quang Canh and Do Tuyet Nhung (2018).

Thirdly, the influence of governance institutions' quality on effective per capita income differs according on institutional feature; for example, corruption control and policy quality have a positive linear relationship. while democracy and public policy have a U-shaped association with income level, the bottom point of the U is much lower than the average local score. Only one feature of public administrative procedures has no effect on provinces/cities' economic growth. It is straightforward to calculate that a 10% rise in the index leads in an increase of 0.21 and 0.26 percent of the effective average GRDP, respectively (with all other factors constant). With regard to the two variables of democracy and public service, after they pass through the letter U's bottom point (4.4 and 5.8 index points, respectively), the higher the index score, the greater the influence of institutional quality development on income levels.

Fourthly, the test results indicate that the growth effect of institutional quality differs by economic location. With the exception of the Central Highlands and Southeast area (because to the uncertainty associated with the quantity of observations), the quality of policy appears to effect solely the Red River and Mekong River deltas. The Northern Midlands and Mountainous Areas, the North Central Coast, and the Central Coast have all benefited from democracy. In the Northern Midlands and Mountainous Areas, as well as the Mekong River Delta, public services continue to have a U-shaped nonlinear relationship with income levels. In the regression for four economic zones, the corruption control index alone is not statistically significant

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DEBT, GROWTH OPPORTUNITY AND INVESTMENT OF VIETNAM LISTED COMPANIES

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ABSTRACT

This study examines the simultaneous relationship between debt and debt maturity structure of firms with different growth opportunities. In addition, we analyze the effects of these relationships on the investment activities of firms listed on the Vietnamese market in the period 2010-2020. Using the 3SLS regression model to control for endogeneity due to the simultaneity of debt and debt maturity structure, the results show a negative relationship between the two factors above, supporting the underinvestment hypothesis. However, when firms have higher growth opportunities, the relationship between the two factors turns positive, supporting the hypothesis of liquidity risk. The results of using the System GMM model to examine the impact of debt, debt maturity, and growth opportunities on investment further confirm the above findings. These findings have important implications for managers in making investment decisions.

Keywords: debt maturity structure, debt, underinvestment.

1. Introduction

Businesses improve their manufacturing capacity and remain competitive by investing (Phan, 2018). According to Xu (2000), investment is a critical path for promoting financial development, which has an impact on economic growth. A firm's finance and investment decisions are independent in a perfect market (Modigliani and Miller, 1958). Because markets are imperfect, transaction costs exist, and information asymmetry exists, capital structure has a significant impact on enterprises' investment activities (Aivazian et al., 2005a). Several studies have pointed to debt and debt maturity structure as important mechanisms influencing investment. Dang (2011) argues that the heavy use of debt creates a disciplinary mechanism that helps to reduce the problem of overinvestment (unnecessary and inefficient investment). Flynn (2017) argues that debt maturity structure plays an important role in the ability of enterprises to access financial resources, thereby affecting their ability to invest.

Previous research has primarily focused on the impact of debt on investment (Lang, Ofek, and Stulz, 1996; Aivazian et al., 2005a; Dang, 2011), with little attention paid to the concurrency relationship between debt, debt maturity structure, and corporate investment (Lang, Ofek, and Stulz, 1996; Aivazian et al., 2005). Furthermore, as compared to research undertaken in rich nations, empirical studies in emerging countries are sparse (Aivazian et al., 2005a; Dang, 2011). Meanwhile, the market in poorer nations remains small, and firms continue to confront significant challenges in obtaining long-term capital.

For the following reasons, this study aims to analyze listed firms in Vietnam to discover about the influence of debt and loan maturity on corporate investment. First, Vietnam has a rapidly growing economy. Despite the negative impacts of the Covid-19 epidemic, Vietnam still recorded an estimated GDP growth rate of 2.91% in 2020, among the highest in the world. Besides, the rapid increase in population size also opens up investment opportunities. Vietnam's population reached 96.5 million in 2019 and is expected to grow to 120 million by 2050 (World Bank, 2021). Second, capital from banks is still the main source of financing for investment by enterprises (Vo, 2018; Phan, 2018). The size of the domestic bond and equity market is still quite low compared to other countries in the region such as Thailand and Indonesia (Lap Luu and Liem Nguyen, 2021). Survey of businesses found that 91% of loans required collateral, 10% higher than

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businesses in the East Asia and Pacific region. Furthermore, the collateral value of the loan is doubled (Phan, 2018). This limits the ability of businesses to access long-term capital. In fact, the majority of listed companies in Vietnam still use a high ratio of short-term debt, which can increase refinancing risks, affecting their ability to invest stably and grow in the long term. of enterprises (Phan, 2018).

Given the importance of bank debt as a source of capital in Vietnam, as well as the country's short loan maturity structure and high growth potential, the research that investigates the simultaneous influence of these variables on business investment is required. Is the company adjusting its capital structure and loan maturity structure to find a balance between decreasing refinancing risk, liquidity risk, and agency costs associated with underinvestment? How does the relationship between debt and debt maturity structure change when firms have the opportunity to grow rapidly? What is the impact of debt, debt maturity structure on investment, and does this impact change depending on the growth opportunity of the business? This study will reveal implications for capital management, corporate governance and investment. Furthermore, the study will also help test the validity of theories of overinvestment and underinvestment.

The second part of the paper presents discussion of previous studies. The third part builds research hypothesis, introduces data and quantitative methods. Section four presents the results of the study and section five summarizes and provides implications for stakeholders.

2. Theoretical framework

2.1. Theoretical framework

Myers (1977) develops the principal-agent model to explain the relationships between growth opportunities, leverage, and debt maturity. He showed that due to the agency cost of outstanding debt, the company with high-growth opportunities might ignore positive-NPV projects. The underinvestment problem arises because with risky debts, the payoff of such projects at least partially accrues to the debt-holders (i.e., the principal) rather than fully accruing to the shareholders and managers (i.e., the agent). The more valuable growth opportunities the company has, the greater the level of underinvestment (also known as "debt overhang" problem) it faces. These underinvestment incentives can be mitigated through a reduction in leverage and / or a shortening of the maturity structure of debt (Myers, 1977). Lowering leverage directly reduces the cost of risk "debt overhang", thereby enabling the realization of potential development opportunities. In addition, using short-term debt that expires before the investment project is implemented allows shareholders to obtain the full benefit from the new project through the renegotiation of the debt contracts, thus minimizing the underinvestment problem.

The liquidity risk hypothesis developed by Diamond (1991) has important implications for the interaction between the factors: growth, leverage and debt maturity. Liquidity risk may cause businesses to limit their choice of short-term debt maturity, however short-term debt is used to control the underinvestment problem. Due to the asymmetry information on investment, companies using short-term debt may not continue to roll over the outstanding debt contracts when their investment projects generate a negative NPV. Too much short-term debt creates serious liquidity risks, thus increasing bankruptcy costs and constraining the debt capacity (Childs et al., 2005). Therefore, the relationship between growth opportunities and debt maturity is determined by the trade-off between the reduction in the agency cost (underinvestment) or the increase in the cost of bankruptcy (liquidity risk).

2.2. Hypotheses

Many researches have looked at the relationship between debt and firm investment but the results have not been consistent with each other. Aivazian and Santor (2008), Umutlu (2010), Jiming et al. (2010), Bao (2010), Kannadhasan (2014), Phan (2018), Kalemli-Ozcan et al. (2018) and Gebauer et al. (2018) show that financial leverage has a reverse effect on investment. This is because debt increases the risk and financial cost of the business (Renneboog et al., 2008; Gebauer et al., 2018). In addition, debt is used as a tool to constrain the overinvestment problem and leads to a reverse relationship between debt and investment, especially for firms with low growth opportunities (Aivazian et al., 2005a). In contrast to the above studies, Bae (2009), John and Muthusamy (2011), Flynn (2017) and Luo et al (2018) suggested that financial

leverage increases investment in the future. Nnadi et al. (2020) noted that investment is inversely correlated with debt in Thai and Indonesian firms but the investment has positive correlation with debt in Singapore firms.

In the debt maturity structure, Aivazian et al. (2005b) suggested that the debt maturity structure negatively impacts on investment for companies with high growth opportunities but there is no evidence on the effect of debt maturity on investment for firms with low growth opportunities. In the Asia region, Khaw and Lee (2016) show that firms with low Tobin Q (low growth opportunity tend to use the maturity of debt to mitigate the underinvestment problem. In contrast, Dang (2011) shows that the debt term structure has no effect on the investment of firms in the UK. On the other hand, Phan (2018) analysis of listed companies in Vietnam shows that the debt maturity structure has a positive impact on investment for state-shareholding enterprises. Overall, enterprises tend to reduce their total debt to increase their investment but the long-term debt ratio does not have a significant effect on their investment.

In short, the results of the studies are not consistent. Moreover, most previous studies had considered the impact of debt, debt maturity structure on investment but they did not analyze the concurrent relationship between those factors and the impact of that relationship on firm investment.

The company's growth opportunities come from projects with positive NPV, but these projects may not be possible because of the under-investment problem. Myers (1977) has pointed out that firms can abandon projects which have positive NPV because creditors will hold part of the benefits of the project, leaving insufficient profits for shareholders. To solve this problem, Myers proposed to increase the level of short-term debt because short-term debt matures before the project is completed, so that the business can invest more. Many researches showed a positive relationship between growth opportunities and short-term debt (Dang, 2011). Dang (2011), Childs et al. (2005), Coad and Srhoj (2019) and Ding et al. (2020) agreed that the short-term debt strategy allows companies to take more growth opportunities, so this strategy leads to increased investment. As such we offer the following hypothesis:

Hypothesis 1. There is a positive relationship between growth opportunities and short-term debt.

Hypothesis 2. There is a negative relationship between short-term debt and firm investment.

According to Myers (1977), the Underinvestment problem can be solved by reducing leverage. Aivazian (2005a) argues that leverage has a negative relationship with investment and this effect is stronger for firms with low growth opportunities. Fatmasari (2011) finds a negative relationship between growth opportunities and a firm's debt. Joshi (2019) shows that high-growth firms hold a lot of cash, rather than debt to enable firms to grasp growth opportunities. However, low-growth firms tend to borrow more debt than hold cash. In agreement with previous studies, Nnadi et al (2020) also suggests that strong growth companies reduce leverage to reduce the problem of underinvestment. Based on the above theory and research, we expect that:

Hypothesis 3: Growth opportunities are negatively correlated with debt.

Hypothesis 4: Debt is negatively correlated with corporate investment.

One limitation of using short-term debt to address underinvestment is the increased risk of refinancing. These companies that not only pay off debts but also lack liquidity would face the risk of bankruptcy if they cannot refinance. It leads to urgent actions that devalue the business, such as firing employees, selling assets, and giving up potential investments which cause tremendous losses to the business (Liu, Qiu & Wang, 2020; Brunnermeier & Krishnamurthy, 2020). The refinance risk results in the shorter debt maturities, the less debt required, and vice versa (positive relationship). Meanwhile, the underinvestment hypothesis predicts a negative relationship between debt maturity structure and debt level. Since both opposing arguments exist, we formulate the following hypothesis:

Hypothesis 5. There is a relationship between short-term debt and leverage.

3. Research method

For corporate leverage

$$LEV_{i,t} = \alpha_0 + \delta LEV_{i,t-1} + \alpha_1 DEBTMAT_{i,t} + \alpha_2 GROW_{i,t} + \alpha_3 GROW \times DEBTMAT_{i,t} + \alpha_4 Size_{i,t} + \alpha_5 ROA_{i,t} + \alpha_6 Tang_{i,t} + \alpha_7 Depre_{i,t} + Ind_dum + \mu_{i,t} \quad (1)$$

For debt maturity

$$DEBTMAT_{i,t} = \alpha_0 + \delta DEBTMAT_{i,t-1} + \alpha_1 LEV_{i,t} + \alpha_2 GROW_{i,t} + \alpha_3 GROW \times LEV_{i,t} + \alpha_4 Size_{i,t} + \alpha_5 Cash_{i,t} + \alpha_6 Efftax_{i,t} + \alpha_7 Term_{i,t} + Ind_dum + \mu_{i,t} \quad (2)$$

For investment

$$Capex_{i,t} = \alpha_0 + \delta Capex_{i,t-1} + \alpha_1 LEV_{i,t-1} + \alpha_2 DEBTMAT_{i,t-1} + \alpha_4 GROW_{i,t-1} + \alpha_5 GROW \times LEV_{i,t-1} + \alpha_5 GROW \times DEBTMAT_{i,t-1} + \alpha_6 CF_{i,t-1} + \mu_{i,t} \quad (3)$$

The above models inherit from Nnadi et al (2020). The Lev represents financial leverage, which is measured by total debt divided by total assets. Debtmat is the average maturity of debt which is measured by the ratio of long-term debt (over a year) to total debt. Grow represents a growth opportunity, measured by the market-to-price ratio of the company's stock. Cash is the ratio between cash and assets. Tang is the ratio of net fixed assets to total assets. ROA is the return on assets. Depre represents a non-debt tax shield. Size represents the size of the business, as measured by the natural logarithm of total assets. Efftax is the effective tax rate, measured by income tax divided by income before tax. The term represents the term structure of interest rates, measured by the difference between 1-year and 10-year bond yields in Vietnam. Capex represents the investment of the business, measured by the ratio of capital expenditures to total assets. CF represents the cash flow of a business, measured as the ratio of cash flow from operations to total assets. Ind_dum are dummy variables representing the industry of businesses. μ is residual in the models.

Research method: For models (1) and (2), to control for the concurrency of two factors, debt level, and debt maturity, we use the 3SLS method. For model (3), we use the System GMM method to control for the possibility that the investment in the previous period is correlated with the investment in the current period, as well as to control for the endogenous phenomenon caused by the use of using dynamic models (Roodman, 2009; Nnadi et al., 2020).

4. Results and discussion

Table 1 summarizes the statistical results of all variables used in the model. The average value of leverage indicates that about 25% of assets are financed by debt. For debt maturity (long-term debt ratio), the average ratio in Vietnam shows that the level of using long-term debt is very low, compared to Dang (2011), Nnadi et al. (2020). This shows that Vietnamese firms are more inclined to use short-term debt than long-term debt. In terms of growth opportunities, the average figure is 1.12, which shows that Vietnamese enterprises have high growth opportunities and are positively evaluated by the market. Since Vietnam is a country with a fast economic growth rate and has the fourth-largest economy in Southeast Asia, along with abundant human resources, especially the proportion of highly qualified human resources is increasing, these have opened up many investment and growth opportunities for firms.

Table 1. Descriptive statistics

| Variables | SQS | Mean | Standard deviation | Min | Max |
|-----------|-------|--------|--------------------|--------|--------|
| leverage | 3,635 | 0.264 | 0.171 | 0.000 | 0.798 |
| debtmat | 3,635 | 0.281 | 0.311 | 0.000 | 1.000 |
| cash | 3,635 | 0.124 | 0.12435 | 0.000 | 0.883 |
| grow | 3,445 | 1.116 | 0.639 | 0.230 | 12.413 |
| tang | 3,635 | 0.263 | 0.220 | 0.000 | 0.966 |
| roa | 3,635 | 0.064 | 0.060 | 0.000 | 0.720 |
| depre | 3,635 | 0.032 | 0.032 | 0.000 | 0.236 |
| size | 3,635 | 27.797 | 1.453 | 23.692 | 33.677 |
| efftax | 3,635 | 0.209 | 0.128 | -0.500 | 1.000 |
| term | 3,635 | 0.017 | 0.008 | -0.010 | 0.025 |

Source: Calculated by the author from research data

The simultaneous impact of debt and debt maturity

Table 2 shows that debt maturity is negatively related to leverage, supporting the underinvestment theory and predicting that there is a significant impact between short-term debt and leverage. The negative coefficient of the debt maturity variable supports the hypothesis that short-term debt maturity reduces the negative impact of growth opportunities on leverage (substitution effect, Myers 1977). If to limit underinvestment, when the enterprise has reduced the debt maturity, there is no need to reduce debt. This is consistent with the substitution relationship of the two strategies. This result is consistent with Nnandi et al. (2020), in which debt maturity is negatively correlated with debt, which is a prediction of the underinvestment hypothesis.

The negative coefficient of the variable Grow shows that there is a negative relationship between growth opportunities and the change of leverage, consistent with Fatmasari (2011). Good growth opportunities come with high cash flow, so firms will prioritize using existing capital or cash flows generated from production and business activities to realize growth opportunities, rather than using leverage, as it is likely to cause the underinvestment problem (Nnadi et al., 2020).

However, the interaction of debt maturity and growth opportunities are positive and statistically significant, while the individual effect between debt maturity and growth opportunities on debt is inverse. This can be explained that when a business has growth opportunities but still increases its debt level, it will lead to sharply increase in risk. Therefore, if the business still increases short-term debt (ie, reduces debt maturity) to deal with the underinvestment problem, it will significantly increase the risk of bankruptcy. In this context, enterprises may prioritize dealing with refinancing and liquidity risks rather than restricting the underinvestment problem.

Table 2. 3SLS regression results – Dependent variable Lev

| Lev | Coefficient | Std. Err | P-value |
|---------------------|-------------|----------|---------|
| debtmat | -5.957 | 1.770 | 0.001 |
| cash | -0.164 | 0.144 | 0.254 |
| grow | -0.682 | 0.236 | 0.004 |
| debtmat*grow | 3.065 | 1.118 | 0.006 |
| tang | 0.915 | 0.327 | 0.005 |
| roa | -0.753 | 0.329 | 0.022 |
| depre | 1.016 | 0.615 | 0.098 |
| Size | 0.178 | 0.027 | 0.000 |
| ind_dummy | Yes | | |
| _cons | -2.687 | 0.391 | 0.000 |
| Observations | 3,445 | | |

Source: Calculated by the author from research data

The results of estimating factors affecting debt maturity using 3SLS regression are presented in Table 3. Debt and debt maturity are negatively correlated, implying that if the firm has financial leverage, it will reduce debt maturity. This result can be explained by the underinvestment theory as short-term debt and leverage act as strategic substitutes to mitigate the underinvestment problem (Myers, 1977). This result is also consistent with Table 2, in which firms that reduce debt maturities to resolve the underinvestment problem have less incentive to continue reducing debt.

The results show that growth opportunities are negatively correlated with debt maturity, consistent with Myers' (1977) hypothesis of underinvestment. In addition, Childs et al (2005), Coad & Srhoj (2019), and Ding et al (2020) provide empirical evidence that using short-term debt allows firms to take advantage of many growth opportunities and increase investment levels. However, this result is different from Stohs & Mauer (1996) and Elyasiani et al (2002).

The interaction term between debt maturity and financial leverage is positive and statistically significant. Growth opportunities come with risks and information asymmetry, so if a firm increases leverage, the risk may increase sharply. In this situation, firms will avoid increasing the use of short-term debt to avoid refinancing/liquidity risk. This result is also consistent with the positive coefficient of the interaction term between growth opportunities and debt maturity in Table 2.

In summary, in the relationship between debt and debt maturity, when considering the individual effects, firms adjust debt and debt maturity to be consistent with the underinvestment theory, but if combining growth opportunities, firms prioritize dealing with liquidity risks. This interactive result indicates the need for additional consideration of the firm's growth opportunities characteristics to be able to fully detect the impact of debt maturity on debt and vice versa.

Table 3. 3SLS regression result – Dependent variable debtmat

| debtmat | Coefficient | Std. Err | P-value |
|---------------------|--------------------|-----------------|----------------|
| lev | -1.424 | 0.268 | 0.000 |
| grow | -0.133 | 0.025 | 0.000 |
| lev*grow | 1.121 | 0.218 | 0.000 |
| size | 0.068 | 0.004 | 0.000 |
| cash | -0.173 | 0.043 | 0.000 |
| efftax | -0.073 | 0.036 | 0.040 |
| term | -0.621 | 0.596 | 0.297 |
| ind_dum | -0.306 | 0.163 | 0.060 |
| _cons | -0.954 | 0.108 | 0.000 |
| Observations | 3,445 | | |

Source: Calculated by the author from research data.

Factors affecting the investment activities of enterprises

Table 4 illustrates the results of the model of factors affecting investment. Hansen and AR(2) test results have p-value greater than 0.1, implying reliable estimates. In addition, the investment in the previous period has a positive coefficient and is statistically significant, showing that it is appropriate to use a dynamic model for panel data.

The coefficient of variable lev is negative and statistically significant at 1%, consistent with Myers (1977) theory that firms will reduce leverage to limit underinvestment. However, the variable debtmat is not statistically significant, showing that the structure of long or short debt maturities does not affect investment decisions of enterprises.

The interaction variable grow*lev has a positive coefficient and is statistically significant, showing that businesses with high growth opportunities and high debt use tend to increase investment. This can be explained that although enterprises understand that growth opportunities and borrowing both bring risks, they alone have the effect of reducing investment (consistent with the underinvestment hypothesis). However, if businesses have growth opportunities but increase debt, it shows that these businesses are confident with their investments.

Moreover, the interaction variable grow*debtmat has a positive coefficient, which means that firms with high growth opportunities and long debt maturities will increase investment. If we consider these two variables separately, it can have the opposite effect, reducing investment (according to underinvestment theory). However, when these two factors interact, the higher the growth opportunity, the higher the risk, so businesses need long-term capital to finance projects with high growth opportunities to invest with confidence. , because in the short term, the enterprise cannot pay off the loan principal and interest as well as

avoid the risk of refinancing. In this case, the long term structure of debt is the key to making investments in high growth opportunities.

Table 4. 2-stage System GMM regression model result

| capex | Coefficient | Std. Err | P-value |
|---------------------|--------------------|-----------------|----------------|
| capex(t-1) | 0.073 | 0.024 | 0.002 |
| lev | -0.111 | 0.032 | 0.001 |
| debtmat | 0.012 | 0.013 | 0.378 |
| cash | 0.055 | 0.016 | 0.001 |
| grow | -0.010 | 0.004 | 0.016 |
| grow*debtmat | 0.019 | 0.009 | 0.032 |
| grow*lev | 0.095 | 0.029 | 0.001 |
| cfopr | 0.030 | 0.014 | 0.036 |
| ind_dum | 0.007 | 0.006 | 0.251 |
| _cons | 0.033 | 0.007 | 0.000 |
| AR(2) test p-value | 0.603 | | |
| Hansen test p-value | 0.425 | | |
| Observations | 2,556 | | |

Source: Calculated by the author from research data

5. Conclusion

Debt policy and its impact on corporate investment decisions have attracted the attention of many researchers with a wide range of topics in many developed markets. Moreover, the studies Research on this topic in developing countries will bring a lot of meaning, especially in Vietnam, when there is no empirical research on this topic and it is expected to make valuable contributions, promote investment. private enterprise in Vietnam. Using a sample of listed companies in Vietnam from 2010 to 2020 along with 3SLS regression models and two-stage System GMM model, this study tests hypotheses about the concurrent relationship between leverage, debt maturity structure and investment of the business. Research results contribute to confirm more firmly some inconsistent results on the impact of leverage and debt maturity structure on investment, through the addition of the growth opportunity factor to consider the interaction. between variables. Previous studies mainly focus on the one-way relationship between two variables, as well as consider only the individual impact of the two variables on investment, ignoring the two-way effect between debt and debt maturity. as well as the growth opportunity factor should be considered for more complete findings.

From the empirical results, the study has some new contributions. The research results show that it is necessary to additionally consider the interaction of growth opportunity factors with leverage factors and debt maturity structure in order to arrive at a full assessment of the impact of debt maturity structure. to leverage and vice versa. When considering the relationship between the individual factors, the results only support the underinvestment hypothesis. However, when combined with the growth opportunity factor, the results show that the correlation between debtmat*grow and lev and lev*grow with debtmat is positive, implying that the risk of refinancing becomes negative. Priority is given to businesses with good growth opportunities. Next, the results of the investment explanatory model with individual variables lev and debtmat and its interaction with growth provide evidence in support of both the underinvestment and liquidity risk hypothesis.

Therefore, future studies should not ignore the addition of simultaneous interactions between factors and business growth opportunities to avoid one-way judgments. These new findings have implications for administrators and policy makers with the implication that debt policy (including total debt and debt maturity) has significant impacts on corporate investment. . The study points out that it is necessary to additionally consider the relationship between leverage, debt maturity structure, and growth opportunities in order to have a complete and comprehensive explanation of its impact on investment. enterprise. From there, leading to optimal investment decisions of enterprises and investment promotion policies of the state.

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DOES FDI AFFECT CLIMATE CHANGE? EVIDENCE FROM ASIAN DEVELOPING ECONOMIES

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ABSTRACT

The world is on the brink of climate degradation due to human's social-economic activities. Although developing countries are attracting foreign direct investment (FDI) as an economic booster, implications on the environment are likely to happen without proper FDI management. This study analyzes the impact of FDI on climate change over 43 Asian developing economies from 2000-2020 using data from the World Bank. The regression model indicates that FDI has a positive effect on carbon dioxide and especially PM2.5 concentrations, potentially leading to worsening climate change. Besides, the study discovers discrepancy among climate change during and after the 2007-2009 economic crisis. This study also generates several recommendations aimed at mitigating the negative impact of FDI on the environment.

Keywords: Asia, CO₂, climate change, foreign direct investment (FDI), environment, PM2.5 concentrations.

1. Introduction

In recent decades, a large amount of FDI has flowed into developing countries in Asia thanks to the removal of trade barriers and the implementation of policies to attract FDI inflows by the governments of these countries. Foreign direct investment flows to developing countries in Asia increased by 4% to \$535 billion in 2020, reflecting resilience amid global FDI contraction (UNCTAD, 2021). However, the increase in FDI has thrived at the expense of the host country's environmental resources. Many studies have demonstrated a positive correlation between FDI and CO₂ emissions - the main cause of climate change globally (Paul et al., 2021; Jiang et al., 2021; Yan, 2021; Rashid et al., 2021; Bardi and Hfaiedh, 2021). According to the World Meteorological Organization, 2020 has been recorded as the "warmest" year since 2010 in Asia, with average temperatures of 1.5°C higher than the 1981–2010 average. As a result, sea surface temperatures and ocean warming in and around Asia are increasing more than the global average – at a rate three times higher than the case for the Arabian Sea (World Meteorological Organization, 2020).

FDI has made great contributions to the economies of Asian developing countries, but at the same time, the potential effects that it has on the environment of the host country cannot be denied. In recent years, pollution centers from developed countries have been redirected to developing countries due to rapid industrialization and economic growth. Only with coordinated economic development and environmental protection can developing Asian countries achieve sustainable economic growth.

This study has improved from a topic that gained the interest of many researchers. However, to the best of our knowledge, it is the first empirical study for developing countries in Asia, which examines the effect of FDI on climate change using Fixed effects regression model (FEM). Besides, this study added PM 2.5, along with CO₂, as a driver to climate change and did empirical research on the impact of FDI on that indicator. Furthermore, our study goes further than previous studies by reviewing the effect in the period during and after the global economic recession from 2007-2009. In the current situation when the Covid-19

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epidemic is showing signs of a new economic recession on a global scale, this new approach may give an overall view to suggest appropriate and timely policies for Asian developing economies.

2. Theoretical framework

With the fast expansion of FDI throughout the globalization age and the escalating severity of environmental degradation, several researches have investigated into whether the growth in FDI has an effect on the environment and to formulate policies that are consistent with the world's sustainable development goals. The authors discuss these research in light of two major impacts of FDI on environmental quality: the negative effect (Pollution Haven Hypothesis) and the positive effect (Pollution Halo Hypothesis).

Pollution Haven Hypothesis was first proposed by Copeland and Taylor in their economic theory (1994). According to them, when trade is liberalized, polluting industries migrate from developed to developing countries, bringing FDI but also increasing the risk of environmental pollution and transforming these countries into "Pollution Havens". The primary reason is that multinational corporations want to minimize the costs associated with complying with environmental regulations in developed countries, such as environmental taxes, costs associated with regulatory delays, noncompliance, environmental pollution-related lawsuits and re-engineering production processes to ensure emission limits. To bolster this hypothesis, Shakib et al. (2021) examined the connections between energy, economy and environment in 42 developing countries participating in the BRI (Belt and Road Initiative) from 1995 to 2019 and demonstrated the positive relationship between energy consumption, economic growth, population growth, and foreign direct investment.

Along with Pollution Haven Hypothesis, the Pollution Halo Hypothesis, first proposed by Birdsall et al. (1993), is also the subject of a plethora of researchers upon FDI's impact on climate change. Basically, the Pollution Halo Hypothesis implies that the investors shall improve productivity and utilize resources in the done's best interest and at the same time, solve environmental issues for the FDI recipient country. It means that by enhancing high-end technology and knowledge, they can ultimately help curb environmental problems and grow the economies of the FDI nations. To put this to a test, Marques & Caetano (2020) use ARDL to analyze the correlation between FDI and environmental emissions in 21 countries divided into high and low-income groups between 2001 and 2017. They find that FDI in high-income nations helps to reduce CO₂ emissions in both the short and long run. Shao (2018) investigates the influence of FDI on CO₂ emissions using the GMM estimate method with data from 188 countries for the period 1990-2013. The results of this study confirm the notion of "spillover effect" in high-income nations, which is explained by the fact that this group of countries concentrates on the quality of FDI rather than the amount of capital inflows.

In addition to the studies that clearly divide the impact of FDI, there are also conclusions that FDI has both promoting and inhibiting effects on the performance of CO₂ and PM 2.5 emissions to the environment (Song and associates, 2021; Dauda et al., 2021; Cheng et al., 2020; Farooq et al., 2020; Liu et al., 2020). The heterogeneity in the impact of FDI on the environment can be explained by the difference in research time, research area and research methods.

Different econometric approaches as well as different theoretical frameworks have been blamed for the heterogeneity in the results of studies for CO₂ and PM 2.5. Currently, the approaches are quite diverse and different, from conducting regression models to case studies. Another significant cause is database heterogeneity. Due to the difficulty of gathering accurate statistics on pollution levels, mitigation costs and effectiveness of environmental regulations, the authors had to rely on different alternative databases. Furthermore, the effects of FDI on environmental degradation vary by country or group of countries, as are the indicators used. Therefore, there is currently no consensus among studies for this correlation.

In general, there have been many studies giving results on the impact of FDI on the environment, however, there are quite few studies showing the specific impact of FDI on the concentration of PM 2.5 in the air because this indicator has only sparked interest since 1997 (before there was PM₁₀ in 1971), and most of the studies were mainly based in China. Besides, most of the studies do not consider potential factors such

as financial development, industrialization, governance or corruption, conflict, electricity consumption, deforestation, etc. directly to FDI flows due to lack of data for the countries involved. These are important factors that future research can exploit to examine in a more multidimensional way the real impact of FDI on the environment of the host country. Furthermore, studies can be extended to different regions or to a comparative cross-regional impact analysis.

3. Research method

According to Zulfikar et al. (2019), the regression model based on panel data bearing both symbol space i and time denoted t has the following form:

$$Y_{it} = \beta_1 i_t + \beta_2 i_t X_{2it} + \beta_3 i_t X_{3it} + \dots + \beta_{kit} X_{kit} + u_{it} \quad (3.1)$$

And the estimation of equation (3.1) depends on assumptions about the origin, slope coefficients and error term u_{it} . The authors of this study assume that only the slope of the origin varies spatially and that the slope coefficient does not vary spatially or temporally for all three popular numerical analysis models: pooled ordinary least squares (OLS) regression model, the fixed effects model (FEM), and the random effects model (REM). Gujarati (2004) recommends starting with the Pooled OLS, FEM model and performing hypothesis testing to find a model that fits the panel data. In this study, the authors will perform regression on all three models and choose the most suitable one. The variables are listed in Table 1.

Table 1. Sources and description of study variables

| Variables | Description | Expected sign | Research source | Data source |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----------------------|-------------|
| Inco2 | Dependent variable to measure climate change (the natural logarithm of total CO2 emissions, in metric tons.) | | Kumaran et al. (2021) | Github |
| pmt | Dependent variable to measure climate change (total fine particulate matter emissions, in micrograms per cubic meter.) | | Xie et al. (2020) | OECD |
| Infdi | Net foreign direct investment inflows (the natural logarithm of net foreign direct investment inflows, US dollars at the 2020 exchange rate.) | + | Paul et al. (2021) | WDI |
| gdp | The rate of growth of gross domestic product (the percentage of the annual growth of gross domestic product, in percent.) | + | Khan et al. (2021) | WDI |
| Inpop | Population (the natural logarithm of the total national population, units of people.) | + | Mujtaba et al. (2021) | WDI |
| urb | Urbanization rate (the ratio of urban population to total national population, in percent.) | + | Hoang et al. (2021) | WDI |
| mht | Value-added of manufacturing industries with medium and high technology (the ratio of value-added of these industries to the total value-added of the manufacturing industry, in percent.) | - | Shakib et al. (2021) | WDI |
| agd | Value-added of the agriculture, forestry and fishery industry (the ratio of the industry's value-added to gross domestic product, in percent.) | - | Shakib et al. (2021). | WDI |
| ope | Trade openness (the ratio of total exports and imports of | + | Opoku et | WDI |

| | | | | |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|----------------------------------------------|-----|
| | goods and services to gross domestic product as a percentage.) | | al. (2021), Singhania et al. (2021) | |
| lfo | Labor force (the percentage of the population aged 15 to 64 who are economically active, as a percentage.) | + | Mujtaba et al. (2021) | WDI |
| utl | Unemployment rate (the ratio of unemployed people to the total labor force, in percent.) | - | Khan et al. (2021) | ILO |
| rs1, rs2, rs3 | rs1=1 if it is in the pre-recession stage, ie 2000-2006, rs1=0 otherwise; rs2=1 if in recession, rs2=0 otherwise; rs3=1 if it is in the post-recession period, ie 2010-2020, rs3=0 otherwise | + | Gallego- Aslvarez et al. (2014) | |
| int1, int10, int13, int14 | int1: lnfdi x rs1; int10: lnfdi x rs3; int13: urb x rs3; int14: mht x rs3. | + | Found by the authors | |

Source: Synthesized by the author (2022)

This study analyzes panel data from 43 Asian developing economies, including Saudi Arabia, Afghanistan, India, Bahrain, Bangladesh, Bhutan, Brunei, Cambodia, East Timor, Fiji, Hong Kong, Korea, Indonesia, Iran, Iraq, Israel, Jordan, Kiribati, Kuwait, Laos, Lebanon, Malaysia, Maldives, Mongolia, Myanmar, Nepal, Oman, Pakistan, Papua New Guinea, Philippines, Qatar, Samoa, Singapore, Solomon Islands, Sri Lanka, Syria, Thailand, Turkey. Taiwan, North Korea, and Palestine were excluded due to a lack of data on the FDI variable. The data set spans the years 2000 to 2020. The data is primarily from the World Bank and has been processed to match the properties of the variables in the quantitative model, ensuring consistency and uniformity. During the processing, some economies' data for a few years were missed and did not meet the estimate, so the authors excluded them from the model.

In addition, according to Laura Diaconu (2014), Asian emerging economies underwent a global recession from 2007 to 2009, which impacted the region's FDI inflows. The primary cause is that developed economies such as the United States and Europe ceased lending, disbursing or withdrawing capital. In order to clarify the fluctuation of the effects of FDI and other factors on climate change throughout different situations, the authors split the study period into 3 parts namely before, during, and after the global recession using dummy variables.

4. Results and discussion

4.1. Results

4.1.1. Descriptive statistics

To identify the statistics before conducting regression analysis, the author conducts descriptive statistics of the variables in the proposed research model. Table 2 gives the descriptive statistics of variables in the model.

Table 2. Descriptive statistics of variables in the model

| Variable | Obs | Mean | Std.Dev. | Min | Max |
|----------|-----|---------|----------|---------|---------|
| lnco2 | 901 | 3.128 | 2.676 | -3.540 | 9.275 |
| pmt | 903 | 20.342 | 23.931 | 0 | 95.800 |
| lnfdi | 811 | 20.584 | 2.748 | 11.890 | 26.396 |
| gdp | 894 | 4.245 | 5.562 | -36.658 | 53.382 |
| lnpop | 903 | 16.104 | 2.268 | 11.343 | 21.068 |
| urb | 903 | 55.419 | 29.334 | 12.978 | 372.435 |
| mht | 740 | 25.886 | 19.361 | 0.260 | 88.037 |
| agd | 876 | 12.622 | 10.756 | 0.030 | 57.140 |
| ope | 874 | 101.628 | 70.112 | 25.277 | 442.620 |
| lfo | 882 | 63.510 | 12.210 | 31.170 | 88.510 |
| utl | 882 | 4.951 | 3.642 | 0.110 | 18.500 |
| rs1 | 903 | 0.333 | 0.472 | 0 | 1 |
| rs3 | 903 | 0.524 | 0.500 | 0 | 1 |

Source: The authors (2022)

Descriptive statistics table includes 12 variables, in which variables co2, fdi, and pop have relatively large standard deviations. Thus, the authors have taken the ln of those variables so that the distribution is normal. Moreover, the net foreign direct investment inflows are in the range of 11.89 to 26.39 with an average value of 20.58 and a standard deviation of 2.75. The population has a standard deviation of 2.27, lower than that of FDI, and the gap between the highest and the lowest value is also shorter than that of FDI.

The average value of trade openness is the largest at 101.63 and the average value of the variable rs1 is the lowest at 0.33. Among the research variables, trade openness also has the largest standard deviation of 70.11. This indicates that there is a relatively large dispersion in trade openness among developing Asian economies, and the lowest is also the variable rs1 with a standard deviation of 0.47.

An ideal model is that the independent variables are not correlated with each other, each containing some information about the dependent variable that is not present in the other independent variables. To test the correlation between the dependent variable and the independent variables in the model, the study uses the correlation coefficient matrix of variables in the model. The results are detailed in Appendix 2 and Appendix 3, showing that the correlation coefficient between the pairs of explanatory variables in the model is less than 0.8, so it can be concluded that the pairs of dependent variables are not strongly correlated with each other. There is no multicollinearity in the model.

4.1.2. Model testing

The study has performed the test steps related to the model including the Wooldridge test, the result shows that the model used in the test has the Prob.F = 0.0000 is less than the significance level of 5%, so the above model occurs autocorrelation; the model with the dependent variable pmt used in the test has Prob.F = 0.0000 value is less than 5% significance level, so the model also occurs autocorrelation. Modified Wald test, the result shows that Prob>chi2=0.0000, the model is affected by heteroskedasticity. The results in the model with the dependent variable pmt show that Prob>chi2 = 0.0000. Therefore, the study used a strong standard errors model (Robust standard errors). The strong standard errors model will give a true estimate of the standard error that accepts the presence of heteroskedasticity and autocorrelation. Additionally, to check

the multicollinearity, the study used the variance inflation factor VIF, the result in Appendix 4 and 5 shows that the VIF values are all less than 5. This shows that multicollinearity does not occur in the model.

The topic conducts a number of tests such as the F test, and Hausman test to select the appropriate model in 3 models Pooled OLS, FEM, and REM to discuss the results. The test results show that the p_value of the F test < 0.01 leads to rejecting the hypothesis H_0 at a 1% significance level. That is, the FEM model is more suitable than Pooled OLS. Hausman test results have p_value = 0.0044, so the hypothesis H_0 is rejected at 1% significance level. That is, the estimated results from the FEM model are more reliable. The results show that the regression coefficient of the variable *lnfdi* has a positive sign and is statistically significant at 1%, showing that FDI has an impact on increasing climate change in developing Asian economies. All other factors being held constant, if the rate of FDI increases, the amount of pollutant emissions will also increase. The results of FDI regression on climate change by 3 methods Pooled OLS, FEM and REM are detailed in Appendix 6.

For the model with the dependent variable *pmt*, the regression results between the three methods Pooled OLS, FEM, and REM are presented in Appendix 7. Although estimated by 3 different methods, the impact direction of the explanatory variables in the model is also very stable. The results show the consensus that increasing FDI will increase fine dust. The topic conducts a number of tests such as the F test, and Hausman test to select the appropriate model in 3 models Pooled OLS, FEM, and REM to discuss the results. The test results show that the p_value of the F test < 0.01 leads to rejecting the hypothesis H_0 at a 1% significance level. That is, the FEM model is more suitable than Pooled OLS. Hausman test results have p_value = 0.0000, so the hypothesis H_0 is rejected at 1% significance level. That is, the estimated results from the FEM model are more reliable. The results show that the regression coefficient of the variable *lnfdi* has a positive sign and is statistically significant at 1%, showing that FDI has an impact on increasing climate change in developing Asian economies. All other factors being held constant, if the rate of FDI increases, the amount of particulate matter will also increase.

4.1.3. Model results measuring the impact of FDI on climate change

The topic has implemented a regression model of the variable *lnfdi* to CO₂ emissions and PM 2.5. The regression results in Table 3 show that the impact of each variable on each model is different, specifically:

The regression coefficient of *the net FDI inflows* variable has a positive sign and is significant at the level of 10% in both models. All other things being equal, a 1% increase in net foreign direct investment inflows will increase CO₂ emissions by 4.04%. This implies that an increase in net FDI inflows shall aggravate pollution emissions, supporting the research's goal. This result is consistent with the authors' initial assumption that developing host countries are experiencing adverse environmental effects from FDI, implying a pollution haven in Asian developing economies. According to Copeland and Taylor (1994), when commercialized, FDI from multinational companies can be harmful to the environment, especially when polluting industries move from developed to developing countries, and some might be seeking to take advantage of relatively lax environmental control laws in the host country. The results are similar to previous studies, such as that of An et al (2021), which concluded that there is a significant spatially positive correlation between FDI and environmental situation in 30 provincial administrative regions in China. Besides, the results are similar to that of Xiaoming Yan (2021), which shows that at the 5% level of significance, other factors remain unchanged, the net FDI inflows increase by 1%, the amount of greenhouse gas emissions increases by 0.077%. The results are more significant, but the effect is not significant. The results are also similar to studies (Jiang et al., 2020; Abdouli and Lê, 2020; Ali et al., 2020; Weimin et al., 2021; Shakib and associates, 2021).

However, *the net FDI inflows variable* is not significant in model 3, implying that net foreign direct investment inflows have no significant impact on PM 2.5 fine dust concentration. This is inconsistent with the hypothesis put forward for PM 2.5 and implies that there is no correlation between PM 2.5 and FDI. However, this can be explained by the influence of FDI and PM 2.5 interacting with each other. In other words, FDI can promote PM 2.5 pollution through economic growth, while FDI can also reduce PM 2.5

pollution through chemical transformation of highly polluting industries (Dong et al., 2018). It is also consistent with previous research by Cheng et al (2017b).

Table 3. Regression results of net FDI inflows on climate change

| Variables | Model (1) | Model (2) | Model (3) |
|------------------------------------------------------------------------------------------------------------|--------------------------|----------------------------|------------------|
| | No interaction variables | Have interaction variables | Dependent PM 2.5 |
| lnfdi: Net foreign direct investment inflows | 0.0461* | 0.0404* | 1.372 |
| | (0.0247) | (0.0231) | (1.101) |
| gdp: The rate of growth of gross domestic product | 0.000853 | 0.000536 | -0.0768 |
| | (0.00312) | (0.00311) | (0.174) |
| lnpop: Population | 0.450** | 0.549*** | 63.83*** |
| | (0.179) | (0.195) | (10.76) |
| urb: Urbanization rate | 0.000462 | 0.00430** | 0.0732 |
| | (0.00102) | (0.00183) | (0.0587) |
| mht: Value-added of manufacturing industries with medium and high technology | -0.00429 | -0.000764 | -0.150 |
| | (0.00360) | (0.00324) | (0.242) |
| agd: Value-added of the agriculture, forestry and fishery industry | -0.0499*** | -0.0392** | -0.670** |
| | (0.0173) | (0.0152) | (0.286) |
| ope: Trade openness | -0.000218 | -0.000170 | 0.00781 |
| | (0.00112) | (0.000957) | (0.0501) |
| lfo: Labor force | 0.0152 | 0.0164 | |
| | (0.00981) | (0.0102) | |
| utl: Unemployment rate | 0.0261 | 0.0141 | 0.717 |
| | (0.0162) | (0.0140) | (0.998) |
| rs1=1 if it is in the pre-recession stage, ie 2000-2006, rs1=0 otherwise | -0.0817 | -0.0828 | |
| | (0.0601) | (0.0611) | |
| rs3=1 if it is in the post-recession period, ie 2010-2020, rs3=0 otherwise | 0.176*** | 0.515*** | |
| | (0.0333) | (0.0930) | |
| int13: Urbanization rate x the post-recession period | | -0.00372** | |
| | | (0.00166) | |
| int14: Value-added of manufacturing industries with medium and high technology x the post-recession period | | -0.00436* | |
| | | (0.00236) | |
| Constant | -5.041* | -7.021** | -1.068*** |
| | (2.893) | (3.131) | (174.5) |

| Variables | Model (1) | Model (2) | Model (3) |
|---------------|--------------------------|----------------------------|------------------|
| | No interaction variables | Have interaction variables | Dependent PM 2.5 |
| Observations | 664 | 664 | 664 |
| Number of ctr | 37 | 37 | 37 |
| R-squared | 0.642 | 0.671 | 0.288 |

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: The authors (2022)

The topic has created the interaction variables (int1 and in10) between net FDI inflows and the dummy variables in the pre-recession and post-recession period, and put it into the model to show *first*, the difference of FDI in the post-recession period and during the recession period has an impact on CO2 emissions; *second*, the difference of FDI in the pre-recession period and during the recession period has an impact on CO2 emissions. The results of the t-test give the irrefutable conclusion of H0, so the two interacting variables are not significant. The detailed results are presented in Appendix 8.

Glen et al. (2011) showed that in the period after the economic recession, CO2 emissions increased, so the study divided the years into *the pre-recession period and the post-recession period*, corresponding to the variables rs1 and rs3. Accordingly, the post-recession period sees an increase in CO2 emissions and less CO2 emissions in the economic downturn. Moreover, the interactive variables of urbanization rate x post-recession period, value-added of manufacturing industries with medium and high technology x post-recession period in model 2 are statistically significant at the level of 5% for int3 and 10% for int4 respectively. Both of these variables have negative effects on the dependent variable, the coefficient has negative values. Then, the increase in the scale of urbanization in the post-recession period makes pollutant emissions lower than during the recession period. The increase in value-added of manufacturing industries with medium and high technology in the post-recession period also results in less CO2 emissions than during the recession.

Besides, *the population* has a positive impact on pollutant emissions at the level of 5% in model 1 and 1% in model 2 and model 3, respectively. In which, the impact of the total population on PM 2.5 fine dust emissions is higher than the impact of the total population on CO2 emissions. When the total population increases by 1%, the CO2 emissions increase by 0.549%, holding all other factors unchanged. When the total population increases by 1%, the emission of PM 2.5 fine dust increases by 0.6333% in the condition that the remaining factors remain unchanged. The results are consistent with the study of O'Neill et al (2012); Cohen, 2015. The results of population impact on fine dust emissions also support the study of Yan et al (2020).

The *urbanization* rate is also identified as a factor that changes CO2 emissions. However, the variable is only statistically significant in model 2 at the level of 5%. This result is consistent with recent studies in Asia and Latin America (Anwar et al., 2021; Adebayo et al., 2021). Furthermore, pollution emissions are negatively affected by the value-added of agriculture, forestry and fishery industry in model 1 at the level of 1%; in model 2 at the level of 5% and in the model 3 at the level of 5%, the increase in value-added of agriculture, forestry and fishery industry slows down CO2 emissions and particulate matter PM 2.5. The results are similar to several previous studies (Prosper et al., 2016; Jebli et al., 2017; Mahmood et al., 2019). Luo et al (2019) also support the results, pointing out the relative impact of the agricultural sector forestry and fishery on fine dust emissions, at the same time clarifying the negative correlation between agriculture forestry and fishery with PM2.5 emissions.

Furthermore, trade openness and GDP growth has no impact on CO2 emissions. Regarding foreign trade, this result is consistent with the study of Ansari et al. (2020) indicating that trade openness is found to be statistically insignificant for Iran, UK, Australia, France and Spain on CO2 emissions. This finding is also

in line with the results of Jayanthakumaran et al. (2012), Farhani and Shahbaz (2014). In terms of GDP, FEM calculations reveal that GDP has a minor beneficial influence on carbon dioxide emissions. This study implies that greater economic activity does not considerably increase carbon dioxide emissions and that rising income may not have played a role in recent attempts to reduce CO₂ emissions. This finding contradicts prior research that indicated an essentially monotonic relationship. The singular result observed here can be justified by a variety of econometric and/or theoretical rationales. Stern (2003) brings out a number of flaws in prior research that may have skewed the results in terms of econometrics. Such issues that have been left unattended in the past include omitted variable bias, random and/or fixed-effects specifications, heteroscedastic error terms, cointegration, and regressor exogeneity. The current study has attempted to rectify many of these issues. Previously unaddressed difficulties include omitted variable bias, random and/or fixed-effects specifications, heteroscedastic error terms, cointegration, and regressor exogeneity. Many of these concerns have been addressed in the current study.

4.2. Discussion

Many Asian developing economies have been attracting FDI over the past 20 years with outstanding results. Up to now, besides the positive impacts that FDI brings to the host country, this capital inflow has also revealed a number of limitations, including the polluted emissions to the environment - the main factor leading to climate change.

In 2019, WHO did state "environmental pollution and climate change" as one of the 10 most serious problems that can affect human life. Extreme heat, floods, landslides, and other severe consequences of climate change are predicted to occur more frequently across parts of Asia region in the 21st century. According to many experts, Asia is the region with the lowest air quality in recent years. CO₂ and PM 2.5 emissions have been causing air pollution, making the risk of facing climate change becoming more and more obvious.

From the results above, the authors conclude that environment or atmosphere of Asian developing economies is affected by negative impacts, due to the consequences of economic growth through attracting FDI inflow and using FDI projects. To explain this finding, the authors found the following: *Firstly*, the legal system and policies related to FDI are overlapping, lacking in synchronization and consistency; *Secondly*, polluting factors such as CO₂ and PM 2.5 concentration are formed mainly from industrial activities and road traffic in big cities under industrialization and modernization context; *Thirdly*, FDI inflows are currently poured into industries that consume much energy, resources, and human resources that are not friendly to the environment because these industries are still bringing high profits to investors as well as taking advantage of the weak legal environment, and cheap labor force in developing economies; *Fourthly*, most of the energy sources used in developing countries are fossil fuels and organic fuels, so the process of burning a large amount of fuel will emit greenhouse gasses; *Finally*, the vast majority of technology transferred through FDI projects has only reached an average level of technology, and even many technology chains are lagging behind for more than half a century. *In fact*, most FDI enterprises still invest in old machinery, outdated technology that lead to high pollution production processes, and create bad impacts on the environment.

Although the research shows that FDI increases climate change, some limitations still exist. This research didn't take into account the characteristics of different Asian developing economies such as income, geographical location... to clarify the level of impact of FDI on climate change in different countries. Besides that, to measure climate change, the scope of the research only mentioned CO₂ and PM 2.5 emissions, but not other pollution indicators such as average annual surface temperature, sea level, rainfall... However, this limitation can be overcome if further research can add the variables related to characteristics of Asian economies such as geographic location or income level, etc., as well as to conduct further research using other climate change indicators to provide more comprehensive results on the impact of FDI on climate change for Asian developing economies.

5. Conclusion

CO₂ emission and PM 2.5 concentrations are the main variables to measure climate change in this study. The regression results imply that an increase in net FDI inflows shall increase climate change in Asian developing economies. In addition to the positive effects on the economy, attracting FDI also brings negative impacts on the environment of the host country. Therefore, both governments and enterprises must take the environment and climate protection into consideration by implementing action to attract and use FDI inflows effectively. Based on the research results, the authors propose the following recommendations:

For the governments of Asian developing economies, policymakers should select FDI based on a greener and more sustainable approach through screening to eliminate investment projects with obsolete technology; natural resources-intensive industries and prioritize investment attraction for environmental-friendly industries with advanced technology in order to minimize negative impacts of FDI on the environment. At the same time, green energy sources such as wind and solar energy should be prioritized for future development. Governments should facilitate companies to invest in new technology innovation to improve production efficiency, limit polluting production processes. Moreover, regulations, policies, and laws on FDI projects need to be completed and widely announced to help foreign investors easily access, understand both the investment environment and necessary regulations to comply with at the host country. In addition, the government should strengthen supervision of FDI enterprises on compliance with environmental protection criteria such as smoke, wastewater, noise... from the beginning to construction, even operation stage. Highly environmental pollution industries need to be disciplined, set up barriers to limit serious violations. Besides that, governments of host countries need to participate, enhance the exchange of experiences, outstanding initiatives in managing FDI flow and responding to climate change through international forums with the participation of many countries, organizations, experts in economics and environment fields.

FDI enterprises should clearly understand and strictly comply with the regulations and policies of the government set forth on emission reduction in business activities. Additionally, they would aim to produce green and environmentally friendly products; invest in modern production technology and equipment so as not to cause high pollution as well as strictly comply with environmental regulations. Finally, it is necessary for enterprises to have self planning and well preparation to easily respond to climate change in many different scenarios to ensure that businesses can develop in a sustainable way.

6. Appendix

Appendix 1. Descriptive statistics of variables in the model

| Variable | Obs | Mean | Std.Dev. | Min | Max |
|----------|-----|-----------|-----------|-----------|----------|
| lnco2 | 901 | 3.128305 | 2.676066 | -3.540459 | 9.274993 |
| pmt | 903 | 20.34197 | 23.93106 | 0 | 95.8 |
| lnfdi | 811 | 20.58365 | 2.747935 | 11.89 | 26.39634 |
| gdp | 894 | 4.244932 | 5.562458 | -36.658 | 53.382 |
| lnpop | 903 | 16.10368 | 2.26844 | 11.34338 | 21.06751 |
| urb | 903 | 55.41948 | 29.33354 | 12.978 | 372.4354 |
| mht | 740 | 25.88592 | 19.36135 | 0.2595292 | 88.037 |
| agd | 876 | 12.6221 | 10.75604 | 0.0302096 | 57.14009 |
| ope | 874 | 101.6282 | 70.1115 | 25.27664 | 442.62 |
| lfo | 882 | 63.51008 | 12.21048 | 31.17 | 88.51 |
| utl | 882 | 4.951054 | 3.641894 | 0.11 | 18.5 |
| rs1 | 903 | 0.3333333 | 0.4716658 | 0 | 1 |
| rs3 | 903 | 0.5238095 | 0.4997096 | 0 | 1 |

Source: The authors (2022)

Appendix 2: Correlation coefficient matrix of variables in the model with Inco2

| | Inco2 | lnfdi | gdp | lnpop | urb | mht |
|-------|--------------|--------------|------------|--------------|------------|------------|
| Inco2 | 1 | | | | | |
| lnfdi | 0.717*** | 1 | | | | |
| gdp | 0.0173 | 0.0618 | 1 | | | |
| lnpop | 0.721*** | 0.444*** | 0.131*** | 1 | | |
| urb | 0.172*** | 0.348*** | -0.137*** | -0.370*** | 1 | |
| mht | 0.650*** | 0.659*** | -0.0734 | 0.332*** | 0.378*** | 1 |
| agd | -0.284*** | -0.398*** | 0.208*** | 0.348*** | -0.666*** | -0.426*** |
| ope | -0.161*** | 0.280*** | -0.0563 | -0.384*** | 0.392*** | 0.323*** |
| lfo | -0.00658 | 0.119** | 0.100** | -0.110** | 0.112** | 0.102** |
| utl | 0.0419 | 0.00138 | -0.116** | -0.00412 | 0.141*** | 0.00712 |
| rs1 | -0.106** | -0.270*** | 0.0874* | -0.0367 | -0.0721 | -0.0418 |
| rs3 | 0.118** | 0.231*** | -0.0751 | 0.0449 | 0.0806* | 0.0485 |

| | agd | ope | lfo | utl | rs1 | rs3 |
|-----|------------|------------|------------|------------|------------|------------|
| agd | 1 | | | | | |
| ope | -0.349*** | 1 | | | | |
| lfo | 0.0272 | 0.234*** | 1 | | | |
| utl | -0.226*** | -0.124** | -0.652*** | 1 | | |
| rs1 | 0.145*** | -0.00559 | -0.0514 | 0.0874* | 1 | |
| rs3 | -0.144*** | -0.00170 | 0.0727 | -0.0954* | -0.715*** | 1 |

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: The authors (2022)

Appendix 3: Correlation coefficient matrix of variables in the model with pmt

| | pmt | lnfdi | gdp | lnpop | urb |
|-------|------------|--------------|------------|--------------|------------|
| pmt | 1 | | | | |
| lnfdi | 0.111** | 1 | | | |
| gdp | -0.0116 | 0.0618 | 1 | | |
| lnpop | 0.207*** | 0.444*** | 0.131*** | 1 | |
| urb | 0.00810 | 0.348*** | -0.137*** | -0.370*** | 1 |
| mht | 0.000567 | 0.659*** | -0.0734 | 0.332*** | 0.378*** |
| agd | -0.0163 | -0.398*** | 0.208*** | 0.348*** | -0.666*** |
| ope | -0.170*** | 0.280*** | -0.0563 | -0.384*** | 0.392*** |
| utl | -0.0919* | 0.00138 | -0.116** | -0.00412 | 0.141*** |

| | mht | agd | ope | utl |
|-----|-----------|-----------|----------|-----|
| mht | 1 | | | |
| agd | -0.426*** | 1 | | |
| ope | -0.323*** | -0.349*** | 1 | |
| utl | 0.00712 | -0.226*** | -0.124** | 1 |

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Source: The authors (2022)

Appendix 4: Variance inflation factor VIF with Inco2 dependent variable

| Variable | Inpop | lnfdi | agd | mht | urb | rs1 | rs3 | ope | utl | lfo | gdp | Mean VIF |
|----------|-------|-------|------|------|------|------|------|------|------|------|------|----------|
| VIF | 4.82 | 3.96 | 3.02 | 2.60 | 2.34 | 2.19 | 2.08 | 2.06 | 1.98 | 1.97 | 1.11 | 2.56 |

Source: The authors (2022)

Appendix 5: Variance inflation factor VIF with pmt dependent variable

| Biến | Inpop | lnfdi | agd | mht | urb | ope | utl | gdp | Mean VIF |
|------|-------|-------|------|------|------|------|------|------|----------|
| VIF | 4.63 | 3.49 | 2.97 | 2.54 | 2.29 | 2.02 | 1.15 | 1.09 | 2.52 |

Source: The authors (2022)

Appendix 6. Regression results of net FDI inflows on CO2 emissions
by Pooled OLS, FEM và REM

| Model | Pooled OLS | FEM | REM |
|------------------------------------------------------------------------------|-------------------------|-------------------------|-------------------------|
| Variables | Inco2 | Inco2 | Inco2 |
| lnfdi: Net foreign direct investment inflows | 0.0532*** (0.0116) | 0.0461*** (0.0113) | 0.0532*** (0.0116) |
| gdp: The rate of growth of gross domestic product | 0.00103 (0.00237) | 0.000853 (0.00228) | 0.00103 (0.00237) |
| Inpop: Population | 0.700*** (0.0533) | 0.450*** (0.0973) | 0.700*** (0.0533) |
| urb: Urbanization rate | 0.00126 (0.000874) | 0.000462 (0.000858) | 0.00126 (0.000874) |
| mht: Value-added of manufacturing industries with medium and high technology | -0.00275 (0.00205) | -0.00429** (0.00209) | -0.00275 (0.00205) |
| agd: Value-added of the agriculture, forestry and fishery industry | -0.0534*** (0.00369) | -0.0499*** (0.00374) | -0.0534*** (0.00369) |

| Model | Pooled OLS | FEM | REM |
|--------------------------------------------------------------------------------|------------|------------|------------|
| Variables | Inco2 | Inco2 | Inco2 |
| ope: Trade openness | -0.000368 | -0.000218 | -0.000368 |
| | (0.000516) | (0.000514) | (0.000516) |
| lfo: Labor force | 0.0126*** | 0.0152*** | 0.0126*** |
| | (0.00395) | (0.00440) | (0.00395) |
| utl: Unemployment rate | 0.0222** | 0.0261*** | 0.0222** |
| | (0.00947) | (0.00947) | (0.00947) |
| rs1=1 if it is in the pre-recession stage, ie 2000-2006, rs1=0 otherwise | -0.0349 | -0.0817** | -0.0349 |
| | (0.0325) | (0.0327) | (0.0325) |
| rs3=1 if it is in the post-recession period, ie 2010- 2020, rs3=0 otherwise | 0.133*** | 0.176*** | 0.133*** |
| | (0.0297) | (0.0299) | (0.0297) |
| Constant | -9.215*** | -5.041*** | -9.215*** |
| | (0.896) | (1.548) | (0.896) |
| Observations | 664 | 664 | 664 |
| Number of ctr | 37 | 37 | 37 |
| R-squared | | 0.642 | |

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: The authors (2022)

**Appendix 7. Regression results of net FDI inflows on particulate matter
by Pooled OLS, FEM và REM**

| Model | Pooled OLS | FEM | REM |
|---------------------------------------------------------------------------------|------------|----------|----------|
| Variables | pmt | pmt | pmt |
| Infdi: Net foreign direct investment inflows | 2.314*** | 1.372* | 2.314*** |
| | (0.830) | (0.789) | (0.830) |
| gdp: The rate of growth of gross domestic product | -0.364* | -0.0768 | -0.364* |
| | (0.192) | (0.174) | (0.192) |
| lnpop: Population | 4.852*** | 63.83*** | 4.852*** |
| | (1.557) | (5.617) | (1.557) |
| urb: Urbanization rate | 0.0808 | 0.0732 | 0.0808 |
| | (0.0616) | (0.0655) | (0.0616) |
| mht: Value-added of manufacturing industries with medium and high technology | -0.138 | -0.150 | -0.138 |
| | (0.118) | (0.159) | (0.118) |

| Model | Pooled OLS | FEM | REM |
|--------------------------------------------------------------------|------------|-----------|-----------|
| Variables | pmt | pmt | pmt |
| agd: Value-added of the agriculture, forestry and fishery industry | -0.606*** | -0.670*** | -0.606*** |
| | (0.210) | (0.243) | (0.210) |
| ope: Trade openness | -0.0449 | 0.00781 | -0.0449 |
| | (0.0293) | (0.0394) | (0.0293) |
| utl: Unemployment rate | -1.062** | 0.717 | -1.062** |
| | (0.496) | (0.717) | (0.496) |
| Constant | -89.29*** | -1,068*** | -89.29*** |
| | (23.87) | (89.68) | (23.87) |
| Observations | 664 | 664 | 664 |
| Number of ctr | 37 | 37 | 37 |
| R-squared | | 0.288 | |

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: The authors (2022)

Appendix 8: Regression results of FDI on climate change contain interaction variables between FDI and periods of economic recession

| Model | 1 |
|------------------------------------------------------------------------------|------------|
| Variables | Inco2 |
| Infdi: Net foreign direct investment inflows | 0.0333 |
| | (0.0306) |
| gdp: The rate of growth of gross domestic product | 0.000631 |
| | (0.00301) |
| Inpop: Population | 0.601*** |
| | (0.199) |
| urb: Urbanization rate | 0.00450*** |
| | (0.00165) |
| mht: Value-added of manufacturing industries with medium and high technology | 0.00101 |
| | (0.00342) |
| agd: Value-added of the agriculture, forestry and fishery industry | -0.0394** |
| | (0.0158) |
| ope: Trade openness | -0.000497 |
| | (0.000937) |

| Model | 1 |
|-------------------------------------------------------------------------------------------------------|-------------------------|
| Variables | Inco2 |
| lfo: Labor force | 0.0161* (0.00941) |
| utl: Unemployment rate | 0.0175 (0.0137) |
| rs1=1 if it is in the pre-recession stage, ie 2000-2006, rs1=0 otherwise | 0.0168 (0.449) |
| rs3=1 if it is in the post-recession period, ie 2010-2020, rs3=0 otherwise | -0.106 (0.461) |
| int1: Net foreign direct investment inflows x pre-recession stage | -0.00485 (0.0192) |
| int10: Net foreign direct investment inflows x post-recession stage | 0.0321 (0.0221) |
| int13: Urbanization rate x post-recession stage | -0.00400** (0.00151) |
| int14: Value-added of manufacturing industries with medium and high technology x post-recession stage | -0.00678** (0.00287) |
| Constant | -7.763** (3.400) |
| Observations | 664 |
| Number of ctr | 37 |
| R-squared | 0.675 |

Robust standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Source: The authors (2022)

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IMPACT OF ORGANIZATIONAL CAPACITY AND SOCIAL-ECONOMIC CONDITIONS ON CHOOSING STRUCTURAL OR NON-STRUCTURAL FLOOD MITIGATION STRATEGY IN VIETNAM

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ABSTRACT

This paper investigates the effects of multiple local geographical and socio-economic characteristics, especially the organizational capacity on the structural and non-structural flood mitigation strategies in the Northern mountain- and the Middle region of Vietnam. The data in the period of 2010-2020 was collected from the Statistic Office and from 1,094 questionnaires undertaken with the provincial flood management officers, commune government staffs, village heads, and key informants at 385 provinces in the Northern mountain- and the Middle region Vietnam. Formative measurement method in combination with Pearson's test and OLS are utilized for measurement. The results indicate that the organization capacity is one of the key factors that have significant influence on the implementation of the structural and non-structural mitigation strategies in these regions. The components of organizational capacity such as commitment, networking, and policy adjustment capability, etc are as crucial as geographical and socio-economic characteristics that influence the flood mitigation strategies. Therefore, capacity building program should be in favour of structural mitigation method in order to protect the community in the long run.

Key words: Disaster control; Flood mitigation strategy; Organizational capacity.

1. Introduction

Flood disasters in recent years tend to have severe negative impacts on people's lives and local infrastructure, especially in the Center- and in the mountainous regions of North Vietnam (General Statistics Office, 2021). According to the General Department of Disaster Prevention (2020), extreme natural disasters have killed 305 people, destroyed 3224 houses, flooded 473449 houses and damaged a large number of infrastructures, which equivalent to 32.900 billion VND lost in these regions. Such loss is much more than all other region's loss combined. Therefore, how to reduce the detrimental effects of flood disasters in the Center and mountainous areas of Northern Vietnam has become a critical concern to many policy makers and local people.

There are two popular flood mitigation strategies to prevent and lessen the harm of flood are structural- and non-structural strategies. Structural strategy often bases on engineering interventions to control floods or protect human settlements by building seawalls and channels, etc. In contrast, non-structural approach often depends on the adjustment of human activities and technology such as forecasting ability, improving community knowledge or social networking, so that people can be proactive in dealing with disasters when they occur (Alexander 1993, Few 2003). Which flood protection methods should be used are widely known to depend on the ability of the flood management organization and social-economic conditions. The ability of the flood management organization can be defined as the capacity to predict floods, to plan, and to make decisions to carry out policies effectively. The ability of the specialized organizations is the fundamental strength to keep floods under control (Wondolleck and Yaffee 2000).

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Surprisingly, the influence of the organizational ability and social-economic situations on the implementation of preventive measures has very few studies in Vietnam (Nguyen Huu Dung 2022). For instance, Nguyen Lap Dan (2007) has mentioned two methods including structural approaches and non-structural approaches to reduce the level of flood harm while the ability of specialized organizations has been ignored. Nguyen Van Ngan and Vo Thanh Danh (2020) have also proved that flood prevention capacity is affected by social-economic situations such as age, the level of education, gender, and salaries. The inadequate research related to the factors reducing the flood damage can lead to the ineffective selection and implementation of flood prevention measures in the context of increasingly severe climate change.

This article will focus on the mountainous provinces of Northern and the Center in Vietnam to illustrate the influence of specialized organizational capacity and social-economic conditions on choosing structural or non-structural approaches. Evidently, the excellence in organizational capacity will enable organizations to keep natural hazards under control. This article especially concentrates on examining the effects of capacity factors on expediting structural and non-structural measures due to the limited resources of social-economic situations.

2. Research methods

To inspect the general hypothesis that a level of competence of the specialized organization will allow them to conduct the extensive implementation of structural and non-structural methods. The overall theoretical framework is based on using Formative measurement (Bollen 2011). According to Dodo and Warren (1985), the components which are affecting flood prevention methods can be divided into two groups: independent variables and controllable variables. The independent variables are the influencing factors, while controllable variables are the factors that can control the dependent variables. For instance, the area which has usually been affected by flooding normally are applied more flood prevention measures than other places. Therefore, the attributes of the region are the variables that control the dependent one. The research model is summarized in Figure 1.

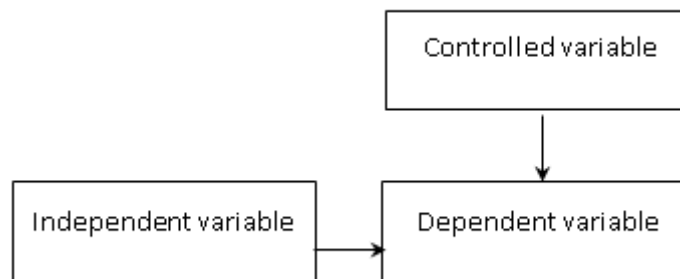


Figure 1. Research model by Formative measurement methods

The calculate the impacts caused, we apply two regression functions with the following variables:

i) Structural measures (the dependent variable): Structural methods (over the last 5 years) are conducted by questionnaire on a scale of 0-2, where 0 is not used, 1 is rarely used and 2 is always used. An overall estimate of structural methods was measured by summing the observed scores for all the variables in this field.

ii) Non-structural measures (the dependent variable): Non-structural methods (over the last 5 years) were surveyed by questionnaire on a scale of 0-2, where 0 means not using, 1 is rarely used and 2 is used extensively. An overall estimate of the non-structural methods was measured by summing the observed scores of all the variables in this field.

iii) The ability of the specialized organizations in charge of flood prevention (independent variable) is measured by 14 variables in Table 1. To estimate organizational capacity for flood mitigation. We measure by summing the observed scores of all the variables in this field on a scale of 0-5, where 0 is unable to fulfill flood mitigation and 5 is a high level of ability in managing flood disasters.

iv) Area (the independent variable): is a binary variable with two values: 1 and 0. This variable is used to divide the geographical area. The reason is that the Central and the mountainous provinces in Viet Nam have differences in policies, regulations and a level of development, which can affect the use of flood prevention methods.

v) Social-economic variables (independent variables): including average income, the level of education in each region based on the percent of the population (over 25 years old) for whom with a bachelor's degree or higher, the population change from 2010 to 2020 with an assuming that area with a higher education level and the richer in these places will be under pressure from population growth, which in turn lead to being given priority using more structural and non-structural methods.

vi) Other controllable variables: to distinguish between the influence of the specific attributes of areas and specialized organizational capacity, we used three controllable variables. Firstly, the percent of flooding areas accumulated over 10 years was being used to reflect local characteristics. Secondly, the total amount of damage in terms of financial aspects in the last 5 years was being used to show the negative impacts on people's lives. Lastly, the recent flood event was being used to reflect the detrimental effects of flood disasters.

2.1. Sample selection

We sample all the districts to be sure that the samples are all data-rich and representative. We set up that: n = number of samples to be investigated, N = total number of districts (385), error (5%), and p = probability of an event caused (0.5). the sample range was designed according to DeVries (1986) as follows:

$$n = \frac{1.96^2 N p (1 - p)}{\alpha^2 (N - 1) + 1.96^2 p (1 - p)}$$

Calculations showed that the number of samples investigated is at least $n=193$. To ensure samples representing 19 central provinces and 15 northern mountainous, we were using Stratified sampling (Hair and partners, 2006). Firstly, the level of natural disaster risks is classified into 3 levels: high, medium, and low. Secondly, the level of disaster damage is divided into 3 groups: large, medium and small. Lastly, we conduct a survey in each province in at least 3 forms. Therefore, the number of forms surveyed is 918, including 3 levels x 3 scale x 34 provinces x 3 forms in each province. In fact, the total sample of the survey is 1200 forms. We interviewed the flood prevention planner, the head or deputy of a specialized organization in charge of flood mitigation, and people who have lived a long period. Technological and economic factors measured by money. The data have been surveyed for 10 years from 2010 to 2020.

Survey tools include online questionnaires and pre-printed forms. In total, we have 1200 forms of which 487 forms were taken by email and 713 forms were taken by printing forms. The cooperation rates of two types are 83.2% and 98.6% in sequence, which provided us with 1108 votes. Because of some inadequate information forms, finally, after eliminating these votes, we have 1094 forms. The data are summarized in the following Table 4 in the appendix.

2.2. Data analysis

With the collected data, we used Cronbach's Alpha to evaluate the reliability of the variables under the support of Stata 16. The results show that the Cronbach's Alpha coefficient of the variables is greater than 0.3, so the reliability of the scale is available. Therefore, these scales are used in regression models.

The problem of missing out-of-model variables was under-counted by using Ramsey Test (RESET). Autocorrelation is also checked afterward. The results show that there is no violation of the assumptions of the OLS model (small squares multiple regression estimators most). However, we discovered the problem of multicollinearity (multicollinearity) between the population variable and the median income variable, so these two variables are excluded from the final analytical model.

Using the tested data, we use the Pearson correlation coefficient which provides initial evidence of a statistical association between flood protection measures and capacity measurement variables.

The objective is to answer the question: Is there a correlation between flood mitigation methods and organizational capacity? And which capacity variable is closely related? Pearson correlation is widely known as a good method to measure the relationship among variables because it is based on the analysis of covariance method (ANCOVA). It provides information regarding the importance of the relationship, correlation, or the connection of the relationship.

Finally, we conduct two OLS regression analyses, in which structural and non-structural measures are the variables affected by the organizational capacity and socio-economic conditions.

3. Result and discussion

3.1. The relationship between structural and non-structural measures with capacity factors

The preliminary evidence regarding a statistical association between flood protection measures and a level of organizational capacity, which are summarized in Table 1.

Table 1. Relationships between structural mitigation, non-structural mitigation and organizational capacity characteristics

| | Structural mitigation | Non-structural mitigation |
|-------------------------|-----------------------|---------------------------|
| Organizational capacity | 0.24** | 0.51** |
| Commitment | 0.31* | 0.59** |
| Sharing information | 0.16* | 0.44** |
| Verbal communication | 0.25** | 0.29** |
| Sharing resources | 0.05 | 0.38** |
| Networks | 0.18 | 0.42** |
| Leadership | 0.35** | 0.32** |
| Financial resources | 0.40** | 0.17* |
| Available staff | 0.28* | 0.33** |
| Data quality | 0.30** | 0.37** |
| Adjustable policies | 0.41** | 0.38** |
| Long range planning | 0.36** | 0.39** |
| Human ecology | 0.42** | 0.45* |
| Specialize | 0.51** | 0.47** |

Note: * $p < 0.05$, ** $p < 0.01$.

Source: Author calculated

The results in Table 1 show that there is a strong connection between specialized organizational capacity and structural and non-structural approaches. In which, the ability to organize work sensibly has a strong relationship with both structural and non-structural approaches ($p < 0.01$). However, there seems to be more importance for the implementation of non-structural methods than structural measures (coefficient $0.51 > 0.24$). The commitment variable is also related to non-structural methods ($p < 0.01$) rather than structural approaches. In addition, sharing information among employees was statistically significant for both two methods, but the correlation with non-structural is much stronger than the other one ($p < 0.01$), such as education, training, or cooperation. This can be explained that non-structural approaches require a high degree of collaboration among parties to fulfill the task effectively

When considering resource sharing (within the same organization or different organizations in the field of flood protection, the impact on structural measures is very different from non-structural approaches. In particular, structural measures do not have a significant correlation, while non-structural measures have a strong connection ($p < 0.01$) because this kind of measures often requires cooperation among parties. The establishment of interpersonal networks also has the same result that it has statistical significance for non-structural measures ($p < 0.01$) but this is not the case for structural measures. The number of staff members in the specialized organizations or the level of data quality are also strongly correlated with non-structural approaches than structural approaches. However, financial resources are more closely correlated with structural methods than with non-structural methods. It is obvious that structural solutions are often much

more expensive than non-structural methods. For example, planning or education often needs a great number of financial resources to be completed.

3.2. The influence of specialized organizational capacity and local social-economic conditions on structural methods

The influence of specialized organizational capacity and local social-economic conditions on structural methods implemented with OLS regression has been summarized in Table 2.

Table 2. The influence of the organizational capacity characteristics and the geographical socio-economic conditions on the structural mitigation

| <i>Variables</i> | <i>Coefficient</i> | <i>Std. Error</i> | <i>t-value</i> | <i>Significance</i> | <i>Beta</i> |
|-------------------------|--------------------|-------------------|----------------|---------------------|-------------|
| Organizational capacity | 0,1044 | 0,0285 | 1,99 | 0,006 | 0,3174 |
| State | 0,8724 | 0,8316 | 1,32 | 0,319 | 0,2792 |
| Floodplain (%) | -0,1325 | 0,0157 | -2,36 | 0,008 | -0,3841 |
| Education | 0,1392 | 0,2910 | 0,47 | 0,539 | 0,0821 |
| Five-year flood loss | 0,0016 | 0,0017 | 0,31 | 0,684 | 0,0197 |
| Recent flood event | -0,2054 | 0,0579 | -1,46 | 0,087 | -0,2650 |
| Constant | 3,0955 | 0,9542 | 2,86 | 0,074 | |
| Adjusted R ² | 0,5835 | | | | |
| n | 1.094 | | | | |

Source: Author calculated

Table 2 shows that when separating the influence of location characteristics from the impact of specialized organizational capacity (via the use of control variables), the capacity of specialized organizations has correlated statistically closely with the increase in structural methods in the central and northern part in Viet Nam. In other words, the increased capacity of the specialized organizations has an impact on the increase in structural measures in order to reduce the detrimental impacts of floods ($p < 0.01$). However, this is the sharp contrast to the proportion of flooded areas ($p < 0.01$) (the estimated coefficient has a negative sign), which means that it will reduce the application of flood prevention measures related to structural methods. Most provinces in the central part of Viet Nam have a tendency to reduce the application of structural methods in flood-prone areas. Flood damage in the last 5 years seems to have no impact on the application of structural measures ($p > 0.01$). In other words, when the number of years (from the time we conducted the survey to the time of the recent flood) increases, specialized organizations have decided to reduce the application of structural measures.

3.3. The influence of specialized organizational capacity and local social-economic conditions on non-structural measures

The calculation of the influence of specialized organizational capacity and local social-economic conditions on non-structural measures have been summarized in Table 3.

Table 3. The influence of the organizational capacity characteristics and the geographical socio-economic conditions on the non-structural mitigation

| <i>Variables</i> | <i>Coefficient</i> | <i>Std. Error</i> | <i>t-value</i> | <i>Significance</i> | <i>Beta</i> |
|-------------------------|--------------------|-------------------|----------------|---------------------|-------------|
| Organizational capacity | 0,1872 | 0,0636 | 2,79 | 0,005 | 0,2615 |
| State | 4,3829 | 1,2822 | 4,00 | 0,003 | 0,4091 |
| Floodplain (%) | -0,0288 | 0,0319 | -1,20 | 0,197 | -0,0867 |
| Education | 3,8725 | 0,9683 | 4,07 | 0,001 | 0,3930 |
| Five-year flood loss | 0,3085 | 0,0192 | 2,23 | 0,206 | 0,1325 |
| Recent flood event | 0,1048 | 0,1827 | 0,36 | 0,364 | 0,1008 |
| Constant | 5,7466 | 2,4782 | 3,08 | 0,027 | |
| Adjusted R ² | 0,6073 | | | | |
| n | 1.094 | | | | |

Source: Author calculated

Table 3 shows that the capacity of the specialized organization has a significant impact on the decision to apply non-structural methods (the estimated coefficient is relatively high). The localities using non-structural measures have proved very suitable (with excellent statistical significance). However, the Northern mountainous region has used more and more non-structural methods to mitigate flooding compared to the central provinces. The proportion of people with a high level of education also leads to the application of non-structural methods ($p < 0.01$) because they have a better chance to access information or training programs. Based on the Beta coefficient, we can notice that education is the strongest factor affecting the application of non-structural measures, the recent flood events have a weak impact on the capacity of specialized organizations. On the contrary, the flood damage variables in the last 5 years is a major factor contributing to the fulfillment of flood prevention by non-structural measures ($p < 0.05$)

Based on the above results, we can notice that the specialized organizational capacity is an important factor that affects the implementation of flood prevention methods at the local level. Factors such as the level of cooperation, commitment, financial resources, expertise, and culture of specialized organizations are more important than the experience, and geographical conditions. Given the importance of the factors that makes up the organization's capacity (listed in Table 1), more emphasis should be put on developing the capacity of specialized organizations in order to reduce the flood damage rather than just focusing on the application of structural measures.

The study also shows that the area with a huge percentage of the flooded area has a tendency to reduce the use of flood prevention measures (the estimated coefficient is negative in both Table 2 and 3), especially structural methods. This is the result of the development of residential areas and infrastructure away from flood-prone areas thus reducing the need of applying flood prevention methods. Financial resource for construction such as dams or waterway is often a burden on localities, therefore, orienting development out of flooded areas not only helps to avoid damage but also reduced the financial resources spent on these methods.

While the percentage of flooded areas was not significantly correlated with the application of non-structural measures, our additional research revealed that politics and policies were the driving force behind the use of non-structural measures. It seems that the aggressive reaction of people in the Northern mountainous areas, whenever there is a loss of property or people due to the negative impacts of floods, leads to the more use of non-structural measures including planning, education, and zoning. The level of education of communities also promotes the implementation of non-structural measures because they are fully aware of the benefits of non-structural methods in the long periods later on.

Finally, our research shows that the previous experience when facing natural disasters affects the flood prevention strategies. For instance, the recent high-damaged flood events stimulate the adoption of structural methods, while non-structural approaches are applied because of their benefits in the long term. This can be explained as follows: Structural methods are often used to prevent a severe flood event, while non-structural measures require a great amount of time to implement, and it is necessary the cooperation among parties. In general, non-structural mitigation policies tend to focus on long-term behavior changes. Indeed, flood event in the last 5 years is highly correlated with the use of non-structural methods (Listed in Table 3). Therefore, the understanding of the natural law will help the policymakers promote the appropriate policy to control natural disasters.

4. Conclusion

This research shows that the capacity of specialized organizations such as professional competencies, commitments, or cooperation plays an essential role in the selection and implementation of flood prevention measures. In general, non-structural measures tend to focus on long-term behavior changes instead of achieving the results as soon as possible. In conclusion, I am convinced that more emphasis should be put on developing specialized organizational capacity at the local level.

5. Appendix

Table 4. Statistics describing the data

| Variable | | Mean | St.Deviation |
|----------------------------------------|---------------------------------------------------------------------------------|-------|--------------|
| Structural approaches: | | | |
| Construction of flood protection works | Reservoir | 1.205 | 0.813 |
| | Dikes | 0.599 | 0.737 |
| | Slope or drainage | 0.793 | 0.762 |
| | Dams | 0.503 | 0.699 |
| Terrain reclamation | Terraces | 1,101 | 0,782 |
| | Intercropping | 0,675 | 0,807 |
| | Designing residential clusters to avoid flooding | 1,406 | 0,732 |
| | Structural renovation of the weak pulse position | 1,312 | 0,760 |
| Non-structural approaches: | | | |
| Technology | Set up a disaster warning system | 1,059 | 0,810 |
| | Development of a communication system | 1,186 | 0,773 |
| | Other scientific and technological applications | 1,207 | 0,745 |
| Society | Raising awareness and skills for people | 1,371 | 0,723 |
| | Improve people's livelihood | 1,343 | 0,729 |
| | Increase people's participation in flood prevention | 1,533 | 0,650 |
| | Settled agriculture | 1,223 | 0,817 |
| | Fairness, transparency and gender equality | 0,495 | 0,618 |
| | Practice the covenants, contracts | 0,373 | 0,567 |
| Environment | Connecting social resources | 1,320 | 0,937 |
| | Vegetation coverage to reduce water flow | 1,422 | 0,673 |
| | Handling the environment after a disaster occurs | 1,112 | 0,815 |
| Policy | Protecting diverse ecosystems | 1,196 | 0,812 |
| | Developing policies and regulations in the field of disaster risk management | 1,069 | 0,840 |
| | A guide to developing a disaster risk management strategy | 0,815 | 0,828 |
| | System of regulations and standards in the field of disaster risk management | 0,778 | 0,836 |
| | Integrating disaster prevention planning | 0,753 | 0,811 |
| | Disaster safety control | 0,803 | 0,792 |
| | Policy on construction management | 0,731 | 0,826 |
| | Regulations on socialization of disaster risk management | 0,921 | 0,832 |
| Economy | Invest in building infrastructure | 1,132 | 0,491 |
| | Investment in construction of works for natural disaster prevention and control | 1,113 | 0,515 |
| | Equipment to support disaster prevention | 1,010 | 0,496 |
| | Disaster insurance | 0,955 | 0,510 |
| | State budget for disaster risk management | 0,976 | 0,462 |
| | Disaster Prevention Fund | 1,001 | 0,818 |
| | Mobilizing and donating from organizations and individuals | 1,022 | 0,500 |

| | | | |
|---------------------------------|------------------------------------------------------------------------------|-------|-------|
| Management | Planning | 1,121 | 0,501 |
| | Implement the motto 4 on the spot | 1,154 | 0,506 |
| | Carry out the response, organize the rescue | 0,998 | 0,502 |
| | Carry out statistics and assessment of damage caused by natural disasters | 0,992 | 0,496 |
| | Disaster recovery activities | 0,983 | 0,507 |
| | Support activities for those affected by natural disasters | 1,072 | 0,502 |
| Institutions | Steering Committee on Disaster Prevention | 1,148 | 0,490 |
| | Command and control mechanism for disaster prevention and control activities | 1,009 | 0,813 |
| | Government at all levels (province, district, commune) | 1,144 | 0,773 |
| | Social and community organizations | 1,048 | 0,825 |
| | Households and individuals | 1,112 | 0,806 |
| Organizational capacity: | | | |
| Personal | Organizational capacity | 3,872 | 1,200 |
| | Commitment | 3,700 | 1,297 |
| | Verbal communication | 3,759 | 1,241 |
| | Culture | 3,212 | 1,505 |
| | Leadership | 3,770 | 1,231 |
| | The ability to adjust policy | 3,379 | 1,492 |
| | The ability to plan | 3,236 | 1,620 |
| Human Resources | Number of personnel | 3,019 | 1,550 |
| | Professional knowledge | 3,007 | 1,549 |
| Resources | Sharing information | 3,716 | 1,293 |
| | Information quality | 3,280 | 1,441 |
| | Sharing resources | 3,324 | 1,616 |
| | Networks | 3,433 | 1,456 |
| | Financial resources | 2,844 | 1,608 |

Source: Author calculated

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DANANG DESTINATION IMAGE AND REVISIT INTENTION OF GEN Z THE CASE OF DOMESTIC VISITORS

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ABSTRACT

This theoretical paper's objective is to clarify the factors that contribute to the destination image of Danang and how the destination image motivates domestic customers in the context of Gen Z to revisit Danang in the deep theoretical sense. Besides, it also defined the influence of how the projected images as well as perceived images formed the destination branding to attract the revisit intention in the long term. From that, this paper gives some theoretical orientation for destination management organizations and enterprises in the field of tourism, travel agents, and restaurants in Danang city to boost some specific activities in terms of motivating domestic revisit intention.

1. Introduction

Visa, the world's leading electronic payment technology company, said that the tourism needs of Vietnamese people today are very large. Research of a consumer voice visa shows that the pandemic has a clear impact on tourism activities when 76% of Vietnamese are currently planning domestic entertainment by 2022, much higher compared to the rate of 38% of people planning to travel abroad. This difference is also reflected in the decision on the destination for business trips (60% of them are domestic trips and 37% are foreign trips) (Visa, 2022, pa.1)

One of the attractive tourist areas that domestic tourists tend to revisit is Da Nang. Since becoming a centrally-controlled municipality, Da Nang has gained some noteworthy developments and great achievements. On this path of development, the tourism industry is increasingly demonstrating its role as a leading economic sector, contributing to economic restructuring, promoting Da Nang's image, attracting investment, and creating numerous jobs. Moreover, it also improves the quality of life for the people, preserves, and promotes the national cultural values. More specifically, the average growth rate of total tourism revenue in the period 2016-2019 reached 24.6%. The contribution of the tourism industry to the city's GRDP every year increases and accounts for a large proportion. In 2016 it was 23.72%, in 2017 it was 24.1%; in 2018 it was 26.35% and in 2019 it was 31.4%. Ms. Truong Thi Hong Hanh said that tourism not only makes an important contribution to the general economic development of the locality, but also contributes to making the urban appearance more spacious, modern, and pervasive, thereby promoting growth and developing other industries; increasing revenue for the budget; creating jobs (50,963 employees in 2019, an increase of 2.2 times compared to 2016); and increasing people's income. According to tourism experts, Da Nang is a young city but has made its own mark by building increasingly diverse, rich, and quality-enhancing tourism products (Suc bat manh me cua du lich Da Nang, 2022). Especially in the Covid pandemic, it is necessary for Da Nang to motivate the number of domestic tourists due to the travel restrictions. This paper will specifically answer the following research question:

RQ1: Which factors influence revisit intention in the context of Vietnamese Gen Z domestic travel?

RQ2: How destination images motivate customers' revisit intentions effectively?

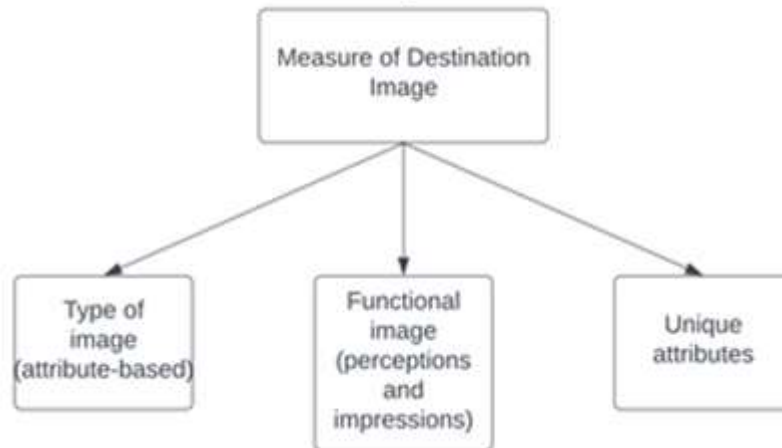
RQ3: How are visitors motivated intrinsically and extrinsically to revisit Da Nang by push and pull factors?

RQ4: How is the perceived image congruent with the projected image to build the destination brand in visitor perception?

2. Theoretical framework

2.1. Destination and the concept of destination image

Most tourism activities take place at destinations, which is a geographical space in which a cluster of tourism resources exists rather than a political boundary (Pike, 2012). Rubies (2001, p.39) termed 'destinations' as clusters - "an accumulation of tourist resources and attractions, infrastructures, equipment, service providers, other support sectors, and administrative organisms whose integrated and coordinated activities provide customers with the experiences they expected from the destination they choose to visit." From a demand perspective, destinations attract visitors for a temporary stay (over one night) with access to tourism products (IGI Global, 2022). From a psychological perspective, it is a place where a tourist(s) feels a certain degree of interest and motivation to visit (ibid).



The study of consumer behaviour in products and services outlined that image is an important indicator in making selection choices, therefore, in the context of tourism, the image of the destination plays the most crucial role in decision making (Rashid et al., 2016) and resulting customer satisfaction (Lee et al., 2014; Sitepu, 2021). In fact, it is widely accepted by scholars and practitioners that images of a destination have a strong influence over travel decision-making (Phau et al., 2014).

2.2. Destination Image Classifications

Despite the attention to destination image (DI) in literature, it remains a problem to define DI. Rashid et al., (2016) paper reviewed 9 definitions of DI and concluded that there was neither a general definition that is universal enough to be understood and adopted by all nor does it agree with the construction of DI (Pike, 2012). The stream of research that uses a construct measurement perspective provided a framework of understanding destination image as a multi-dimensional concept; (Echtner and Richie 1991; 1993; cited in Rashid et al., 2016) with a three dimensions framework to understand the concept as summarised in figure 1:

Sources: Generated from Rashid et al., (2016)

This framework proposed a continuum between common functional and psychological attributes that visitors used to rate a destination and more unique features (Pike, 2012). However, it is noteworthy that unique features are not necessarily improving a destination's competitive advantage if they are not contextually relevant (ibid, p.204). Using a different approach of measurement, Phelps (1986) clearly differentiated between the secondary image formed before visiting to the destination and the primary image formed after visiting as part of their experience.

In recent guidelines for Tourism Marketing, researchers have found and confirmed that the development of DI is based on consumers' rational and emotional preferences (Lin et al., 2007; Dominique-Ferreira, 2011; Stylos et al., 2016), which led to the categorisation of DI by combining 2 dimensions:

Perceptual and cognitive: This dimension maintains that DI is evaluated by the attributes of its physical feature of environments and its attractiveness that can motivate tourists to visit the destination (Govers et al., 2007; Dominique-Ferreira, 2011).

Affective: the feelings and emotions raised towards and by the destination (Balogu and McCleary, 1999; Rashid et al., 2016)

In consideration of destination image transformation stages and tourist's travel experience model, Gunn (1988) proposed a slight deviation of the image at three levels: organic, induced and primary; and these images can be formed and modified during each stage of the experience. Despite the context and timeline in which it was developed, the model remains relevant and has been the basis of many recent tourism studies and research (Pike, 2012; Chen et al., 2013; Lee et al., 2014). particularly :

Mental impression about the destination: – organic image

2. Modification of DI using further information – formation of induced image

3. Decision making about the visit to the destination

4. Travel to destination

5. Experience the destination

6. Return with collections and memories (primary and complex images)

(Rashid et al., 2016)

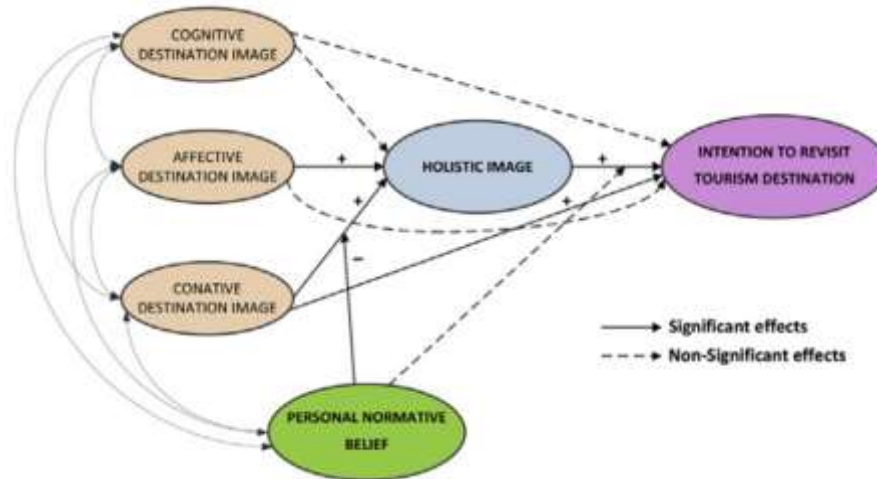
This model argues that an organic image is a collection of information formulated by non-touristic and non-commercial sources including mass media, education, and opinions of others (Lee et al., 2014); induced image is assimilated from tourism promotions provided by marketers through advertising and travel agents (Pike, 2012). And the primary image is the result of the on-site experience that tends to be realistic, complex and differentiated (Chen et al., 2013; Stylos et al., 2016).

Other streams of researchers have classified destination images using the hierarchy of effects models, consisting of distinct components: cognitive, affective, and conative that positively influence customer satisfaction and revisit purpose (Gartner, 1993). Specifically, the cognitive image is expressed through the sum of beliefs and knowledge, reflecting evaluations of the perceived attributes of the destination (Bigné, Sánchez & Sanz, 2009; del Bosque & Martín, 2008; Stylos & Andronikidis, 2013). In addition, with respect to cognition, Pike (2008) argued that it is the sum of what is known or believed by the individual about a tourism destination, as well as the associated knowledge that could or could not be derived from a previous visit. The affective component refers to the emotional responses or appraisals of the individual, reflecting the tourist's feelings towards the destination (Baloglu & Brinberg, 1997; Baloglu & McCleary, 1999a; Bigné, Andreu, & Gnoth, 2005; Hallmann, Zehrer, & Müller, 2014). According to Russell and Snodgrass (1987), people develop effective evaluations of a place before entering that environment, during their presence there, and after leaving that place to move somewhere else. Moreover, Klenosky (2002) has shown that before tourists make their travel decision, they formulate a more positive affective destination image when the destination-related emotions match their motives and the benefits pursued. Besides, tourists' active consideration of a location as a prospective trip destination is represented by the conative component of destination image (Gartner, 1993). Although many experts regard conative destination image to be synonymous with intention, it demonstrates how and why sentiments of new or repeat visitors influence the choice of a certain holiday spot (Pike & Ryan, 2004; Tasci et al., 2007). Mention the interrelationship among cognitive, affective, and conative images, according to Gartner (1993), the components are arranged in a hierarchical order, with cognitive images preceding effective images and affective images preceding conative images. Bagozzi (1992), on the other hand, believes that both cognition and affective image have a direct impact on conative image.

2.3. The Conceptual Model of DI influence on Revisit Intention

Gitelson and Crompton (1984) examination of tourists' vacation phenomenon refers to revisit intention as the likelihood of tourists returning to a site of destination another time; and is a form of their

post-consumption behaviour (Hallak et al., 2017), and characterised as an extension in customers' satisfaction. Besides, revisit intention is also expressed through the willingness to recommend a destination to relatives and related social groups (Tran, 2021). Extensive research with revisit intention as a dependent variable has been done in various contexts; and it has been found that perceived values, service quality, perceived risk, subjective norm and destination image effectively determine tourist attitude and the likelihood of visiting (Abbasi, 2020). In revisit intention, service quality, satisfaction, destination image and perceived values are deemed as prime predictors that significantly impact tourist behaviour (Baloglu & McCleary, 1999; Chen and Tsai, 2007; Assaker et al., 2011).



Stylos (2016) with an interest in examining the complex relationship between destination image components and behavioural intentions; proposed a conceptual model of DI as a predictor of intention to revisit.

| Authors | Title | Context | Journal | Which attributes of DI affect revisit intention | Sample size |
|--------------------------------|----------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|--------------------|-----------------------------------------------------------------------------------------------------|------------------------------|
| Stylos et al, 2016 | Destination images, holistic images and personal normative beliefs: prediction of intention to revisit a destination | Outbound tourism from Russia to Greece | Tourist management | Cognitive Image Affective Image Conative Image Personal Normative Belief Holistic Image | 270 respondents |
| Afshardoost and Eshaghi (2020) | Destination image and tourist behavioural intention: A meta-analysis | Synthesise the effect of destination image to understand the relationship between it and tourist's behavioural intention | Tourist management | Image components Overall and affective image Cognitive image | Based on 87 previous studies |
| Martin and | Exploring the | Holiday | Tourism | Perceived | 807 tourists |

| | | | | | |
|-------------------------|----------------------------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|------------------------------------------------------|
| del Bosque, (2008) | cognitive-affective nature of destination image àn the role of psychological factors in its formation | destination | management | image The multi-dimensional concept Culture value | |
| Kyriakaki et al, (2017) | Factors influence recommendation and tourists' revisit intention. | Revisit intention to Island of Chios, Greece | International Conference on Social Sciences, Multidisciplinary, Economic, Business and Finance study | Destination image Local Culture infrastructure and cleanliness Hospitality service | 305 Turkish tourists on the island of Chios, Greece. |

Research conducted by **Ci & Qu (2008)** states that customer satisfaction and revisited purpose can be positively influenced by the destination image. In the conditions of outbound tourism from Russia to Greece, Stylos et al., (2016) re-confirmed the positive effect of destination image (affective and conative image) on tourists' intention to revisit a destination; and a holistic image with a mediating role in predicting intention to revisit. In the context of outbound tourism in Russia, Stylos et al., (2016) re-confirmed the positive effect of affective and conative images on tourists' intention to revisit Greece as a destination; and holistic images with a mediating role in predicting the intention to revisit. In the research of Ba Ria -Vung Tau context, Infrastructure, Variety Seeking, Accessibility, Local food, Atmosphere, Environment, Price Value, Leisure and Entertainment were all found to have a positive impact on the intention of visitors in this area (Ha et al, 2020). Furthermore, Nhu et al. (2013) found that DI is the most important factor in tourists' revisit intentions in their study of the impact of Vietnam's DI on international tourists' revisit intentions. Visitors are more likely to return if DI is promising. Attractive cultural features; Cuisine; Natural environment; Travel infrastructure; Socio-economic environment; Natural resources and language; and Atmosphere of the destination are the six factors that make up Vietnam DI.

Here, we will develop 4 hypotheses as follows:

H1: Holistic image positively mediates the relationship between cognitive image and tourist's revisit intention to destination.

H2: Holistic image positively mediates the relationship between affective image and tourist's revisit intention to destination.

H3: Holistic image positively mediates the relationship between conative image and tourist's revisit intention to destination.

H4: Holistic image positively mediates the relationship between destination images and tourist's revisit intention to destination.

2.4. Motivation theory of destination image

The processes that cause people to behave in a certain way are referred to as motivation (Solomon et al., 2019). From a psychological standpoint, motivation occurs when a customer has a desire to fulfill that desire. This desire can be utilitarian (wanting to achieve a functional or practical benefit) or hedonistic (wanting to experience emotional responses and fantasies) (ibid, p.161). Behaviour and behavioral intentions are the driving forces before motivation, according to the study of consumer behavior (Lopes, 2011), and it is critical for marketers to understand the motivation, the main triggers that drive consumers to create products and services that are relevant and beneficial to them (Karamehmedovi, 2018). In tourism studies, scholars agreed that motivation was the main factor in interpreting an individual's behaviour, especially in image formation and decision-making processes (Lopes, 2011; Mai & Hyunh, 2014). In this context, we consider the moderating role of travel motivation on the effect that holistic image has on travel intention. It is anticipated that:

H5: Travel motivation positively moderates the relationship between holistic image and a tourist's intention to revisit a destination.

An extension of utilitarian and hedonic needs in the tourism context have argued that a tourist's motivation is driven by 2 forces: push factors (an internal motivation, explaining that the choice of destination should satisfy psychological needs) and pull factors (an external motivation, in which the physical attribute of the destination is an attraction) (Dann, 1981; Lopes, 2011; Rashid, 2016; Njagi (2017). Crompton (1979) proposes seven-psychological motives of push factors, including escape, self-explanatory, relaxation, prestige, social interaction, and skin-ship enhancement. This view, however, was expanded by later researchers with the integration of Maslow's hierarchy of needs (Lopes, 2011), who added five categories of human needs and its impact on travel motivation.

| Authors | Title | Context | Journal | Key attributes | Audience |
|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| Prekom Doe and Dadzie, 2018 | The future of youth tourism in Ghana: motives, satisfaction and behavioural intentions | Ghanaian tourism | Journal of Tourism Futures | Pull factors: Acesibility and good value of historical or cultural attractions; Natural/Ecological Heritage; Service delivery. Push factors: Rest-relaxation; knowledge seeking; Novelty; ego-enhancement. | 15-35 Ghanaian (557 participants), who have visited at least one Ghana tourist site |
| Njagi et al (2017) | Understanding the relationship between push and pull motivational factors in cruise tourism: A canonical correlation analysis | Tourism in Kenya | International Journal of Tourism Research | Pull factors: budget, culture and history, ease of travel, wilderness, cosmopolitan environment, facilities and hunting Push factors: novelty, escape/relaxation, self actualization, nature, self-enhancement, romance, kinship-belonging, autonomy, self development (host-site involvement), nostalgia, stimulation, isolation and recognition. | 132 visitors to the nairobi nation park |
| Nguyen et al (2020) | Travel Intention to Visit Tourism Destinations: A Perspective of Generation Z in Vietnam | gen Z in the most important cities across Vietnam. | The Journal of Asian Finance, Economics and Business | Pull factors: accessibility, recreation service, affordable, image of destination Push factors: Knowledge seeking, ego-enhancement, socialisation, escape | 369 samples |

Table 11.2 Needs and tourism motives

| Need | Motive | Tourism literature |
|------------------------|-----------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Physiological | Relaxation | Escape, relaxation, relief of tension, sunlust, physical, mental relaxation of tension |
| Safety | Security | Health, recreation, keep oneself active and healthy |
| Belonging | Love | Family togetherness, enhancement of kinship relationships, companionship, facilitation of social interaction, maintenance of personal ties, interpersonal relations, roots, ethnic, show one's affection for family members, maintain social contacts |
| Esteem | Achievement, status | Convince oneself of one's achievements, show one's importance to others, prestige, social recognition, ego-enhancement, professional business, personal development, status, prestige |
| Self-actualisation | Be true to one's own nature | Exploration and evaluation of self, self discovery, satisfaction of inner desires |
| To know and understand | Knowledge | Cultural, education, wanderlust, interest in foreign areas |
| Aesthetics | Appreciation of beauty | Environmental, scenery |

Source: Adapted from Mill & Morrison (1992, p. 20).

Following Maslow's theory, the desires of travellers were organised into a hierarchy, with the lowest level being relaxation, followed in the upwards order. Nevertheless, it was suggested that travel motivation of a tourist is not only distinct to one motive but a set of motivations with one being dominant (Pearce and Lee, 2005). Based on Maslow's hierarchy of needs, Pearce (1988, 1991, 1993, in Pearce and Lee, 2005) developed a travel motivation theory labelled the Travel Career Ladder. Broadly, the theory states that with the accumulation of travel experiences, a tourist will progress upward through the levels of motivation. Meaning that, the more people travel, the more likely their motivation is to move upwards in Maslow's model.

Tourists are also being pulled to destinations because of their accessibility, historical-cultural attractions, natural-ecological heritage, and service delivery (Preko et al., 2019). These elements are thought to have a direct and significant impact on tourist satisfaction, with a positive increase in pull factors increasing a traveller's satisfaction with the location (Sirait et al., 2019). Destination images have long been recognized as influential "pull" factors in destination choice (Prayag, 2010). Research by Klenosky (2002) and Kim (2008) found a symbiotic relationship between these motivations, with push factors stimulating the need and desire to travel and pull factors simultaneously pulling them toward a specific destination that satisfies those needs and desires (Whyte, 2017). These forces not only have positive impacts on tourist satisfaction, but also their future revisit intention (Qiao et al, 2008; Pratminingish et al, 2014).

Yoon and Uysal (2005) used an integrated approach to try to extend theoretical and empirical evidence on the relationship between push and pull motivations, satisfaction, and destination loyalty. This paper found that tourists to Northern Cyprus were more inclined to destination loyalty if it satisfied their internal (push) motivation; and pull motivation was only significant in predicting tourist satisfaction. In later research, Mai and Hyunh (2014) revalidated push motivation's role in influencing revisit intention in the context of Ho Chi Minh City. Interestingly, the paper also contributes to previous work with empirical evidence to argue that

the pull factor had a more significant impact on revisit intention than the push factor (ibid, p.494). These findings imply the need to create links between push and pull factors within promotional materials for targeted audiences (Whyte, 2017) and readjust marketing strategies and tools to reinforce revisit intention (Mai and Hyunh, 2014).

2.4.1. Motivation to travel among gen Z Vietnam

The literature reviewed highlights that Vietnamese tourists are both pushed by internal and pulled by external motivation to make travel decisions (Mai and Hyunh, 2014; Ha et al., 2020; Nguyen, 2021). Thammadee (2015) identified *shopping, novelty-seeking, and relaxation* as the core motivations in forming travel motivation to Thailand. Incorporating this study with that of Pearce and Lee (2005), who developed a scale of 14 motivation factors in forming travel motivation and indicated that *novelty, escape/relaxation, and strengthening relationship* motivation are the most important factors.

Four elements of push motivation were selected for examining the relationship between travel motivation and revisit intention among gen Z: Escape/Relax; Relationship; Nature and Stimulation; with Escape/ Relax lies at the most basic motive (Nguyen, 2013). Built upon results of Ha et al., (2020, p.216), visitors to Ba Ria Vung Tau (Vietnam) would have a high intention to come back to “explore the natural landscape and other types of tourism” – nature; build and strengthen relationships between family/friends. Additionally, research by Airbnb (2020) found that booking for adventure travel – Stimulation among gen Z globally has increased drastically (190%), with the need to explore the unknown, feeling excitement and having adventurous experiences (Pearce and Lee, 2005).

Two elements of pull motivation were considered in this context: Accessibility and the natural environment and man-made attractions (Preko et al., 2019). By incorporating results from Truong (2020) and Nguyen et al., (2021), it is expected that accessibility and attributes are significant factors that pull gen Z to visit and revisit Da Nang.

2.5. Destination Branding - The role of Perception and Attitude of Destination Image towards Revisit Intention (Destination branding with the moderating role between Holistic Image and Revisit Intention)

2.5.1. Concept of destination branding

A commonly cited definition of “ a brand” developed by Aaker (1991, in Pike, 2012) states that: “A brand is a distinguishing name and/or symbol (such as logo, trademark, or package design) intended to identify the goods or services of either one seller or a group of sellers, and to differentiate those goods from those of competitors”. This definition of Aaker was repeated by the American Marketing Association, with a brand being represented by name, term, sign, symbol or design, or a combination of them (Keller and Swaminathan, 2020). As seen, both definitions stress the core benefit of branding concept: identification and differentiation.

In tourism studies, it was not until 1998 that the first paper of destination branding was published by Dosen et al., (1998). A destination brand was considered a “collective hallucination” as suggested by Professor John Urry in the 2003: *Taking Tourism to the Limits* (Pike, 2012). Indeed, destinations are more complicated than goods and services, leading to a more multi-dimensional destination branding concept (Pike, 2005) that comprises both tangible and intangible components (Salehzadeh et al., 2016). From the perspective of the organisation, Blain et al., (2005) viewed branding concepts with the concept of destination image, taking the view that the brand should influence the destination choice of tourists. In consideration of both organisation and the market’s perspective, the authors then defined destination branding as a set of marketing activities that: support the creation of tangible components to identify and differentiate a destination, which consistently stand for a promise of unique memorable travel experiences associated with the destination. These experiences then consolidate and reinforce an emotional bond between tourist and the destination, hence, reduce the effort for information search and perceived risk (ibid). This definition is adopted in our study, and it is in line with Aaker’s conceptualisation of branding, comprising brand identity (brand’s perspective) and brand image (tourist’s perspective) (Pike, 2010; Pike, 2012).

Brand identity as projected image

Brand identity plays a key role in formulating decision making powers of tourism managers and internal stakeholders (Ruzzier, 2013). It is created by DMOs and reflects the contribution of all brand elements to image and awareness (Gover, 2007); which provides a direction and meaning to the destination brand and its strategic vision (Tsaour et al., 2016). Scholars referred to brand identity as projected image (Gover, 2007; Pike 2012; Ruzzier, 2013). Brand identity can be reflected as an induced image in travel experience as discussed in earlier sections, more specifically, a set of secondary images in their perception (Duan et al., 2020). The formation of induced image has an impact on modification of DI in tourists (Rashid, 2016), and it is the only image (out of organic, induced and primary) that marketer can effectively modify (Pike, 2012). As such, the impact of projected destination image on DI can positively differentiate a destination from the others in the tourist decision making process. Picazo and Moreno-gill (2017) suggest that visual content is a vital tool to make a good first impression that makes people easier to recognize compared to words. As a valuable asset for a place, destination “develop promotional materials to create, reinforce or alter the decision to attract visitors” about the images of destination (Duan et al., 2020). Visual content and photographs consumption are becoming the new paradigm in tourism communication (Leung et al., 2013) as a result of the rise of the Internet and social media in pre- and post-trip planning (Pabel and Prideaux, 2016).

Danang’s projected image

The face of Danang as we see nowadays is formed through a long historical development with political incidents, however, it is considered a young city (Truong, 2019) - city with nature characteristic and human touch, which is suitable with Gen Z lifestyle. In fact, Gen Z appreciate and pay great attention to sustainable tourism, while preserving the intact beauty of nature and experiencing the most new and interesting things in each land they go through (Gen Z Viet di du lich co gi khac, 2021).

To position itself as a fantastic and dynamic city towards tourists and visitors, Da Nang was recently proposed to be a “Fantasticity” since 2014 then as a result, all future Danang tourist advertisements and communications will be based on this slogan ((Danang - Journey to become a #FantastiCity, 2022)). This is due to the fact that, Danang's values include freshness and proximity to nature, its golden beach, its distinctive and contemporary bridges that signify its rapid growth, its young vigor and strong drive to rise, and, most importantly, its people's warmth and friendliness with smiles on their faces. Additionally, it is important to recognise that Danang’s environmental orientation is one of the most important components that make up Danang’s identity. This side of identity has been agreed between internal stakeholders, with a high agreement in relics and landscapes as the most prominent identity of the city (Truong, 2019).

Brand image as perceived image

Brand image refers to the actual image about a destination and held by the consumer, namely, perceived image. Kim and Lehto (2013) analysed brand image as the outcome of generating information from indirect sources and direct experience at the destination. With reference to travel experience, perceived image presents a far more complex and comprehensive image after visiting a destination, which helps them make decisions on whether they will revisit the destination (Rashid, 2016; Duan et al, 2020).

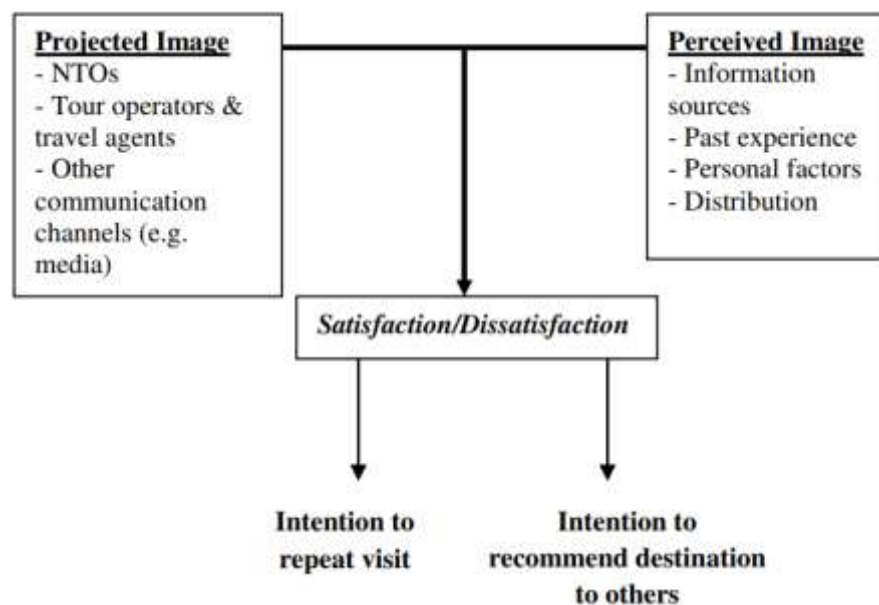
Interestingly, Reynolds (1965, in Pike, 2012, p.204) argues that “images only have a tenuous and indirect relationship to facts”; the extent to which an individual’s perceived images “are correct or not is not as important as what the consumer actually believes to be true”. This proposition has continuously underpinned consumer behaviour research today and is referred to as *perception is reality* (ibid). Perception is the process by which a set of stimuli (sights, sounds, colour...) are selected, organised and interpreted by an individual to form a meaningful and coherent picture of a destination (Solomon et al., 2019). Since the meaning of a stimulus is interpreted by one’s motivations, learning, attitudes, and previous experience (Haarhoff, 2018); the author postulates that these stimuli are subjective in nature, hence, are not processed objectively. Due to the intangibility of tourism offerings, tourists must make decisions based on their

perceived image of destination (Haarhoff, 2018) which is interpreted through stimulus and secondary image to comprise the sum of beliefs, ideas and impressions of a tourism destination (Tsauro et al., 2016).

It is notable to highlight the importance of motivation and previous experience in the formation of one's perceived image; and the predicting role of perceived image on tourist's behaviour, satisfaction and decision making (Marine-Roige and Clave, 2016). In the Danang context, it is considered as the city with the luxurious destination, beaches, tropical sun, friendliness, young and dynamic.

Congruence between projected image and perceived image

Studies from both theoretical and empirical perspectives have been conducted to understand the relationship of sender-and-receiver image relationship. Generally, it was accepted that "the closer projected image and perceived image are, the better" (Marine-Roig and Ferrer-Rosell, 2018). Asworth and Goodall (1998, in Ji and Wall, 2015) addressed that a potential mismatch in demand-and-supply-side images can lead to a gap between the fact and visitors's perceived image; and the more reality differs from the expectations, the less likely they are to consider the destination in their evaluation for next holiday (ibid, p.21). And it is common for researchers to find that gaps exist between the two types of images: Gover et al., (2007) global scale research; Ji and Wall (2015) on Qingdao, China; Tsauro et al., (2016) and Duan et al., (2020) on rural tourism destinations. The measurement of the image gap outlined the need for internal stakeholders to rectify the gap between perception and reality.. Therefore, the closer the gap between projected image and the perceived image, the stronger their satisfaction, thus, revisit intention (Farmaki, 2011; Marine-Roig and Rosell, 2018).



Farmaki's (2011) model for relationship of image(s) and revisit intention

With its beneficial impacts, achieving a good level of congruence between the projected and perceived image has become a key objective for NTOs and DMOs (Sun et al., 2021). Furthermore, the congruence between images can assist tourism organisation in evaluating their activity in promoting destination image and whether or not it has been accepted by their target audience (ibid, p. 2).

In this regard, "gap bridging" was proposed by Gover and Go (2009) as a key component in brand image analysis with the goal of addressing and closing brand image gaps at various levels (Marine-Roig, 2015). The significance of the congruence can be hypothesised as:

H6: The congruency between projected image and perceived image positively moderates the relationship between holistic image and revisit intention.

Danang's projected image and perceived image and revisit intention

Despite the popularity of destination images in tourism research, not much has been written about communicating DI between DMO (sender) and external stakeholders (receiver) in the context of Vietnam

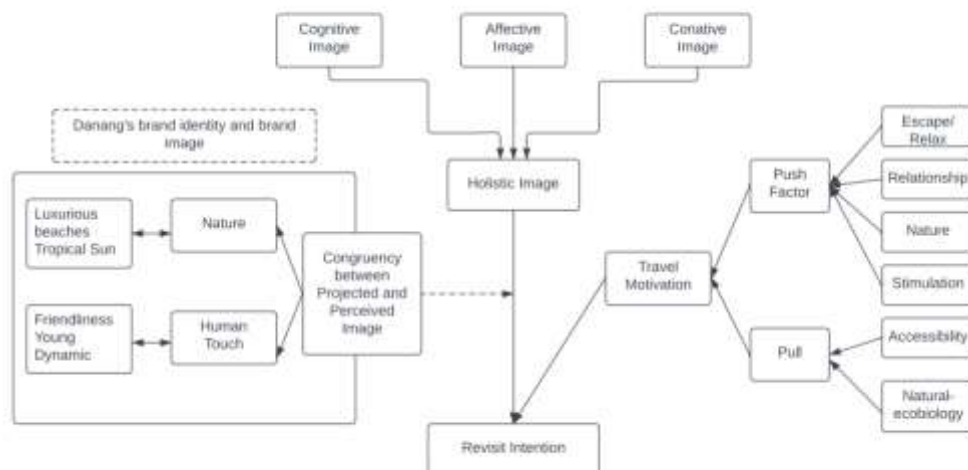
tourism. The review of key contributors (Nguyen, 2013, Truong 2019, 2020) investigated the destination image from the destination's point of view highlight as: Da Nang has long been pursuing the image of a nature and human touch city, which is defined in the "Danang fantasticity" holistic image that is central to promoting their talent attraction policy. The image of nature is significant in promoting urban planning that "enhances long-term community well-being and addresses important unmet needs arising from the nature of twentieth-century urban development" (To and Nakaseko, 2018, p.44). This research, however, only provides understanding about tourist's projected image through secondary sources and does not cover their perception from experience in Vietnam. So that, based on the Danang's holistic image and identity, it can be expected that:

P1: Environmental and psychological factors of Danang are the most crucial components that tourists seek for in their visit; in exchange, the policy of nature and human touch city effectively delivers the images that are meaningful to them.

While designed to attract talent and start-ups, Truong (2020) argued that Da Nang was (and is,) struggling with the criteria of a liveable city as investors and tourists are not benefiting from the policy (p.154). The author then discussed the recent idea of Danang as an inspiring city by Le (2018) in an internal unpublished document. Inspiring places was approached from peak experience: inspiring places facilitates the peak experience and personal journey beyond interaction with other people and culture to reach one's inner self (Keken, in TPBO, 2015). According to Keken, an inspiring city highlights the importance of interaction with the other, a sense of accomplishment and creating emotional attachment through human touch. However, this theory is inappropriate with the Gen Z, besides, base on the fantasticity slogan, to orient Danang's destination image to Gen Z, it can be considered:

P2a: Tourist's perception of Danang as an fantasticity can be effectively delivered through nature attributes: Luxurious destination, Beaches, Tropical Sun

P2b: Tourist's perception of Danang as an fantasticity can be effectively delivered through human touch attributes: friendliness, young, and dynamic



3. Conclusion

In conclusion, to motivate the revisit intention of domestic visitors, destination images play a vital role that can influence the extrinsic and intrinsic desire to revisit Danang city by push and pull factors, respectively. Moreover, this theoretical paper discusses the views of the gap between projected images and perceived images in terms of attracting the attention of visitors to the destination branding. However, these deliberations are only based on theory and previous researchers' work without practical research, which is predicted to work in the future

Appendix

RQ1: Which factors influence revisit intention in the context of Vietnamese Gen Z domestic travel?

RQ2: How destination images motivate customers' revisit intentions effectively?

RQ3: How are visitors motivated intrinsically and extrinsically to revisit Da Nang by push and pull factors?

RQ4: How is the perceived image congruent with the projected image to build the destination brand in visitor perception?

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INFLUENCE OF SUSTAINABLE MARKETING ON CUSTOMER LOYALTY: A STUDY OF VIETNAMESE COFFEE

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ABSTRACT

During the last three decades, Asian countries in general and Vietnam in particular have achieved significant economic development, but that growth has been accompanied by corresponding ecological degradation. Faced with that situation, business activities towards sustainable development are extremely necessary. The study analyzes the influence of sustainable marketing factors including: economic, cultural, environmental and social on customer loyalty in the Vietnamese coffee market. Based on the analysis of 284 customers, the authors conduct the analysis through SPSS 20.0 software. The analysis results show that social, environmental and economic factors affect customer loyalty in the Vietnamese coffee market. The results of the study are the basis for coffee businesses and brands to build marketing strategies towards customer loyalty, and at the same time improve sustainability in economic development.

Keywords: Sustainable marketing, customer loyalty, Vietnamese coffee market.

1. Introduction

In the world, organizations and businesses are gradually prioritizing sustainability to maintain consistent growth in their businesses. By carrying out many activities for sustainability, organizations and businesses have laid the foundation for long-term development. Marketing activities in organizations focus on satisfying the social and ethical needs of customers (Choi & Sung 2013) [4]. Sustainable marketing activities have a positive impact on improving brand image, profit growth and longevity of the business (Ross Gordon, Marylyn Carrigan & Gerard Hastings, 2011) [31]. Thus, an organization's sustainable marketing activities aim to build a positive brand image and attitude towards customers (Kv&umpully & Suhartanto, 2003) [17]; in return, the organization gains a competitive advantage based on brand equity (Porter & Kramer, 2006) [27].

Besides, according to the World Bank (2020), Vietnam's development over the past 30 years is remarkable. Economic and political reforms since 1986 have spurred economic development, rapidly transforming Vietnam from one of the poorest countries in the world to a lower middle-income country. From 2002 to 2018, GDP per capita increased 2.7 times, reaching over USD 2,700 in 2019, with more than 45 million people escaping poverty. The poverty rate dropped sharply from more than 70% to less than 6% (\$3.2/day at purchasing power parity).

Along with the rapid growth and industrialization of Vietnam, it has left many negative impacts on the environment and natural resources. Total electricity consumption has tripled in the past 10 years, faster than electricity production. With an increasing reliance on fossil fuels, the energy sector emits nearly two-thirds of the country's total greenhouse gas emissions. Unsustainable exploitation of natural resources such as sand, fisheries and timber can negatively affect long-term growth prospects. Given the above situation, it is necessary to come up with sustainable solutions for stable and long-term development. Specifically, the sustainable solution mentioned in this study is sustainable marketing.

As for the Vietnamese coffee market, according to Euromonitor's report published in the first year of 2020, the five largest coffee chains in Vietnam accounted for 15.3% of the market share. In which, Starbucks holds nearly 3% of the market share and Highland Coffee holds more than 7%. Sales of major coffee brands

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continuously increase; In 2019, Highland Coffee's revenue reached VND 2,199 billion, followed by The Coffee House with VND 863 billion, Starbucks 783 with VND billion, Phuc Long with VND 779 billion and Trung Nguyen with VND 409 billion. It can be said that the Vietnamese beverage market has never cooled down, especially coffee. Big brands always have fierce competition and make a lot of profit and contribute to economic development.

Because of the above points, this study analyzes the relationship between the factors of sustainable marketing affecting customer loyalty in the Vietnamese coffee market. Through that, it is possible to offer solutions and recommendations to help businesses and organizations promote sustainable marketing activities to build customer loyalty, contributing towards the development of a sustainable economy.

2. Literature review

2.1. Sustainable marketing

Elkington (1997) [6] claims that sustainable marketing activities should contain three factors: economic, social, and environmental. Sustainable marketing refers to the decision-making process and business activities by the local community and consumers, such as production and sales, and their social environment and environmental-friendly ethics. Cultural activities aim at recognizing cultural diversity (Kim et al., 2015; Kim & Schellhase, 2015; Sun & Ko, 2016) [14][13][36]. The conceptualization of sustainability has prompted active discussion in various fields (Ko et al., 2015; Kim, 2015; Rapert, Newman, Park, & Lee, 2010) [15][12][25]. As society's interest in sustainability grows, companies use sustainability management activities to get closer to customers (Lee, Park, & Lee, 2013) [18]. Recent sustainable marketing activities have evolved into an era of shared value management beyond corporate CSR (Choi et al., 2013) [4]. Furthermore, sustainable marketing activities pursue mutual growth and harmony among factors such as the economy, environment, society, and culture (Gladwin, Kennelly, & Krause, 1995) [7].

- ***Economical factors***

Economic marketing activities represent sharing economic benefits through economic support within a region. The activity should share economic benefits with customers, employees, partners, and stakeholders in the community; it should also promote company growth through profits. Amalrick and Hauser (2005) [2] argue that innovation, creation of value, and efficient management should generate profits through new products and services as well as share profits with local stakeholders. Economic accountability also has a positive impact on revenue growth (Maignan, Gonzalez-Padron, Hult, & Ferrell, 2011) [21]. Thus, economic marketing activities should maximize profits based on the efficiency of management through the establishment of an e-commerce environment, enhancement of store environment, and modernization of facilities

- ***Cultural factors***

Cultural marketing activities are “the consideration, preservation, and presentation of tangible and intangible heritage, artistic production, as well as the knowledge and skills of various social groups, communities, and nations” (Stylianou-Lambert, Boukas, & Christodoulou-Yerali, 2014) [35]. In this decade, the role of culture is emphasized as the center of sustainable development (Lee et al., 2013; Kong, Ko, Chae, & Mattila, 2016; Jang, Ko, Chun, & Lee, 2012) [18][16][9]. This trend has evolved to focus on psychological factors such as experience, story, history, and service in rapidly changing industries such as design, production, prices, and brands (Ro & Kim, 2011) [30]. Cultural marketing activities are related to the role a company plays in society, explicitly crafting a culture, and they help promote a company's various cultural characteristics applicable to its society (Jun, Kim, Yi, & Park, 2016) [10].

- ***Environmental factors***

Environmental marketing activities means, “all activities designed to generate and facilitate any exchanges intended to satisfy human needs or wants, such that the satisfaction of these needs and wants occurs, with minimal detrimental impact on the natural environment” (Stanton & Futrell, 1987) [34].

Examples include the development of environmentally-friendly fashion products through recycling shopping bag sharing events, re-use of recycled banners, and protection of nature for green growth. These activities are important, as consumers are becoming increasingly interested in eco-friendly consumption.

- ***Social factors***

Social marketing activities are social contribution activities that achieve other objectives of a company, besides business tasks aimed at pursuing profits (Min Kong & Ko, 2017; Sun, Kim, & Kim, 2014) [22][37]. Social activities also have a positive effect on consumers' beliefs about a company. A company's social activities help customers remain tied to their behavioral intentions, such as their reactions and attitudes toward a company's products (Sen & Bhattacharya, 2001; Park, Lee, & Koo, 2017; Lee & Sung, 2016) [32][25][19]. As a member of society, companies are aware of their roles and carry out their social responsibilities to the local community. Then, companies can evolve into social enterprises from a long-term perspective. For example, social contribution activities include sharing food with community members, conducting free health examinations for residents, and other community volunteering activities.

2.2. Customer loyalty

Oliver (2010) [23] defines loyalty as “a strong willingness to buy or visit a consistent, preferred product or service, even if the consumer is in a situation that could trigger a conversion action to select another brand.” Loyalty also exists when customers resist the pressure to switch to another brand. Thus, loyalty results in regularly purchasing or reusing a particular product or service or repeatedly consuming the same brand (Oliver, 1999) [24]. Loyalty can help companies acquire a stable customer base, reduce acquisition and transaction costs, and lower revenue volatility (Srivastava, Shervani, & Fahey, 1999) [33]. Other benefits include lower marketing costs, attracting a more significant number of clients, increasing market share, and willingness to pay premium prices (Aaker, 1996; Rauyruen) [1]. Consumer loyalty, therefore, is a critical factor for a brand's long-term competitive advantage and is an essential goal in the service marketing industry.

3. Analytical Framework

Based on analytical framework and the results of Jung, Kim & Kim (2020) [11], Kim & Schellhase (2015) [13] and Sun & Ko (2016) [36], this research will assess the influence of sustainable marketing on customer loyalty in Vietnamese coffee market through 4 dimensions:

- Economical factors such as management and production, economic power
- Cultural factors such as different ethnic, spiritual values
- Environmental factors such as recycle wastes, consider environment
- Social factors such as donating, take care of employees

Besides, this study also examines the relationship between sustainable marketing and customer loyalty. The analytical framework is shown as following:

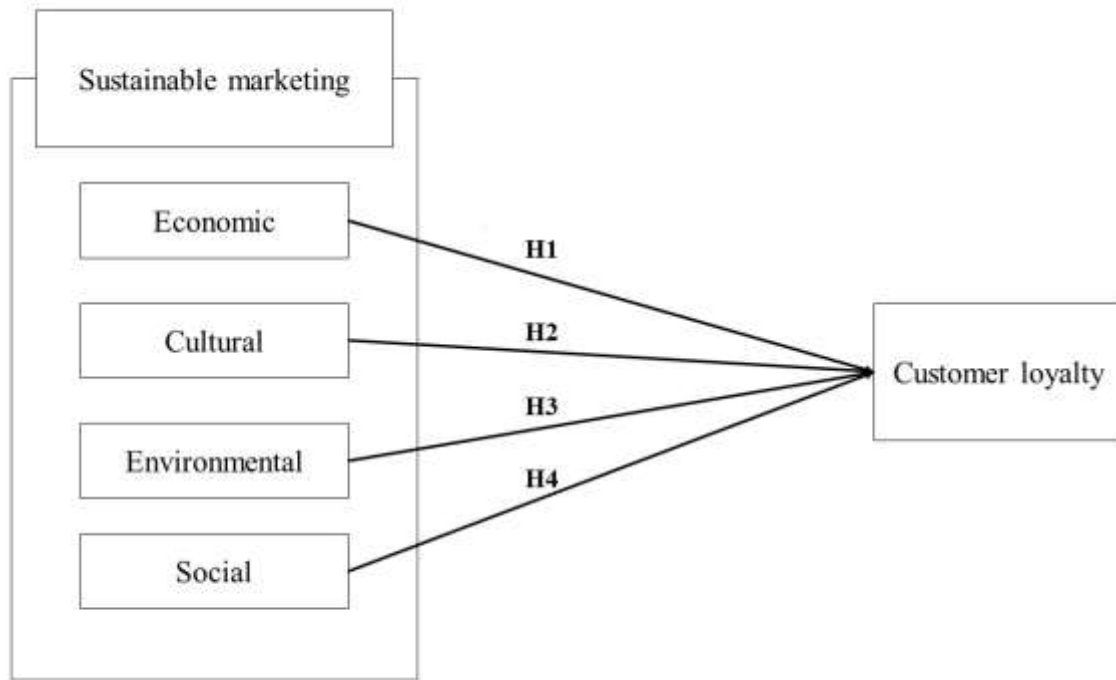


Fig 1: Research framework

Analytical Framework has 4 hypotheses including:

Hypothesis 1: Economic marketing has a positive impact on local customer loyalty

Hypothesis 2: Cultural marketing has a positive impact on customer loyalty

Hypothesis 3: Environment marketing has a positive impact on customer loyalty

Hypothesis 4: Social marketing has a positive impact on customer loyalty

4. Research method

4.1. Data collection

Based on reviewing literature to model the analytical framework, a questionnaire was built and divided into 3 sections:

The first section was designed to measure sustainable marketing activities. This part comprises 16 statements in total measuring 5 dimensions of sustainable marketing: Economic (4 items), Cultural (3 items), Environment (6 items), Social (3 items).

The second section aims to assess the perceived level of customer loyalty including 5 items.

The last section consists of questions relating to demographic information about respondents, such as age, gender, income and frequency .

The first two sections are measured using a 5-point Likert rating scale, which corresponds to 1 = strongly disagree, 2 = somewhat disagree, 3 = neither agree nor disagree, 4 = somewhat agree, and 5 = strongly agree. This questionnaire was in Vietnamese and was used to survey customers in the Vietnamese coffee market so that they could give more meaningful responses. A total of 284 potential customers were approached and 203 responses were obtained, indicating a response rate of 71%. All the respondents are Vietnamese. The majority of respondents are between the ages of 18 and 30 with 86% including 58% percent being female, 39% percent male. Average monthly income from 5 million VND to 20 million VND.

4.2. Research method

The study used statistical analysis software SPSS 20.0. The authors have tested the reliability of the variables Cronbach's Alpha, and conduct exploratory factor analysis EFA to identify sustainable marketing factors that mainly affect customer loyalty. The authors remove, arrange the remaining variables into factor groups based on the results of the rotated factor matrix table. From there, the study gives a regression table of the importance of groups of variables to the model. Regression results serve as the basis for proposing some solutions to help businesses implement appropriate marketing activities to both build customer loyalty and contribute to the sustainability of economic development. .

5. Results

Data collected are firstly tested to ensure the reliability through Cronbach's alpha value with the purpose to check the internal consistency. Internal consistency describes the extent to which all the items in a test measure the same concept or construct, hence it is connected to the inner-relatedness of the items within the test. In general, the alpha coefficient ranges in value from 0 to 1, and the increase of this value means that the correlations between the items increase. In this study, scales which have Cronbach's alpha coefficient greater than or equal to 0.6 will be accepted. Besides, variables which have greater than 0.3 item-total correlations will be accepted; the others which have smaller than 0.3 item-total correlations will be eliminated from analysis data. The result of this study indicated that all Cronbach's alpha values of 5 dimensions ranged from 0.915 - 0.727 (Table 1), showing high reliability level of the database.

Table 1: Cronbach's Alpha test

| Dimension | Coding | Cronbach's alpha |
|-----------------------|--------|------------------|
| Economic marketing | ECO | 0,727 |
| Cultural marketing | CUL | 0,755 |
| Environment marketing | ENV | 0,883 |
| Social marketing | SOC | 0,840 |
| Customer loyalty | LOY | 0,915 |

Then, conducting exploratory factor analysis (EFA), the results showed that the variables ECO3, ENV6 were unsatisfied because these variables were in 2 groups of factors and the absolute difference of factor loading coefficient was not greater than 0.3 and the variables ECO1 and ENV4 are unsatisfied due to factor loadings or factor loadings < 0.5 (Hoang Trong et al., 2008) [3]. The KMO coefficient = 0.905 satisfies the requirements ($0.5 < KMO < 1$) and the Bartlett test has Sig. = 0.000 (< 0.05) showing that the EFA exploratory factor analysis is appropriate with the actual data.

Table 2: KMO and Bartlett's Test

| | | |
|--------------------------------------------------|--------------------|-----------|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | 0,905 |
| Bartlett's Test of Sphericity | Approx. Chi-Square | 1.253.672 |
| | df | 66 |
| | Sig. | 0.000 |

Regression analysis was conducted to test the relationship between sustainable marketing and customer loyalty in the Vietnamese coffee market. Firstly, mean scores of both dependent variables (customer loyalty) and independent variables (Economic, Cultural, Environment, Social) for 203 respondents are calculated. In investigating the impact of sustainable marketing on customer loyalty in the Vietnamese

coffee market, the R Squared value indicates that 60,9% of the variance in customer loyalty can be explained by 5 sustainable marketing variables. Moreover, a significant value of 0.000 confirms that a group of four sustainable marketing components have a statistically significant relationship with customer loyalty variables at the 5% significant level.

Table 3: Regression analysis result

| R | 0.781 | | | | | | |
|-------------------|-----------------------------|------------|---------------------------|-------|-------|-------------------------|-------|
| R square | 0.609 | | | | | | |
| Adjusted R square | 0.603 | | | | | | |
| Sig. | 0.000 | | | | | | |
| | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Collinearity Statistics | |
| | B | Std. Error | Beta | | | Tolerance | VIF |
| (Constant) | 0,241 | 0,206 | | 1.172 | 0,243 | | |
| ECO | 0,151 | 0,063 | 0,145 | 2.397 | 0,017 | 0,532 | 1.880 |
| CUL | 0,960 | 0,063 | 0,093 | 1.523 | 0,129 | 0,525 | 1.905 |
| ENV | 0,256 | 0,059 | 0,259 | 4.356 | 0.000 | 0,550 | 1.817 |
| SOC | 0,442 | 0,063 | 0,428 | 7.040 | 0.000 | 0,528 | 1.896 |

Apart from culture, three remaining sustainable marketing components express a significantly positive impact on customer loyalty at the 5% significant level. Social component shows the strongest impact on customer loyalty with the highest coefficient value of 0,442. Then, the environment component, which refers to recycling wastes, considering the environment used to impress the customer, shows the coefficient value of 0,256. Last but not least, the economic component, which is related to management, production and economic power, shows a coefficient value of 0,151.

Table 4: Hypothesis test

| | | | |
|--------------|--------------------------------------------------------------------|-----------|----------|
| Hypothesis 1 | Economic marketing has a positive impact on local customer loyalty | ECO → LOY | Accept |
| Hypothesis 2 | Cultural marketing has a positive impact on customer loyalty | CUL → LOY | Unaccept |
| Hypothesis 3 | Environment marketing has a positive impact on customer loyalty | ENV → LOY | Accept |
| Hypothesis 4 | Social marketing has a positive impact on customer loyalty | SCO → LOY | Accept |

Research results show that apart from hypothesis 2, the remaining 3 hypotheses are accepted. It is concluded that sustainable marketing affects customer loyalty in the Vietnamese coffee market, and that influence is described by the following equation:

$$LOY = 0,241 + 0,442 SOC + 0,256 ENV + 0,151 ECO$$

6. Findings and discussions

From the regression results of the study, it shows that the economic, environmental and social factors of sustainable marketing have a positive influence on customer loyalty in the Vietnamese coffee market. In which, social factors in sustainable marketing have the strongest influence on customer loyalty, followed by environmental factors and finally economic factors.

Social is the most important element of sustainable marketing. This element of sustainable marketing is social contribution activities aimed at achieving other brand objectives, which are carried out concurrently with business missions in pursuit of profit. Social activities also have a positive impact on customer trust in the brand and the aim of building customer loyalty. Therefore, businesses need to support and implement projects that are useful to the community, showing their concern about the level of public health and safety, and make efforts to help those in need, a group of people with less fortune, difficulties and weaknesses in society.

Environmental factors have the second most important role in sustainable marketing. This factor can be understood as activities designed to create favorable conditions with minimal adverse impact on the natural environment. Enterprises need to develop a socially responsible discharge process, making use of waste products such as coffee grounds, limit the use of plastic and plastic bags, prioritize the use of green items such as paper and bamboo, and use devices to reduce energy consumption and power from solar energy.

Economy is the factor in sustainable marketing that has the least impact on customer loyalty. This shows that activities that contribute to technological innovation or promote economic growth of coffee brands in the Vietnamese market have not received much attention from customers. To improve this situation, businesses need to apply technology to the coffee-making process, digitize customer and business information, and show their contribution to GDP growth. The economy and sustainable development activities of enterprises into the general sustainable development economy.

The customer loyalty factor is also a motivating factor for businesses to implement sustainable marketing activities, activities that are associated with factors of social development, environmental protection, ensuring both development and sustainability of the economy. Therefore, consumers when choosing products and services of a brand, business or organization need to consider sustainable factors in their marketing in order to contribute to sustainable economic development.

7. Conclusions

The results of this study indicated that apart from culture, three remaining sustainable marketing components express a significantly positive impact on customer loyalty. In addition, the findings also help businesses and brands in the Vietnamese coffee market improve the quality of services and brand image, contributing to building customer loyalty.

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PARTICIPATION OF VIETNAM IN THE GLOBAL GARMENT AND TEXTILE VALUE CHAIN

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ABSTRACT

The garment and textile industry is one of the industries growing strongly with high technology speed, capable of creating more jobs for workers, increasing profits for accumulation as a premise for development for other industries. The international production network of the garment and textile industry is getting more and more attention. Immersed in the context of global economic integration, Vietnam's garment and textile industry is trying to affirm an essential role in the development of the domestic economy and the international production network. Applying indicators assessing a country's participation in the Global Value Chain (GVC), the article analyzes and evaluates Vietnam's participation in the global garment and textile value chain and compares it with ASEAN-5 countries to identify opportunities and challenges of Vietnam when participating in the chain. Research results show that Vietnam gradually transforms itself into an upstream position to gain more added value. Vietnam's participation in the chain tends to decrease due to the limited involvement in the forward linkage. Currently, Vietnam mainly exports garments and textiles in the form of CMT, which makes the rate of value earned for the garment and textile industry only low. Comparing Vietnam's participation in the global garment and textile value chain with countries in the ASEAN-5 region shows that while Vietnam's participation index is relatively higher, Vietnam's position index is relatively lower. Based on the results obtained, the article has proposed implications for Vietnam to continue to improve its participation and position in the chain.

Keywords: Global value chain, garment and textile, Vietnam, ASEAN-5.

1. Introduction.

In harmony with the development trend of the world, Vietnam is increasingly participating in globalization, integrating more profoundly and broader with the region and the world. Currently, Vietnam's international integration process is being actively implemented in the new context of the world with many changes. Many bilateral, regional, and multilateral free trade agreements (FTAs) have been successfully signed. Some notable recent agreements include the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP), Vietnam - EU Free Trade Agreement (EVFTA), Free Trade Agreement Because Vietnam - UK (UKVFTA), and the Regional Comprehensive Economic Partnership (RCEP) have created many open opportunities for Vietnam to reach further and deeper into the international market.

Since 1998, Vietnam's garment and textile industry has developed brilliantly with a series of events expanding investment and trade relations with countries and territories worldwide. For Vietnam, garment and textile is one of the key industries and are focused on developing to serve the process of industrialization and modernization of the country. Vietnam's garment and textile industry has a long history of development and has made many contributions to the country's economic growth. Since Vietnam acceded to the WTO (2006), Vietnam's garment and textile industry has achieved many outstanding achievements. Specifically, Vietnam's garments and textiles are currently the top export item and have had a growth rate. According to data from the General Statistics Office and Report of Textile and Garment (2017), the garment and textile industry is the second-largest export turnover industry in the country, creating jobs for a large number of workers (accounting for more than 20% of the labor force and nearly 5% of the total national workforce).

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Immersed in the context of deep international economic integration and vigorous efforts to develop the garment and textile industry, the prospect for Vietnam to participate more deeply in the global garment and textile value chain is very active. The article “*Participation of Vietnam in the global garment and textile value chain*” focused on analyzing and evaluating the participation of Vietnam's garment and textile industry in the global value chain and compared it with ASEAN-5 countries, including Thailand, Malaysia, Indonesia, the Philippines, and Singapore. On that basis, the article will identify the opportunities and challenges of Vietnam when participating in the global garment and textile value chain, from there, propose some implications for Vietnam to continue promoting its participation and position in the chain.

2. Theoretical framework.

2.1. Definition and structure of global value chain.

The term global value chain has formed and developed through several concepts such as commodity chains, supply chains, and value networks. While a supply chain is more about the relationship between a business and its suppliers and customers to provide products or services at a lower cost (Christopher, 2005), global value chains go deeper and focus on certain value-creating activities of the links in the chain to create competitive advantages (Al-Mudimigh et al., 2004).

There are many views and interpretations of global value chains. The concept of a global value chain originates from the idea of "value chain," initiated by Michael Porter in the 90s of the twentieth century. In which, a value chain is a set of activities such as designing, producing, distributing, and marketing... to bring a product from a concept to be usable and after-sales service. These activities can be carried out within a single enterprise or shared between different businesses.

Koopman et al. (2010) define: "Global value chain is the entire production process of goods, from raw materials to finished products. They are completed wherever the skills and raw materials needed to manufacture are available at competitive prices and guarantee the quality of the finished product."

However, later, the concept of the global value chain was updated by famous and experienced researchers in the field of value chains, Stefano Ponte, Gary Gereffi, and Gale Raj-Reichert (2019) defined “A global value chain is a complete chain of activities that enterprises and employees perform to bring a product from concept to end-use and beyond, is done on a global scale and can be undertaken by one or more businesses.”

According to Ponte et al. (2019), the structure of a neutral GVC consists of four main parts: (1) value-added activities or economic functions; (2) supply chain; (3) output market; and (4) supportive environment (Figure 1).

“Value-added activities” represent six essential functions that a business can engage in to take a product from concept to creation, starting with research and design, then production and distribution, and finally marketing, sales, and after-sales services. Research and development include activities related to the improvement or development of a product, a process, market, and consumers. The design consists of aesthetic and technical product development, where software and modeling tools play a vital role in this link. Production is creating products to sell to other companies in the chain or to the end consumer. Logistics and distribution involve the transportation or storage of products or inputs. The companies involved in this activity are usually wholesalers, intermediaries, distribution centers, and warehouses. Marketing and sales are associated with brand promotion, advertising, and sales activities. Other services include after-sales service, customer support service, repair, maintenance, etc.

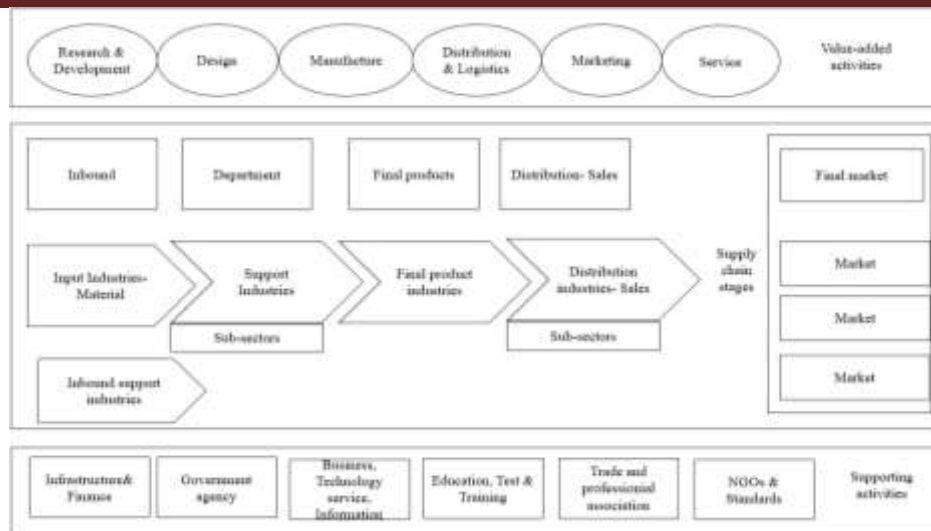


Figure 1. The structure of the global value chain

Source: Ponte et al. (2019).

The supply chain is an essential element of the value chain. It is a connection between companies and suppliers to produce and deliver a product or service from its initial state to the final customer. A typical supply chain includes the following main stages: (i) input materials; (ii) intermediaries; (iii) final product; and (iv) distribution and sales. Supply chains have become a powerful tool for organizations to optimize their production, storage, and transportation processes.

Output market segmentation of a final product or service is often based on demographics, needs, priorities, shared interests, and other psychological or behavioral criteria that help organizations identify customers.

The supportive environment is the policy and non-policy elements, represented by the institutional actors at the local and global levels responsible for setting and enforcing the legal rules for participating in the global value chain.

2.2. Definition and structure of the global garment and textile value chain.

Based on the definition of the global value chain and basic features of the international production network of the textile industry, the global value chain of the textile industry is defined as: “a series of activities from the Research, design, production of materials, cutting and sewing, distribution, marketing and sales of textile products; each stage of creating different values and often involving the coordination of many countries in the world”.

Gereffi and Memedovic (2003) depicted the structure of the global garment and textile value chain as follows (Figure 2).

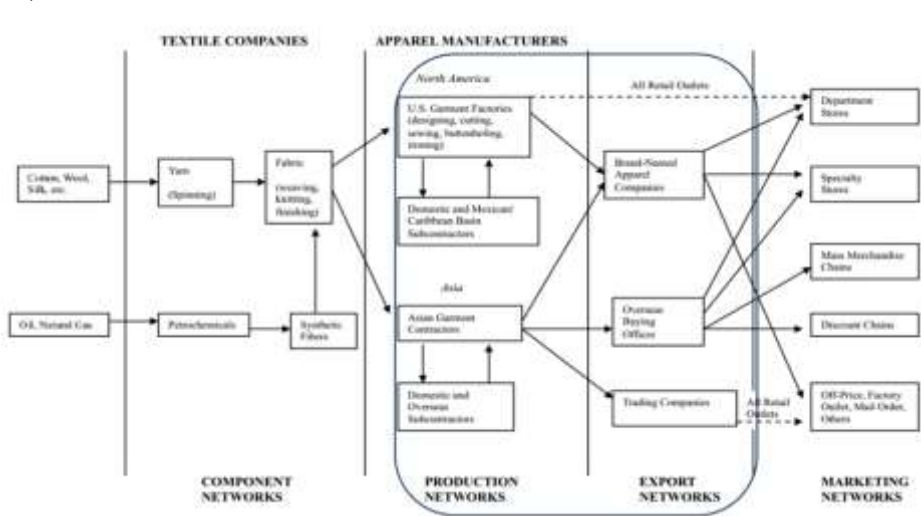


Figure 2. The structure of the global textile value chain.

Source : Gereffi và Memdovic, 2003.

The first segment is the raw material stage, consisting of inputs (natural and artificial fiber manufacturing operations) and factors of production (including natural and synthetic fabrics). The second segment is the auxiliary materials when textile companies use yarn inputs from the raw material network. The third segment is the production network, consisting of garment factories and subcontractors concentrated mainly in North America and Asia, performing the design, cutting, sewing, and finishing of products. The fourth segment is an export operated by branded apparel companies and trading companies to deliver products to retailers worldwide. The fifth segment is the marketing carried out by retailers worldwide to bring products to the end consumers.

2.3. Definition of participation in the global value chain

When it comes to defining a country's participation in global value chains, the method that has attracted the most attention to date is Hummels, Ishii, and Yi (2001), associated with the term “dimensional specialization vertical” and the inherit and complete of Koopman, Power, Wang, and Wei (2010). Specifically, Koopman, Power, Wang, and Wei (2010) decomposed a country's total exports to the world as the sum of the following five terms (Figure 3):

- (1) Domestic value-added embodied in exports of final goods and services absorbed by the direct importer;
- (2) Domestic value-added embodied in exports of intermediate inputs used by the direct importer to produce its domestically needed products;
- (3) Domestic value-added embodied in intermediate exports used by the direct importer to produce goods for third countries (“indirect value-added exports”).
- (4) Domestic value-added embodied in intermediate exports used by the direct importer to produce goods shipped back to the source (“reflected domestic value-added”).
- (5) Value-added from foreign countries embodied in gross exports (“foreign value-added used in exports”).

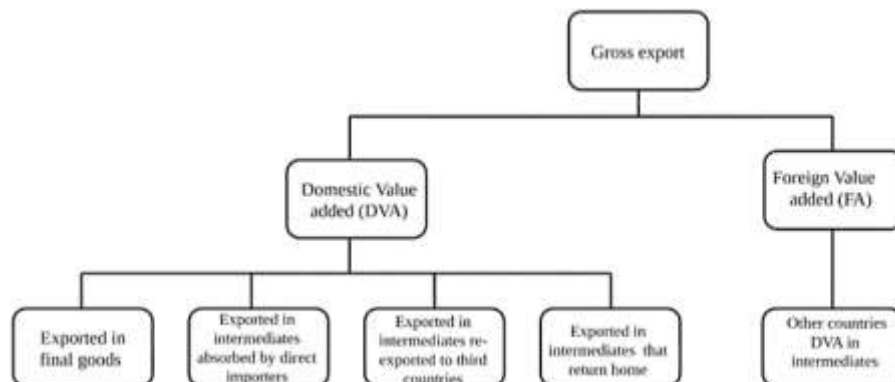


Figure 3. Decomposition of gross export.

Source: Koopman et al. (2010).

Accordingly, Koopman et al. (2010) defined the participation of a country/industry in the global value chain as: “The participation in the forward and backward linkage in the value chain and is determined based on the source of the value-added represented in the total exports of the particular country/industry. Participation in the backward linkage shows the extent to which domestic firms use foreign value-added for export activities. While forward linkage participation is when a given country's exports are used by firms in other countries as inputs for their exports”

3. Research method and data

3.1. Research method

Koopman et al. (2010) proposed a mathematical framework to measure country/industry participation in global value chains through the following four indicators: i) Backward linkage index; ii) Forward linkage index; iii) Position index; iv) and Participation in global value chains index.

i) The backward linkage index is shown in the import of foreign inputs/intermediate goods for domestic export is calculated as follows:

$$\text{Backward linkage} = \frac{\text{FVA}}{\text{GE}}$$

In which, FVA: Value-added from abroad shown in total exports (foreign value added is used in exports); GE: Total exports of the reference country.

ii) The forward linkage index is reflected in the export of intermediate goods abroad and continues to be exported to a third country is calculated as follows:

$$\text{Forward linkage} = \frac{\text{DVX}}{\text{GE}}$$

In which, DVX: Domestic value-added is reflected in the export of intermediate goods that the importer directly uses to produce the good and exports to third countries (indirect value-added exports); GE: Total exports of the reference country.

iii) Position index is calculated as follows:

$$\text{GVC_Position} = \log \left(1 + \frac{\text{DVX}}{\text{GE}} \right) - \log \left(1 + \frac{\text{FVA}}{\text{GE}} \right)$$

In which, DVX: Domestic value-added is reflected in the export of intermediate goods that the importer directly uses to produce the good and exports to third countries (indirect value-added exports); FVA: Value-added from abroad shown in total exports (foreign value added is used in exports); GE: Total exports of the reference country.

The GVC_Position position index is used to determine the position of a country upstream or downstream in the GVC. If GVC_Position > 0, it means that the share of indirect value-added (DVX) exports in total exports will be higher than the share of foreign value-added (FVA) imports in the country's total exports, which means that the country is located upstream of GVCs. Conversely, when GVC_Position < 0, the country is located downstream of GVCs.

iv) Participation index is calculated as follows:

$$\text{GVC_Participation} = \frac{\text{DVX}}{\text{GE}} + \frac{\text{FVA}}{\text{GE}}$$

In which, DVX: Domestic value-added is reflected in the export of intermediate goods that the importer directly uses to produce the good and exports to third countries (indirect value-added exports); FVA: Value-added from abroad shown in total exports (foreign value added is used in exports); GE: Total exports of the reference country.

The GVC_Participation Index indicates a country's level of participation in GVCs, the openness of its economy, and its role in GVCs. An in-depth analysis of this indicator also shows that the country is mainly participating in GVCs at the backward or forward linkage in GVCs at a specific moment. If the country is primarily engaged in the forward link, it is mainly engaged in exporting intermediate goods to foreign markets and continues to be exported to third countries. If the country is primarily involved in the backward linkage, then that country is mainly engaged in importing inputs from abroad.

3.2. Data.

To trace value-added trade flows between countries, the researchers combined information from customs authorities with country input and output tables to build a global input-output table. The most widely used are the World Input-Output Database (WIOD), a collaborative project led by researchers at the University of Groningen; the Trade Value Added (TiVA) database compiled by the Organization for Economic Cooperation and Development (OECD); and the Eora global supply chain database built by a team of researchers at the University of Sydney. This study uses the Eora database to calculate indicators showing Vietnam's participation in the global value chain and the global garment and textile value chain in particular.

4. Results and discussions

4.1. Overview of Vietnam's participation in the global textile and garment value chain.

Regarding Vietnam's position in the global garment and textile value chain in the period 2010-2017, although it is located downstream of the chain, Vietnam has been recording a stable and sustainable improvement in its position over the years. Specifically, the position index (GVC_Position) of Vietnam in the global garment and textile value chain is negative, showing that Vietnam is located downstream of the chain. Typically, downstream positions will generate less added value than upstream positions (IMF, 2019; UNCTAD, 2013), however, OCED (2015) and IMF (2019) have pointed out that even countries located downstream, or focusing on import activities when participating in the global value chains, can also gain benefits. However, throughout the year, Vietnam's position index has also recorded a relatively sustainable improvement. Specifically, Vietnam's position index in the global garment and textile value chain increased from -0.232 in 2010 to -0.184 in 2017 (Figure 4). This is a potential development trend for Vietnam's textile and garment industry, as it moves towards its upstream position and probably has opportunities to gain more added value for the country.

Two factors contribute to the positive status of Vietnam's participation in the global garment and textile value chain. Firstly, Vietnam is increasingly exporting value-added garment and textile industry to foreign markets and continues to export to third countries. Specifically, the share of DVX – representing the participation in the forward linkage in the global value chain – in total value-added exports of Vietnam's garment and textile industry has increased markedly, from 3.31% in 2010 to 7.43% in 2017 (Figure 5). Second, Vietnam is strongly restricting the value-added import of the garment and textile industry from abroad. Specifically, the share of FVA – representing the participation in the backward linkage in the global value chain – in total value-added exports of Vietnam's garment and textile industry decreased significantly, from 76.11% in 2010 to 63.92% in 2017. The combination has also created momentum for Vietnam to move upstream in the global garment and textile value chain, promising to bring more benefits to the industry and the country.

There has been a significant change in the level of Vietnam's participation in the global garment and textile value chain from 2010-to 2017. Specifically, in the early years of the study period, Vietnam's participation index in the global value chain was about 78-80%, but Vietnam strongly limited its participation to about 70-72% in the following years. The main reason is Vietnam's limited participation in the backward linkage or the import of input materials of the garment and textile industry from abroad (Figure 5). This is a good sign that Vietnam has been more proactive in supplying raw materials for the production of garments and textiles.

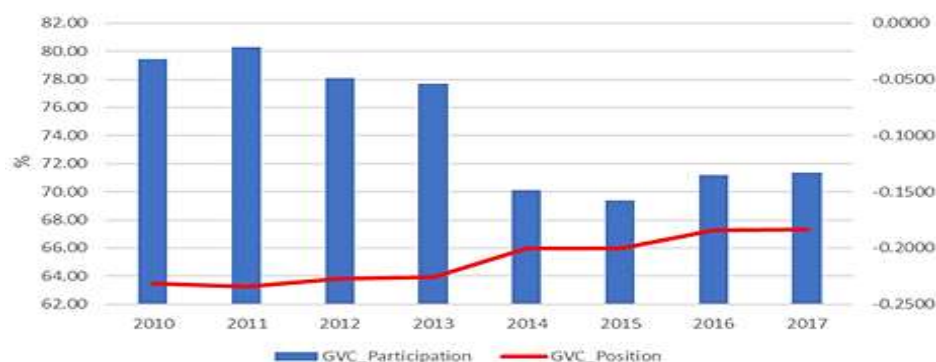


Figure 4. Indicator of Vietnam's position and participation in the global textile and garment value chain

Source: Research team's calculations from MRIO, UNCTAD data.

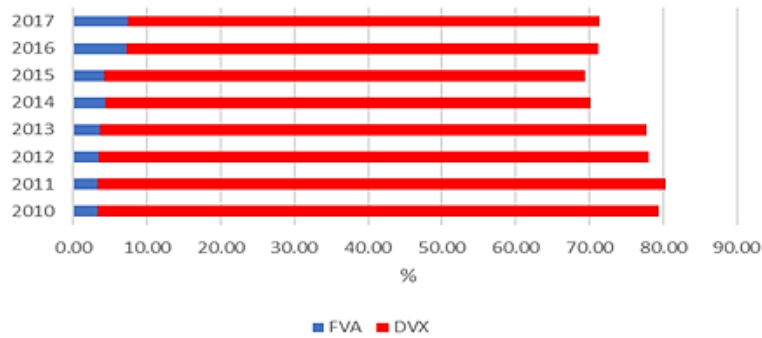


Figure 5. Vietnam's participation in the forward and backward linkages in the global garment and textile value chain

Source: Research team's calculations from MRIO, UNCTAD data.

Regarding the segment where Vietnam mainly participates in the global garment and textile value chain, Vietnam participates primarily in cutting and sewing, which usually gains the least value-added in the smile curve. According to statistics of the Vietnam garment and textile association, in 2013, the rate of garment export of Vietnam by CMT (Cut - Make - Trim) method accounted for 70%, export by FOB method was only about 25%, remaining 4% by ODM method and only 1% by OBM method; In 2015, Vietnam continued to participate in the global value chain at the production stage, mainly by CMT (65%) and FOB (30%, of which FOB level 1: 20%, FOB level 2:10). %) and in 2019, CMT accounted for about 65% of total export turnover, while advanced business models such as OEM and ODM production in Vietnam only accounted for 35%. Thus, it can be seen that the export of garments and textiles, mainly in the form of CMT, has made the rate of return for Vietnam's garments and textiles relatively low. Meanwhile, manufacturers worldwide are competing by moving to FOB level III or ODM production methods to gain influential positions in the garment and textile global market.

4.2. Comparison of Vietnam's participation in the global garment and textile value chain with ASEAN-5 countries.

Comparing Vietnam's position with ASEAN-5 countries in the global garment and textile value chain in the period 2010-2017, although all selected countries are downstream with the GVC_Position <0, Vietnam's position is still quite lagging (Figure 6). ASEAN-5 countries often focus on labor-intensive stages such as CMT production, while activities requiring high-value technology and capital such as design and marketing usually belong to developed economies. However, compared to ASEAN-5, Vietnam had a significantly lower GVC_Position index of about -0.023 to 2010-to-2017, while ASEAN-5 countries have a GVC_Position index between -0.02 and 0. Usually, the closer the GVC_Position index is to 0, or greater than 0, corresponding to the shift or upstream of the value chain, bringing more value-added to the country/industry (IMF, 2019; UNCTAD, 2013). Therefore, Vietnam will need to reconsider its position in the international production network of the garment and textile industry to be able to stand out in the region and global marketplace.



Figure 6. The index of Vietnam's and ASEAN-5 countries' positions in the global textile and garment value chain

Source: Research team's calculations from MRIO, UNCTAD data.

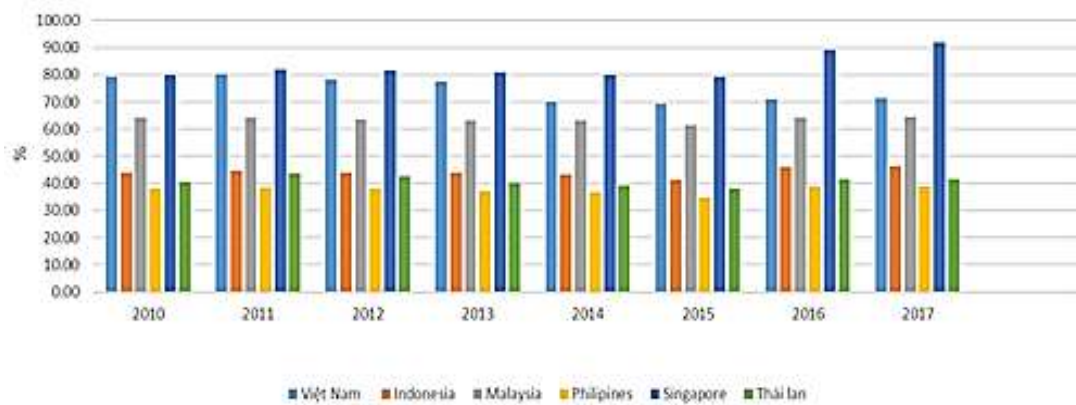


Figure 7: Participation index of Vietnam and the ASEAN-5 countries in the global textile and garment value chain from 2010 to 2017

Source: Research team's calculations from MRIO, UNCTAD data.

Regarding the degree of participation in the global garment and textile value chain of Vietnam and ASEAN-5 countries in 2010-2017, Vietnam played a pretty active role in the chain but mainly participated in the backward linkages. Specifically, while the index of Vietnam's participation in the global value chain of the garment and textile industry was about 70% in the period 2010-2017, the ASEAN-5 countries only reached about 50% (Figure 7). This shows that Vietnam has a relatively open orientation when participating in the international production network of the garment and textile industry. However, if looking at figure 11, it can be seen that this participation is mainly from importing raw materials. Specifically, in 2010, the FVA index - representing the participation in the backward linkage of Vietnam accounted for 64 % of the industry's total export; by 2017, this proportion reached 68 % (Figure 8). This result shows that Vietnam is still quite dependent on foreign materials for domestic garment and textile production.

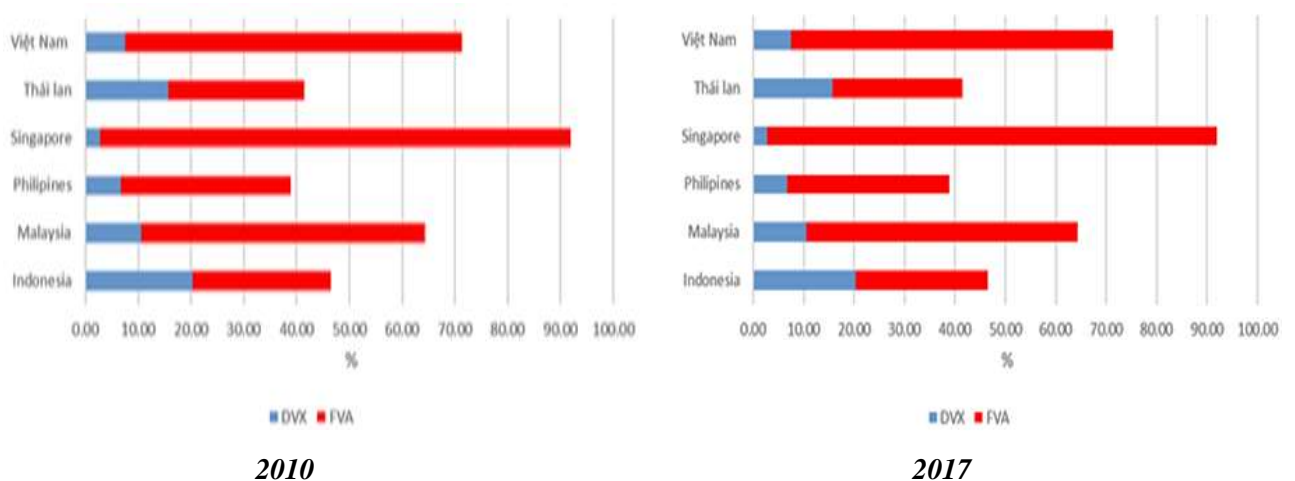


Figure 8. The participation of Vietnam and ASEAN-5 countries in the global textile and garment value chain in 2010 and 2017.

Source: Research team's calculations from MRIO, UNCTAD data.

5. Opportunities and challenges of Vietnam when participating in the global garment and textile value chain.

5.1. Opportunities.

Vietnam can take advantage of specific opportunities with the current situation of participating in international trade and the global garment and textile value chain. Specifically:

Firstly, opportunities to continuously maintain the right direction for Vietnam to develop and participate in the international production network of the garment and textile industry. The research results show that in recent years, Vietnam's garment and textile industry has had potential development when moving steadily upstream in the value chain, which promises to bring more added value to the industry. This

good news has affirmed the right direction of the Government of Vietnam, continuing to enhance the position and role of Vietnam in the international garment and textile market. According to the Ministry of Industry and Trade, the Vietnamese government is oriented to develop the garment and textile industry by 2030, with a vision from 2030 - 2045 through the development of supporting industries such as growing more cotton to reduce dependence on imported cotton raw materials; increasing investment in the undeveloped dyeing sector. According to this development orientation, the textile and garment industry is one of six areas on the list of supporting industrial products that prioritize the development of Vietnam. Thus, the garment and textile industry will have a relatively favorable business environment for growth in the coming time.

Secondly, the opportunity for Vietnam to participate deeply in the global garment and textile value chain by taking advantage of bilateral and multilateral trade agreements. The Regional Comprehensive Economic Partnership (RCEP), CP-TPP, and EVFTA are considered the new generation trade agreements Vietnam has recently joined. The EVFTA agreement signed in 2020 can create an excellent opportunity for Vietnam to upgrade in the global value chain. According to the General Statistics Office, Vietnam exported 41.7 billion USD to the EU market in 2019. The outstanding advantage of Vietnam in exporting to the EU is the high complementarity and mutual reciprocity, so there is little competition or confrontation. Therefore, it will create advantageous Vietnamese goods and be a golden opportunity for the Vietnamese economy (Nguyen Van Giao, 2020). In addition, the implementation of the EVFTA agreement will create opportunities for Vietnam to receive investment flows and modern technology from Europe. Since then, the added value and technology content of the production stage in Vietnam will likely increase, enhancing Vietnam's opportunities to participate in the global value chain. According to the Vietnam Chamber of Commerce and Industry (VCCI), EVFTA can create motivation and pressure to promote economic restructuring toward increasing autonomy and sustainability.

Thirdly, Vietnam's advantages in terms of production time and labor costs in the textile and garment manufacturing industry are relatively low. With a labor-intensive industry like the textile and garment industry, Vietnam has an advantage in developing the industry's production because Vietnam has a young population structure, excellent skills and learning ability, and a high level of education. Average wages in the textile and garment industry are among the lowest in the world. Specifically, in terms of quantity, with a population of more than 90 million people, of which 49% of the population is of working age, it has provided the textile and garment industry with an abundant source of labor (GSO, 2014). Furthermore, Vietnam's textile and garment sector has a comparatively low labor cost, with an average basic pay of 4,225,000/month, which has enabled Vietnamese textile firms to gain a competitive advantage in terms of manufacturing costs when compared to many other nations in the area (report of Vietnam General Confederation of Labor, 2019). According to the Textile and Garment Report (2017), the average production time in Vietnam is from 60 to 90 days, only lower than China and India (40 - 70 days), equivalent to Indonesia, Malaysia, and higher than Bangladesh, Cambodia (80 - 120 days). However, the cost of wages for garment workers in Vietnam is only two-thirds of wages in Indonesia and Malaysia. Therefore, Vietnam is the choice of order for the textile and garment production stage of fashion brands and retailers around the world. Considering the Vietnamese textile and garment industry in particular, the future will be supported by: (1) Cost competitiveness (labor, electricity) and productivity; (2) an Industrial support environment. Vietnam's tariff and investment incentives are competitive with other garment-producing countries; (3) Trade preferences; (4) Access to foreign markets (through MNC); (5) Connectivity (through trade and investment) and proximity to China; (6) Product diversity and especially synthetic clothing (Vietnam at a Crossroads, WB 2017).

Fourthly, by moving garment production from China, Vietnam's textile and garment industry increased its export revenue. In the 12th five-year plan, the Chinese government has targeted the development of the textile sector in two directions: raising the share of textiles and participating in higher value-added stages such as product design and development. For example, the Chinese government has established a special economic zone in Xinjiang (Western China) for the textile industry, with incentives such as the fact that the electricity price here is half that of the regular electricity price in China. The

government subsidizes a third of the labor salary for nationals and corporations. For the garment industry, financial commitments to the development of a Chinese fashion brand and the goal of having Made in China branded products account for at least 50% of total T&A exports by the end of 2015. Furthermore, in May 2015, China launched the "Made in China 2025" strategy to create a roadmap to replace the low-cost industry that consumes a lot of energy, causing pollution, as textiles, fibers, and footwear have been encouraged to invest abroad. As a result, China's garment manufacturers will prefer to transfer to neighboring countries, typically Bangladesh, Vietnam, Cambodia, and others, where competitive advantages such as low labor costs and a large labor force for batching units have made Vietnam an appealing destination.

5.2. Challenges.

In addition to opportunities, the textile and garment sector in Vietnam still has numerous drawbacks, according to textile academics, including: (i) Vietnam's garment industry is still in its early stages; (ii) the garment industry's supporting industry is underdeveloped (70 percent of raw materials and accessories are still imported from abroad); (iii) high processing rate, low value-added content, and inability to provide all-inclusive packages; (iv) Inadequate skilled human resources. The domestic content consists primarily of low- or medium-skilled workers combined with imported machinery, equipment, and raw materials; (v) The national competitive environment is still slow to improve, procedures are slow and cumbersome, and many costs remain high in comparison to regional and international standards; and (vi) Labor relations are complicated, labor fluctuations are large (20-30%/year) (Journal of Industry and Trade, 2021).

The immediate challenges for Vietnam's textile and garment industry are expressed in the following points:

Firstly, the signed FTAs allow Vietnam to participate more extensively in the global supply chain, but they also present numerous hurdles when working with high-tech countries' fine art. Over 70% of the industry's businesses are small and medium-sized, making it challenging to invest in and implement new technologies. Only 30% of firms, including foreign-invested enterprises, have used automation at every production level, with less than 5% planning to use connection automation technology (Ministry of Industry and Trade).

Secondly, Vietnamese textile and garment enterprises have to compete with some countries in the region; the trend is to shift the production of expensive garments to other countries. Vietnam's textile and garment industry has to compete in terms of production costs with an increasing trend of workers because of frequent changes in social insurance and adjustments to the minimum wage. That is why Vietnamese garment production will have to face the fact that fashion houses and foreign investors move to neighboring countries with lower labor costs. According to BMI's Report on Vietnam's labor market risks in Q3/2017, in the ranking of competitiveness in labor prices, Vietnam ranks 14th out of 18 Southeast Asian countries in terms of risk of cost change labor. It proves that labor costs in Vietnam are gradually becoming less competitive compared to other garment-producing countries such as Cambodia or Myanmar.

Thirdly, the domestic market is vulnerable to foreign control. When FDI projects in the textile and garment sector have been continuously approved in recent times, the domestic market for Vietnam's garment production has been left open, creating opportunities for FDI enterprises to seize. Furthermore, thanks to free trade agreements, foreign goods can enter the domestic market without being subject to quotas. Fashion trends are changing due to cultural imports from Japan and Korea and the movement of using foreign products with more diverse designs and designs. Famous foreign fashion brands such as Zara, H&M, and Topshop have recently entered the Vietnamese fashion and apparel market at prices that are not significantly higher or sometimes cheaper than other brands in the country, but the design is diverse and suitable for all ages. FDI enterprises and imported goods may capture the domestic market if domestic enterprises do not change to reduce costs and diversify product designs.

Fourthly, the Vietnamese textile and garment industry lacks skilled and technical human resources, thus exploiting and transforming production models towards high value-added stages in the global textile

and garment value chain face many constraints. According to the International Labor Organization, the labor productivity of Vietnamese people is always in the group of low-productivity countries. Furthermore, according to the Ministry of Industry and Trade's assessment, the human resource level of Vietnam's textile and garment enterprises remains low, with 84.4 percent of workers having a general education and only 0.1% having a university degree... And the 2019 Global Competitiveness Report indicates that Vietnam's graduates have the lowest competitive index scores, ranking only 116 out of 141 countries, and digital skills only ranked 97/141 (VEF,2019). This also demonstrates that the quality of human resources in Vietnam in general and the textile and garment industry, in particular, remains low, which will be a significant challenge for the textile and garment industry as it strives to improve competitiveness, labor productivity, localization rate, and, most importantly, the ability to receive and apply 4.0 technology in production.

Fifthly, the current level of integration and response to the industrial revolution 4.0 of Vietnamese textile and garment enterprises in digital technologies is still at a low level. Indeed, technology 4.0 will be a driving force in shifting textile and garment production to other countries due to lower costs. However, enterprises continue to face difficulties and challenges such as high investment costs, a shortage of management and technical personnel, and a lack of human resources (both in quantity and quality) prepared for the industrial revolution.

Sixthly, a prolonged pandemic may reduce the textile and garment industry's market share. Because the textile and garment industries require many workers, workers infected with Covid-19 will have a direct impact. The complicated pandemic situation from the beginning of May 2021 makes Vietnam less attractive than the situation from the beginning of 2020 to March 2021. Factories in the pandemic's epicenter, such as Ho Chi Minh City, Binh Duong, Dong Nai, etc., must implement the "3 onsite" strategy, including Production - Isolation - Accommodation at work leading to an increase in business management costs. According to the Securities Industry Report (2021), due to the unsuccessful disease control during this COVID-19 pandemic, a part of EU orders have begun to be temporarily diverted from Vietnam. If the situation persists, it will cause Vietnam's market share to mitigate in the long term.

6. Conclusion and some implications for improving Vietnam's participation in the global textile and garment value chain.

Vietnam has achieved remarkable results in actively participating in the global textile value chain. Vietnam's textile and the garment is currently the top export item and has had a growth rate. It is trying to transform itself into an upstream position to bring more added value to the country and tend to increase participation in the global chain. The promotion of exports of textiles, fibers, textiles, etc., to major international markets such as the US, EU, Japan, Korea, and ASEAN may create a premise and basis opportunities to take advantage of and increase benefits from FTAs. However, Vietnam's textile and garment industry has few competitive advantages and several drawbacks in sustainable development, especially accessibility and deep participation in the global textile value chain. Vietnam's garment manufacturing industry participates in the global value chain at the production stage, mainly by the CMT method, and cannot provide packages, so the added value is still low. Distribution and marketing are weak points of Vietnam's textile and garment industry; as a result, Vietnam rarely has its own branded products to reach retailers around the world. Therefore, Vietnam needs to step up efforts to be at least not left behind in the region. To realize this, Vietnam should focus on the following solutions.

Firstly, to improve competitiveness when participating in FTAs and the production capacity of textile and garment enterprises, Vietnam needs to complete appropriate development and investment mechanisms and policies in the context of integration. Establishing a complete textile and garment industry cluster to overcome the lack of synchronous development among segments in the entire supply chain is necessary. The group's construction will help boost the productivity and efficiency of businesses by increasing access to services and raw materials, speeding up and reducing transaction costs between businesses, thereby improving quality improvement. In addition, the cluster will help companies access information quickly, which can promote trade and innovation in industries.

Second, it is necessary to develop domestic raw materials. To have a stable supply of raw materials, the government and the textile industry need to have a strategy for planning raw materials towards domestic materials that will replace most of the imported materials. When most raw materials are active, the textile and garment industry will actively carry out negotiable orders with partners. Moreover, this is of significant help in avoiding the risk of increasing world raw material prices; Vietnam's textile and garment industry can maintain its leading position in the world's exports. The textile and garment industry needs to coordinate with the agriculture sector to develop cotton-growing areas in the Central Highlands and expand to other regions. Implement projects on growing cotton under the farm model to replace the scattered cotton-growing method in households so that the source of raw materials is produced and supplied stably. It is necessary to invite good technical experts to advise and supervise cotton-growing techniques to create a source of high-quality raw materials that can meet the standards for exporting garment products.

Thirdly, the Vietnamese government should have a solution to training and developing human resources. In addition to investing in education and training in general, the authority needs to consolidate and expand the system of schools and training centers in the garment industry to improve training efficiency to meet the needs of skilled garment workers, designers, managers, and technicians. Organize human resources training to serve the 4.0 industrial revolution in the textile and garment industry by opening more interdisciplinary training disciplines to approach the industrial revolution 4.0. Meanwhile, there is a need for the government to supplement policies to encourage domestic training institutions to link together and link with foreign training institutions to improve training quality and encourage businesses to associate with universities training in textiles and garments actively.

Fourthly, businesses manufacturing textiles should promote the application of industrial revolution 4.0 in the textile industry. Such enterprises need access to the world's leading textile technology to reduce the amount of labor per product. It is advisable to invest in digital technology equipment in simple and highly repeatable stages to produce complex and fashionable products such as jackets, vests, skirts, etc. Besides, it is necessary to strengthen information technology and software management to build smart factories.

Fifthly, textile enterprises have to overcome difficulties during the covid-19 pandemic. Thanks to the Vietnamese Government's reasonable control of the epidemic and the enterprises' efforts in flexible production operations, the overall negative impact of the market has been limited. Many firms have quickly turned to producing cloth masks, medical masks, and specialized protective clothing for the domestic market and exporting to the international market. To limit difficulties and reduce losses, businesses have flexibly applied solutions such as cost savings, investment postponement, or requesting member units to seek export orders for epidemic prevention products actively,

Last but not least, the group of solutions to improve Vietnam's participation in the global value chain of the textile and garment industry in each particular segment is proposed as follows:

Vietnam needs to gradually improve product designs and learn more from foreign design experiences by cooperating and outsourcing production for international fashion brands in terms of product design. We can take advantage of precious materials such as brocade and silk to create specialized product lines that take advantage of inputs and are imbued with Vietnamese culture. Businesses and organizations need to actively learn and seize opportunities to launch unique and fancy products, stimulate consumer demand and catch the eyes of investors. The design team needs to be well-trained, create an environment to develop creativity, and create opportunities for domestic designers to meet and interact with foreign designers to get inspiration for a new design more realistic way.

About the production of raw materials. To maintain a good supply of raw materials and accessories, the government and the textile and garment sector must prioritize investment, encourage enterprises and farms to employ scientific and technological advances effectively, and increase investment in processing convert cotton and silk. To develop cotton-growing areas, boost cotton-growing areas in the Central Highlands, and spread to other regions, the textile and garment industry must collaborate with the agriculture sector. Implement cotton-growing initiatives based on the farm model to replace the scattered cotton-growing approach in homes, ensuring a consistent source of raw materials. At the same time, propagandize

and mobilize farmers in areas with suitable soil and climate conditions to grow cotton and silk for the production of textile products. It is necessary to invite good technical experts from infamous cotton-growing countries to advise and supervise cotton-growing techniques to create a source of high-quality raw materials that can meet the standards for production export garment products.

About production and export. Businesses should adopt sophisticated, contemporary, and streamlined management models to improve management and administration capabilities. Develop and efficiently utilize scientific and technological breakthroughs, improve production organization in regular textile production lines, and employ overseas specialists to discover production organization solutions. To make informed and essential judgments, every textile and garment exporter must know the market, tastes, import and export status, etc. The government should help businesses by building a system for collecting, assessing, and disseminating information for the entire industry, which would serve as a foundation for timely planning and sensible legislation.

About distribution networks and marketing. It is necessary to establish a distribution system for regional and international markets. Vietnam's garment and textile manufacturing enterprises for export are to penetrate the distribution system of textiles and garments in the global market, so enterprises must actively carry out this work. The distribution system will help provide information on market demand and fluctuations to domestic businesses while also learning about the distribution system of textiles and garments for export in these countries aims to find opportunities for Vietnamese enterprises to shorten their relationship links to be closer to customers.

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PURCHASE INTENTION OF SMART HOME SERVICES IN HO CHI MINH CITY AND VICINITY: A STIMULUS – ORGANISM – RESPONSE MODEL

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ABSTRACT

Based on the Stimulus-Organism-Response, this study proposes a comprehensive research model that can explain potential customers' intention to purchase smart home services in Ho Chi Minh metropolis and its vicinity and explore key factors that affect their purchase intention. Data were collected using a self-administered survey distributed through the internet. The sample consisted of participants living in Ho Chi Minh metropolis and its vicinity. The data (N=300) from the survey were analyzed using Partial Least Square – Structural Equation Modeling. The results suggest that facilitating conditions, compatibility and price value positively affect customers' attitudes towards smart home services, which in turn positively affect smart home purchase intention. Besides, compatibility and price value positively affect smart home purchase intention, whereas facilitating conditions is found to be insignificant. The recommendations based on the results in this research are expected to provide important inputs on the critical factors for suppliers to improve the value of the products, thus enhancing the development of smart home usage in Vietnam in general and in Ho Chi Minh metropolis and its vicinity in particular.

Keywords: Smart Home; purchase intention; SOR; Ho Chi Minh metropolis and its vicinity.

1. Introduction

The technology of IoT (Internet of Things) which is deemed as a critical Industry 4.0 enabler has shed new light on the concept of a “smart home”, the new residential environment recently introduced during Consumer Electronics Show (CES) 2016. According to a market research study published by Research and Markets (2021), the demand analysis of the global smart home systems' market size and share revenue is projected to expand at a 10.4 percent compound annual growth rate (CAGR) during 2021-2026, from USD 84.5 billion in 2022 to USD 138.9 billion in 2026. Vietnam's smart home market, though still in its early beginning, also possesses promising investment prospects. According to B-Company (2020), up to August 2020, the Vietnamese smart home market has reached revenue of about USD 179 million, three times higher than that of 2017. Furthermore, with the diffusion of mobile networks and the popularization of smart appliances, experts predict this figure to reach USD 524 million in 2025 with a CAGR during 2020-2025 of 23.9%. Recently, many major technological giants have formed affiliates in Vietnam as the development of smart homes becomes an indisputable trend. The launch of various brands in numerous sectors to fulfill the need of diverse users has accompanied the market's expansion.

It is obvious that various studies have given a better knowledge of the fundamental factors that influence customer intention and usage of smart home services. However, there are still some limitations in the stimulus aspect as those research just mainly focused on factors influencing user's attitude and decision after appliances are purchased officially in the market. On the contrary, our research profoundly studied external factors that producers as well as suppliers can adjust to change customer's attitude towards smart home services in a positive way and attract them in the purchasing process. During the last decade witnessed a quantum leap in the country's economy, transforming Vietnam to a middle-income nation, resulting in citizens' stronger financial conditions and better technological background. Additionally, Vietnam is predicted to be an international investment and trade activity destination in Southeast Asia. These factors,

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therefore, are expected to intertwine closely to obtain a deeper knowledge of IoT-based services and establish appropriate strategies for investing in the technological field in the context of foreign enterprises in Vietnam. Nevertheless, there are still few articles that go into depth to analyze Vietnam's smart home market. Therefore, to learn more about those issues, this research investigated the core determinants of smart home services usage, examining how they affect customer's attitude and purchase intention by utilizing a Stimulus-Organism-Response (S-O-R) model. By presenting the current users' perceptions of these services within the stimulus-organism-response (S-O-R) framework, improvement plans and suggestions for the service's success could bring new evidence to the literature on smart home utilization in this study research. Moreover, it is expected to propose some recommendations to help businesses producing and distributing smart home services and evaluate further beneficial outcomes of adopting these appliances to promote positive attitude and purchase intention of customers in Ho Chi Minh metropolis and its vicinity.

2. Theoretical framework and hypothesis development

2.1. Theoretical framework

2.1.1. Smart home services

Smart Home services can be defined as “residential locations equipped with processing, computing, sensing, and information technology which provides the functions for responding to the needs of the respondents and improving their safety, comfort, security and life-quality, based on the connection between the inside and outside of the home” (Eunil P. et al, 2017). A study carried out by Marikyan et al. (2018) concluded that a smart home is furnished with smart technologies designed to provide users with personalized services, which enables people in monitoring, controlling, and being supported to improve the quality of life and encourage independent living. Besides, smart home services include assisted living to help vulnerable people enhance their quality of life and live better and longer in their own homes for as long as possible.

2.1.2. Theory of S-O-R model

The Stimulus-Organism-Response (S-O-R) framework originates from the arguments of psychologists, Mehrabian and Russell (1974). This internal processing affirms that “clues (stimulus) perceived from the environment can trigger a person's internal assessment state (organism), which in turn produces positive or negative behaviors (response) for stimuli” (Mehrabian and Russell, 1974). Stimulus (S) refers to possible environmental cues arousing individuals' psychological and behavioral response. Secondly, Organism (O) is defined as a process in which various environmental stimuli influence an individual's cognitive or emotional experience, and following a series of internal psychological events, the individual then produces behavioral responses to previous stimuli (Hu et al., 2016). Lastly, the internal response (R) is the individual's outcome from stimuli and organisms, “which is manifested as the individual's attitude and the external response is manifested as the individual's specific behavior” (Lorenzo-Romero and Gomezborja, 2016).



Figure 1. Stimulus-Organism-Response (S-O-R) Model

Source: Mehrabian and Russell (1974)

The S-O-R model, as a theoretical foundation for consumer behavior research, does not simply relate to psychological contexts but also contributes as an analysis of a proven theory in management information systems for assessing user behavior, including purchase intention, client dedication, shopping behavior, and

other topics. The S–O–R model was empirically examined in various consumer behavior scenarios, such as the role of a retail environment on impulse buying behavior (Chang et al., 2011).

These utilized S-O-R models are recognized as important analytical frameworks in explaining the process of human behavior, specifically in the context of information science, including smart home conditions, where recordable information and knowledge are involved.

2.1.3. Purchase intention

Purchase intention is defined as an “individual’s readiness and willingness to purchase a certain product or service” (Ajzen and M. Fishbein, 1980). Customers' purchase intention is an important aspect of behavioral intentions (Zeithaml et al., 2006) and is important to comprehend actual purchase behavior (Hsu et al., 2012). Based on previous studies, customers who express intention to buy a product had greater actual buying rates than those who say they have no intention of buying (Berkman and Gilson, 1978). Purchase intention can also be used to evaluate the construction of a new distribution channel, assisting managers in which geographic areas and customer categories to target through the channel (Morwitz et al., 2007). Therefore, it's critical to assess the concept of purchase intention in this research.

2.1.4. Facilitating Condition

Facilitating conditions refers to the educational training in a new technology that an organization provides for users when it attempts to promote the use of that technology (Wang et al., 2017). It may also be conceptualized as the extent to which a person believes that supporting resources are available to facilitate task accomplishment based on a particular utilized technology (Venkatesh et al., 2012). In this study, facilitating conditions point to variables helping people utilize smart home services, including knowledge, operators’ facility assistance, warranty policy, and requirements while using smart home services. When consumers have enough levels of enabling factors, their desire to use smart home services at home should potentially be higher.

2.1.5. Compatibility

The conceptualization of compatibility was defined by Since Rogers (1983,1995) as the extent to which “a unique innovation is consistent with the current and traditional values and needs, and past experiences of potential adopters”. In this study, compatibility refers to the level of convenience in a customer's lifestyle when they adopt a new system of smart services. According to Tornatzky and Klein (1982), compatibility has a significant effect on the adoption of new products or systems. This characteristic has become one of the most important factors that customers take into consideration before deciding to adopt new technological systems or services.

2.1.6. Price Value

Price value is defined as the customers' cognitive trade-off between the perceived benefits of an information system (IS) and the monetary cost of using it. In general, the user's behavioral intention is influenced by price value, with higher price value resulting in a stronger behavioral intention of a specific IS. In marketing research, the monetary cost is usually conceptualized together with the quality of products or services to determine the perceived value of products or services (Zeithaml, 1988). As a result, within the context of highly-tech appliances, when IoT technologies are compared to non-IoT products, price value is expected to particularly have a significant influence on customers’ purchase intention.

2.1.7. Attitude

According to the theory of reasoned action (TRA), attitude refers to a learned predisposition to respond in a consistently favorable or unfavorable manner towards an object, event, or stimulus. The more favorable the attitude is, the greater is the individual intention to perform a particular behavior (Ajzen, 1991). Further, this theory stated that a person develops their attitude over a period of time-based on knowledge and experience with an object. In general, attitudes are “mental states used by individuals to structure the way they perceive their environment and guide the way they respond to it” (Aaker, Kumar, and Day, 1995). The present study defines an organism as emotional gratification, sensory experience, functional utility, and

performance following current studies' suggestions (Kim et al., 2019; Gregory et al., 2002). Therefore, we can see that the attitude belongs to organisms in the S-O-R model.

2.2. Hypothesis development

2.2.1. Effects of facilitating conditions, compatibility, and price value on attitude towards smart home services

The facilitating conditions assume a significant job in the promotion as it is one of the reliable predictors of attitude and behavioral intention of the use of an information system (King et al., 2006). As a result, facilitating conditions (also known as service quality) were found to have a positive effect on attitude towards smart home services (Papagiannidis et al., 2021). According to Groves and Zemel (2000), technical support, including the provision of helpdesks, hotlines, and online support services, was ranked highly among the sorts of support that affect users' implementation to technology. Therefore:

H1: There is a positive relationship between facilitating conditions and customers' attitudes towards smart home services.

In the evaluation process, compatibility is used as a variable for attitude formation (Saaksjarvi M., 2003). When customers experienced incompatibility with an innovation, they rejected it without hesitance and without accessing its usability and advantages (Olshavsky and Spreng, 1996). Furthermore, the importance of compatibility in predicting technology acceptance outcomes has also been consistently supported in other empirical IS studies (e.g., Karahanna et al., 1998; Taylor and Todd, 1995). Briefly, the group of authors assumed that compatibility has a direct relation with users' acceptance attitude towards technology in general and smart home services in particular:

H2: There is a positive relationship between compatibility and customers' attitude towards smart home services.

A satisfied customer is one to believe that the value of goods and services is comparable with the price, resulting in the fact that many firms, not excluding household electrical appliances stores, use psychological pricing techniques when determining the price of their product or service recently. Price value would also be positively related to attitude towards products (Ranaweera, C. and Karjaluoto, H., 2017). Consequently, the perceptions of customers of a given price can have a direct relationship with their decision to buy a product (Zechmeister et al., 1997), including their psychological aspects which were considered prior to any pricing decisions made by suppliers. Thus, the study proposes the following hypothesis:

H3: There is a positive relationship between price value and customers' attitude towards smart home services.

2.2.2. Effects of facilitating conditions, compatibility, and price value on the purchase intention of smart home services

Facilitating conditions is indicated to be a direct key aspect leading to the behavioral intention. The finding of Sequeiros et al. (2021) confirmed that facilitating conditions influenced the behavior intention to use smart home services. However, other studies did not detect such a relationship, as the research of Aldossari et al. (2018), revealed that facilitating conditions are not a significant predictor of behavioral intention of smart home services. As users with little or no experience may fail to distinguish between using smart home technology and using the comparable, non-IoT objects, leading them to the belief that no resources needed to facilitate their use of smart home technology. Although it is uncertain whether facilitating conditions affect users' intention to use, facilitating conditions is still proposed as a key variable to consider in directing users' intention in this study. Therefore:

H4: There is a positive relationship between facilitating conditions and customers' intention to purchase smart home services.

The research of Holak (1998) stated that customers are notably more concerned with physical space and lifestyle compatibility than with the operation or performance of the innovation when considering purchase, with higher compatibility leading to more preferable adoption. Customers were more concerned

about a new item's compatibility with their living patterns and self-images than with specific information about its operating features or benefits (Holak and Lehmann, 1990). Moreover, Agarwal and Prasad (1999) asserted a positive relationship between an individual's prior compatible experiences and acceptance of the new information technology. Therefore, the group of authors assumed compatibility as a predictor of intention to use smart home services and proposed the following hypothesis:

H5: There is a positive relationship between compatibility and customers' intention to purchase smart home services.

Pricing is more critical and relevant to consumer buying behavior (Huo et al., 2021). It is believed that pricing has a significant effect on the purchase intention of consumers because the higher a product is priced, the fewer units are sold. By contrast, products selling at prices lower than the market rate are assumed to sell at a higher volume (Sadiq M. W. et al., 2020). In the context of technology acceptance, price value has been confirmed as an important predictor of intention to use ISs (Aldossari and Sidorova, 2020). As a result, the following hypothesis was created using price value as a predictor of purchase intention to use smart home services:

H6. There is a positive relationship between price value and customers' intention to purchase smart home services.

2.2.3. Effects of attitude on purchase intention

As the literature suggests, attitude towards use plays an important role in purchasing smart home services (Norizah and Siti, 2007). The attitude-intention relationship was referred to in the TRA and TPB, which suggests that an individual's attitude is an evaluative predisposition to the behavior as a function of its determinant personal consequences (Ajzen, 1985). Park and colleagues (2013) pointed out that one's attitude towards e-customized products mediates the relationship between customers' psychological characteristics and purchase intention and concluded that customers' attitudes towards an object are a main factor in the intention to purchase. Based on the above argument, we considered the hypothesis:

H7: There is a positive relationship between attitude and customers' intention to purchase smart home services.

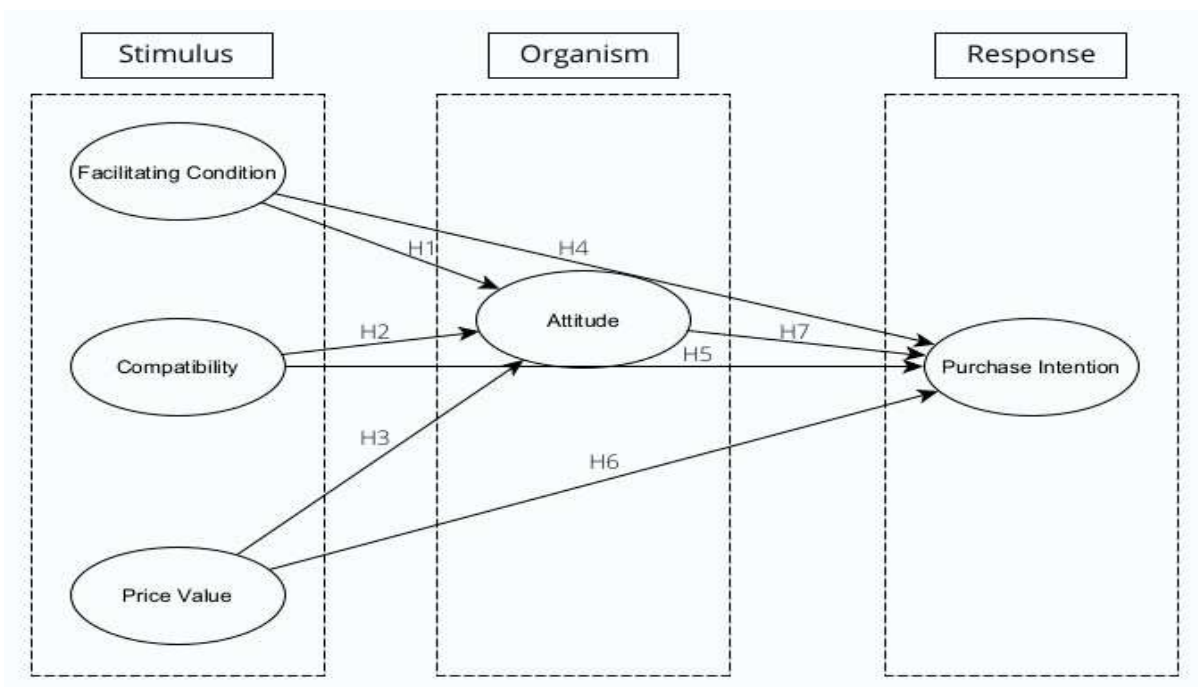


Figure 2. Proposed research model

3. Research method

3.1. Sample and data collection

The data was an analysis of customers in Ho Chi Minh metropolis and its vicinity who have fundamental knowledge about smart home services and genuine interests in the potential of purchasing smart home appliances. This research sample was conducted through interviews and web-based questionnaires. The survey was pre-tested by 25 volunteers with various demographic backgrounds. After that, the research team developed a web-based survey (Google Form) to collect data from customers in Ho Chi Minh metropolis and its vicinity. We sent a total of 313 questionnaires, in which there were 300 questionnaires used for the last analysis.

Among the respondents, 46,7 percent were men, and 53,5 percent were women. 62,6 percent of the respondents was well-located in Ho Chi Minh metropolis while the remaining 37,4 percent was from Ho Chi Minh's vicinity. The respondents' ages vary between 18-62 years, with 46.3 percent being 18 up to 24 years old, 38,7 percent were 25 up to 40 years old, and 13,7 percent 41–56 years old, and 1,3 percent above 56. As for the marital status of the respondents, the majority (i.e., 51,67 percent) were single whilst 48,33 percent were married. The number of single respondents is 155, while the number of respondents who are married is 145. In the group of married respondents, those who had children tended to be more interested in the intention to buy smart home services than those who were married but did not have children (124 versus 21).

3.2. Measurement scale

This research used a 5-point Likert scale questionnaire to measure variables. The items in the questionnaire are based on previous research and proposed by the group of authors, which we have adjusted to be suitable for the Vietnam market. The scale of the facilitating condition was measured by 4 observation variables adopted and adjusted following the study of Vankatesh et al (2012), except FC4 is suggested by the group of authors. We added FC4 to this scale as the previous study of Wang et al., (2017) stated that facilitating conditions helps users reduce problems they may encounter when using smart home services. The scale of compatibility was measured by 4 observation variables measured based on the scale of Chacko, Sumathi, Narayanan, and Syam Narayanan, S. (2021). The scale of price value was partly based on research of Kim et al., (2015) and partly suggested by the group of authors. Our group suggested adding PV2 and PV3 in this scale as value may impact customer perceptions and purchase intention. To support this, the study of Daniele (2005) stated that different shopping values lead to different customer's behavior. As a result, in case the price to own an IoT device and the cost to maintain it works afterward are reasonable, there will be a positive connection between customers and the services. The scale of attitude was built with 4 observation variables adopted from the study of Venkatesh (2012), Ajzen (1991), Porter and Donthu (2006) and David (1989). Purchase intention is measured by four items in the same scale given by the theory of Rodger (2003) and Cheung et al (2017). The scale measurements are detailed in Table 1.

Table 1. Measurement scale

| Construct | Measurement | References |
|-------------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------|
| Facilitating Condition | FC1: I have the resources necessary to use smart home services | Vankatesh et al., (2012) |
| | FC2: I have the knowledge necessary to use smart home services | |
| | FC3: I can get help from others when I have difficulties in using smart home services | |
| | FC4: I receive a warranty from the smart home services suppliers | |
| Compatibility | CO1: I feel that the smart home appliances fit my lifestyle | Chacko, Sumathi, Narayanan, and Syam Narayanan, S. (2021) |
| | CO2: I feel that the smart home appliances are compatible with my day-to-day needs | |
| | CO3: I think that the smart home appliances will fit well into my home | |
| | CO4: I think that the smart home products and applications are useful | |

| | | |
|---------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------|
| | for the tasks I do at home | |
| Price Value | PV1: I was able to easily afford smart home services PV2: Smart home services are reasonably priced PV3: The cost of maintaining and repairing essential components in the smart home services is reasonably priced | Kim et al., (2015) |
| Attitude | AT1: I like the idea of using smart home services AT2: It is desirable for me to learn how to use smart home services AT3: It makes sense to use smart home services AT4: I have positive feelings towards smart home services | Venkatesh (2003), Porter and Donthu (2006), David (1989) |
| Purchase Intention | PI1: I would like to have more information about smart home objects within a purchase intention context PI2: I plan to purchase smart home services in the future PI3: I am willing to purchase smart home services PI4: From now on, I plan to purchase smart home services | Rodgers (2003), Cheung et al., (2017), Ding et al., (2017) |

3.3. Analytical method

In this study, the PLS-SEM using SmartPLS 3 was used. There are two main reasons to choose PLS-SEM. Firstly, the relationship between facilitating conditions, compatibility, price value, attitude and purchase intention is at the exploratory stage and has not been established and empirically tested in the literature. Secondly, since PLS-SEM obtains solutions with small sample sizes when models comprise many constructs and a large number of items (Fornell and Bookstein, 1982; Willaby et al., 2015; Hair et al., 2017c) by computing measurement and structural model relationships separately instead of simultaneously, PLS-SEM is considered the suitable option to analyze the small sample size data at exploratory relationship stage. We employed SmartPLS software to measure the proposed research model and hypotheses using partial least squares structural equation modeling (PLS-SEM). The PLS-SEM data analysis, according to Henseler and Chin (2010), completes an investigation in two steps: evaluation of measurement model and evaluation of structural model.

4. Results and discussion

4.1. Results

4.1.1. Common method variance (CMV)

If one component can clarify the bulk (typically more than 50%) of covariance in the dependent and independent variables, common method variance occurs. The research must ensure that there is no common method variance before executing the measurement model. To anticipate whether common method variance (CMV) exists, we used Harman's single-factor test.

Results of Harman's single-factor test (Table 2) reveal 20 factors with eigenvalues greater than 1 emerging from the analysis. Approximately 40% of the variance is accounted for by the first factor. These findings suggest that the study does not suffer from the CMV issue.

Table 2. Total Variance Explained

| Total Variance Explained | | | | | | |
|--------------------------|---------------------|---------------|--------------|-------------------------------------|---------------|--------------|
| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | |
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % |
| 1 | 8.076 | 40.381 | 40.381 | 8.076 | 40.381 | 40.381 |
| 2 | 1.409 | 7.044 | 47.425 | | | |
| 3 | 1.138 | 5.688 | 53.113 | | | |
| 4 | .992 | 4.958 | 58.070 | | | |
| 5 | .916 | 4.579 | 62.649 | | | |
| 6 | .817 | 4.083 | 66.732 | | | |
| 7 | .716 | 3.579 | 70.312 | | | |
| 8 | .679 | 3.396 | 73.707 | | | |
| 9 | .598 | 2.992 | 76.700 | | | |
| 10 | .562 | 2.809 | 79.509 | | | |
| 11 | .533 | 2.663 | 82.172 | | | |
| 12 | .497 | 2.487 | 84.658 | | | |
| 13 | .476 | 2.380 | 87.039 | | | |
| 14 | .463 | 2.313 | 89.352 | | | |
| 15 | .435 | 2.174 | 91.525 | | | |
| 16 | .392 | 1.959 | 93.484 | | | |
| 17 | .373 | 1.865 | 95.349 | | | |
| 18 | .327 | 1.634 | 96.983 | | | |
| 19 | .311 | 1.556 | 98.539 | | | |
| 20 | .292 | 1.461 | 100.000 | | | |

4.1.2. Measurement model assessment

With reference to the mentioned Table 3, most indicators' loadings were higher than the threshold value of 0.708 (Hair et al., 2018), suggesting that more than 50% of the variance in a single indicator can be explained by the corresponding latent construct, confirming indicator reliability (Benitez et al., 2020; Hair et al., 2017a; Roldán and Sánchez-Franco, 2012). The FC3 variable had a loading factor of 0.699 was retained in the measurement model for its contribution to the construct's conceptualisation. Furthermore, the removal of these indicators has no effect on the criteria for construct reliability, as indicated by the extracted internal consistency and variance, as well as its discriminant validity; hence, they are regarded as appropriate for the measurement model (Chin, 1998a; Hair et al., 2013).

We applied composite reliability and Cronbach's Alpha for assessing the reliability of the research. As can be seen from the Table 3, the composite reliability ranged from 0.843 to 0.874, which is consistent with

the value suggested by Hair et al. (2009), and the Cronbach's alpha results of all latent variables were above 0.7 (Vinzi et al., 2010), indicating a strong mutual association among indicators in describing the intended constructs.

In terms of convergent validity, the AVE should exceed 0.5 to demonstrate that the constructs capture an adequate amount of variance observed by their corresponding items (Hair et al., 2009). In this study, the AVEs were in the range of 0.574 and 0.668, thus were acceptable.

Table 3. Reliability and convergent validity

| Construct | Items | Indicator Loadings | Composite Reliability | Cronbach's Alpha | AVE |
|-------------------------------------|--------------|---------------------------|------------------------------|-------------------------|------------|
| Compatibility (CO) | CO1 | 0.782 | 0.860 | 0.782 | 0.605 |
| | CO2 | 0.772 | | | |
| | CO3 | 0.804 | | | |
| | CO4 | 0.752 | | | |
| Facilitating Conditions (FC) | FC1 | 0.853 | 0.843 | 0.751 | 0.574 |
| | FC2 | 0.723 | | | |
| | FC3 | 0.699 | | | |
| | FC4 | 0.747 | | | |
| Price Value (PV) | PV1 | 0.834 | 0.858 | 0.752 | 0.668 |
| | PV2 | 0.829 | | | |
| | PV3 | 0.789 | | | |
| Attitude (AT) | AT1 | 0.752 | 0.874 | 0.819 | 0.580 |
| | AT2 | 0.736 | | | |
| | AT3 | 0.756 | | | |
| | AT4 | 0.757 | | | |
| | AT5 | 0.806 | | | |
| Purchase Intention (PI) | PI1 | 0.811 | 0.855 | 0.776 | 0.596 |
| | PI2 | 0.805 | | | |
| | PI3 | 0.706 | | | |
| | PI4 | 0.762 | | | |

In the measurement model, the concept of discriminant validity is assessed to assure that a concept measure is empirically distinct and captures phenomena of interest that other measures in a structural equation model do not (Hair et al., 2018). The evidence for the discriminant validity of the constructs is shown in Table 4 through the HTMT value. Most of the values are below the threshold of the HTMT_{0.85} requirements deemed satisfactory for discriminant validity suggested by Clark and Watson (1995) and Kline (2011). The HTMT ratio between purchase intention and customers' attitude is slightly higher than the threshold at 0.887, which can also be accepted according to a new criterion for assessing discriminant

validity suggested by Gold et al., (2001). Therefore, it indicates that the measurement model possessed adequate validity and discriminant validity.

Table 4. Discriminant Validity

| | AT | CO | FC | PI | PV |
|----|-------|-------|-------|-------|----|
| AT | | | | | |
| CO | 0.828 | | | | |
| FC | 0.807 | 0.769 | | | |
| PI | 0.887 | 0.840 | 0.733 | | |
| PV | 0.598 | 0.572 | 0.597 | 0.638 | |

4.1.3. Structural model assessment

The results of VIF values (Table 5) are below the common threshold of 5 (Hair et al., 2011), showing that the models do not suffer from multicollinearity.

Table 5. Variance Inflation Factor

| | AT | CO | FC | PI | PV |
|----|-------|----|----|-------|----|
| AT | | | | 2.226 | |
| CO | 1.645 | | | 2.010 | |
| FC | 1.676 | | | 1.926 | |
| PI | | | | | |
| PV | 1.350 | | | 1.393 | |

In this study, PLS-SEM shows all the path coefficient values regarding the variables and factor loadings of each item that it has calculated. Figure 3 shows the values of all items' factors loadings and their path coefficients of AT and PI.

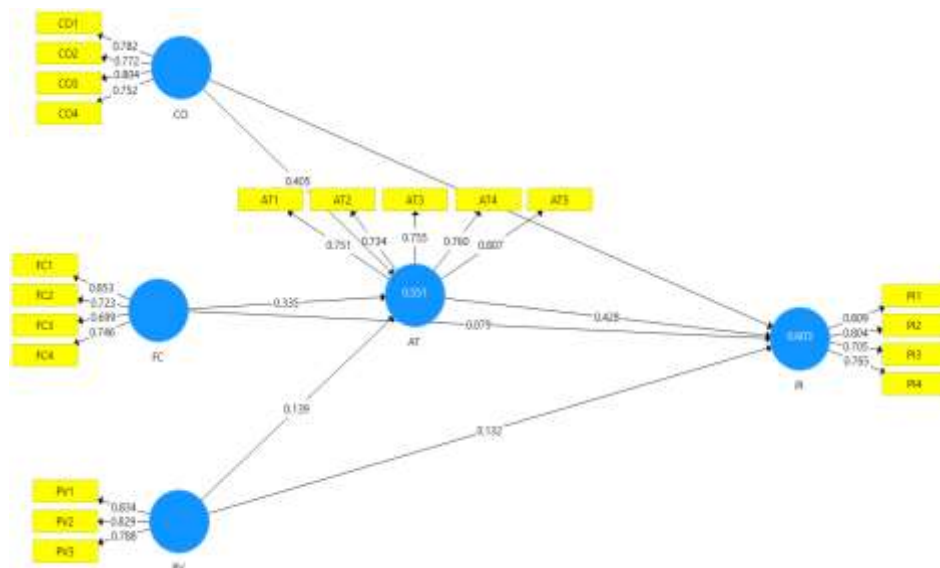


Figure 3. The structural model after assessing the PLS-SEM

As suggested by Ramayah et al. (2016), the R^2 value measures the goodness of the structural model. Similarly, Hair et al. (2011) stated that the coefficient of determination and the level of significance of the path coefficients (beta values) can be measured by the R^2 . A higher R^2 value indicates greater explanatory power. Similarly, Götz et al. (2010) assumed that a higher R^2 is preferable since it represents the model's capacity to explain a significant amount of variance in the variable in question. The R^2 for the generated

results was 0.551, suggesting that 55.1 percent of the variance of attitude towards smart home services could be explained by CO, FC, and PV and 44.9% of the variation was explained by other independent variables that were excluded from the model and random error. As for the R² coefficient of purchase intention, the value reached 60.3% means that 60.3% of the variation in purchase intention was explained by the independent variables CO, FC and PV, and the mediating variable AT.

4.1.4. Hypotheses testing

The hypothesis testing results are illustrated in Table 6. Bootstrapping outcomes (with 5000 resamplings) for the association between the notions in the suggested study model demonstrated that the t-value of the H1, H2, H3, H4, H6, H7 was higher than 1.96, and these hypotheses were meaningful at a 5% level. As a result, these hypotheses were supported. However, H5 was not statistically significant in influencing the purchasing intention of the smart home services, at a significance level of 0.05. Therefore, H5 is not supported.

Table 6. Hypothesis testing result

| Hypothesis | Relationship | Standardized beta coefficient | t-value | P-value | Findings |
|------------|--------------|-------------------------------|---------|---------|---------------|
| H1 | CO → AT | 0.405 | 6.654 | 0.000 | Supported |
| H2 | FC → AT | 0.335 | 5.059 | 0.000 | Supported |
| H3 | PV → AT | 0.139 | 2.633 | 0.020 | Supported |
| H4 | CO → PI | 0.274 | 5.655 | 0.000 | Supported |
| H5 | FC → PI | 0.079 | 1.432 | 0.170 | Not supported |
| H6 | PV → PI | 0.132 | 3.050 | 0.006 | Supported |
| H7 | AT → PI | 0.428 | 6.974 | 0.000 | Supported |

4.1.5. Mediation Effect

Results displayed in Table 7 indicated that there are three mediating effects in this study: Customers' attitude has a mediating effect on compatibility and purchase intention, customers' attitude has a mediating effect on facilitating conditions and purchase intention, customers' attitude has a mediating effect on price value and purchase intention. These relationships resulted in an indirect effect of $\beta=0.173$, $\beta=0.143$, $\beta=0.060$ and with t-values of 4.828, 4.048 and 2.641 respectively. In addition, mediation effects were present when the 95% bootstrap confidence interval did not straddle a 0 between the upper and lower intervals (Preacher and Hayes 2008). This criterion was relevant for the relationship of CO → AT → PI (0.105, 0.245), FC → AT → PI (0.078, 0.215) and PV → AT → PI (0.018, 0.106) where 0 was not straddled in between, indicating that mediation effects existed in these three relationships.

Table 7. Specific Indirect Effect

| Relationship | Specific indirect effect | | Bootstrap percentile/confidence Interval (95%) | | T-value |
|--------------|--------------------------------|---------|------------------------------------------------|-------------|---------|
| | Standardized beta coefficients | p-value | Lower limit | Upper limit | |
| CO → AT → PI | 0.173 | 0.000 | 0.105 | 0.245 | 4.828 |
| FC → AT → PI | 0.143 | 0.000 | 0.078 | 0.215 | 4.048 |
| PV → AT → PI | 0.060 | 0.009 | 0.018 | 0.106 | 2.641 |

4.2. Discussions

Regarding the impact of the stimulus (S) factors on customer attitudes towards smart home services, the results indicate that compatibility is the strongest factor influencing smart home service attitudes. Users develop more positive attitudes towards smart home services when they feel the product is compatible with their lifestyle, consistent with other studies in the same literature. Facilitating conditions, in turn, were also found to have a significant influence or contribution to others' attitude towards smart home services. These results are in line with the S-O-R Theory, indicating that if customers believe that the facilitating conditions (such as service quality and technical support) are adequate, they will form more positive attitudes towards smart home services. Unsurprisingly, the price value of a Stimulus (S) can significantly affect a customer's attitude towards smart home services. Indeed, if the cost of smart home services is estimated to be unreasonable, customers may be hesitant to purchase and use them, as has been the case for several years and in other countries. However, the magnitude of the effects of this factor was smaller than that of other factors. This fact comes from customers' cautiousness and price sensitivity when it comes to paying for products that are relatively new and require market education like smart home.

In terms of the effects of the Stimulus (S) factors on customers' purchase intention of smart home services, the first findings indicate that the analysis result of compatibility is consistent with the prior proposed theories. This is also in line with other studies within the same literature, such as the statement that higher compatibility may lead to preferable adoption (Chen-Ying Lee et al., 2015). As a result, it is reasonable to assume that as the compatibility of smart home services improves, so will customers' purchase intention. Subsequently, unlike our proposed theories dedicating that facilitating conditions have a significant effect on the purchase intention of customers, the findings surprisingly provide evidence establishing that its figures have no significant and positive impact on the purchase intention of smart home services. To explain, we conjecture that facilitating conditions, commonly referring to supporting resources, are not deemed as factors enhancing the perceived value of high-tech appliances after being purchased. Concerning the next evaluation related to price value, this figure of smart home services is unsurprisingly perceived as considerably significant for the purchasing. This facilitates the relationship expressing that the higher a product is priced, the fewer units are sold. Lastly evaluated are the result findings on the effect of attitude on the purchase intention. This finding appears completely consistent with prior theories and hypotheses proposed in studies in the same field, where it is frequently inferred that customers' attitudes towards an object are a main factor in the intention to purchase (Park et al., 2013). Furthermore, the attitude displays a customers' appreciation for a product or service because it cares about the external and environmental stimuli such as facilitating conditions, compatibility, and price value. As a result, the more positive it is towards the adoption of high-tech appliances, the stronger the intention to purchase them and vice versa.

Lastly, attitude was proven to substantially mediate the relationship between stimuli factors and customers' purchase intention. This means the more satisfaction and preference customers have due to the influence of external factors, i.e., the degree to which customers interact with technology before purchasing, the more likely they are to purchase smart home services.

4.3. Implication

4.3.1. Theoretical implication

Firstly, the study establishes the explanatory value of an established SOR model in the context of smart home services. The results show that compatibility, price value and consumers' attitude positively influence consumers' purchase intention towards smart home services. In addition, the study highlights the importance of consumers' attitude as a mediator of the relationship between external and environmental stimuli and purchase intentions.

Secondly, the findings report that attitude is the strongest predictor of smart home purchase intention. It reinforces previous studies' concept that attitude is crucial in determining consumers' purchase intention (e.g., Norizah and Siti, 2007; Park et al., 2013).

Finally, facilitating conditions is uncritical in predicting consumers' purchase intention, contradicting the prior study's findings by Sequeiros et al. (2021). That is, facilitating conditions, as compared to compatibility and price value, is less important in predicting smart home purchase intention.

4.3.2. Practical implication

According to the empirical results, some suggestions are provided in the context of improving the service quality and purchase intention within technology-specialized corporations.

Firstly, besides in-depth market research, not only the compatibility among a single IoT service but the compatibility between a whole smart home system with the convenience of users should be focused intensely. Customers will be convinced of the benefits and value smart home services bring to their lives if appliances function well together and meet users' everyday demands, and companies will have a good chance of converting customers who are in the awareness stage to purchase intention stage.

Secondly, although the analysis results inferred that facilitating does not directly affect the intention period to a large extent, better facilitating conditions should be considered to influence customers in their awareness period. Particularly, concerning facilitating conditions policy, lengthening the warranty period helps customers feel protected both before and post service. Ideally, visualized guidebooks could be more convenient in adapting to new IoT systems, especially with the elderly.

Thirdly, an affordable price should be taken into consideration. In Vietnam, costly purchasing is mainly ideal for metropolises like HCMC and Hanoi, limiting high-end segments and the process of penetrating Vietnam market. For the new entry, profound market research should be implemented to retarget potential audiences (i.e., households in suburbs or smaller cities) instead of competing in same customer segments. With medium prices, therefore, IoT-specialized companies could possibly extend their market to small-medium cities.

Lastly, attitude was proven to substantially mediate the relationship between stimuli factors and customers' purchase intention, as the more satisfaction customers have from external factors, the more likely they are to purchase. Consequently, smart home services could be manipulated to optimize customer experience by applying innovations in the pre-purchase stage. Thus, by giving customers the ability to sense the products themselves, retailers could set clear expectations for what is being offered, or to inform them of what to expect and how to properly use the product. This will assist retailers in linking customer's core needs with the company's core values, building stronger relationships as a result of product exposure.

4.4. Limitation and future development

Beside the contributions of our research, we realized several limitations during the process of implementing. Analytically, since the quantitative data collection method was simple random sampling, the survey could not approach a huge number of possible respondents in other regions to provide an overview of customers' perspectives throughout Vietnam. Besides, the group of authors had difficulties in reaching various demographics leading to the limit in sample objectives and sample size since most of the responses are from 18-24 aged surveyors. Therefore, this study does not generalize the attitude and purchase intention of Vietnamese customers among various age segmentations. In addition, the research was generally conducted based on customers' personal background and knowledge about different domestic and foreign smart home businesses, not on a separate brand or on an expected reaction from a particular group of customers. As a result, the research responses may differ from each segment, resulting from various experiences and rationales behind the purchase intention of smart home services. Thus, future studies should extend the sample to include a broader range of research participants, as well as incorporate other theoretical frameworks, to better understand the customers' purchase intention.

5. Conclusion

The Internet of Things (IoT) is a relatively new phenomenon that is projected to have a substantial impact on many aspects of modern technology, particularly in the post-pandemic era. The goal of the study is to determine how well IoT technologies are likely to be acquired in Vietnam in the context of smart home

services. The suggested and investigated theoretical model combines the S-O-R model with literature on facilitating factors, compatibility, price value, and attitude as mediators of customers' purchase intentions. The findings suggest that compatibility and price value, as well as attitude as key mediator in the process, have a substantial influence in determining a customer's purchase intention, with price value having a minimal impact on comparison. Surprisingly, the findings also show that facilitating conditions hardly influences purchase intention as the others. Thus, the findings may have practical implications for encouraging the adoption of smart home technologies so that businesses may give better value and improve their selling endeavors.

6. Appendix

Appendix A. Model fit - Coefficient of Determination

| | R Square | R Square Adjusted |
|----|----------|-------------------|
| AT | 0.551 | 0.546 |
| PI | 0.603 | 0.597 |

Appendix B. Path coefficients

| | Original Sample (O) | Sample Mean (M) | Standard Deviation (STDEV) | T Statistics (O/STDEV) | P Values |
|----------|---------------------|-----------------|----------------------------|-------------------------|----------|
| AT -> PI | 0.428 | 0.423 | 0.061 | 6.972 | 0 |
| CO -> AT | 0.405 | 0.404 | 0.058 | 6.971 | 0 |
| CO -> PI | 0.274 | 0.276 | 0.051 | 5.386 | 0 |
| FC -> AT | 0.335 | 0.335 | 0.063 | 5.315 | 0 |
| FC -> PI | 0.079 | 0.08 | 0.053 | 1.482 | 0.138 |
| PV -> AT | 0.139 | 0.142 | 0.051 | 2.733 | 0.006 |
| PV -> PI | 0.132 | 0.134 | 0.047 | 2.805 | 0.005 |

Appendix C. Specific Indirect Effect

| | Original Sample (O) | Sample Mean (M) | 2.50% | 97.50% |
|----------------|---------------------|-----------------|-------|--------|
| CO -> AT -> PI | 0.173 | 0.171 | 0.105 | 0.245 |
| FC -> AT -> PI | 0.143 | 0.142 | 0.078 | 0.215 |
| PV -> AT -> PI | 0.06 | 0.06 | 0.018 | 0.106 |

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FACTORS INFLUENCING ON FAKE NEWS SHARING BEHAVIOUR ABOUT COVID-19 ON SOCIAL MEDIA

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ABSTRACT

This study measures the factors that influence the behavior of spreading fake news about Covid-19 on popular social networking platforms. The research firstly illustrates that the factors affecting the decision to share fake news related to Covid-19 are contributed to seven main factors, including the information overload on social networking platforms in the current digital technology era; other elements deriving from the demands of individuals in sharing information: Status seeking, socializing, pass time. Furthermore, cyberchondria is influenced by these characteristics, as well as a person's perceived COVID-19 severity and sensitivity. The final results show that five factors have a positive impact on the behavior of fake news sharing about Covid-19 and cyberchondria. Our finding suggests that we should controlling network security, directing social network users to reliable and precise information, preventing information overload and problems affecting mental health when entering the period of new normal.

Keywords: fake news; fake news sharing; Covid-19; social media.

1. Introduction

Since the advent of the Internet in the 1970s, the world has witnessed rapid change due to its influence in all fields: economy, politics, ethics, and society. In the digital era, one of the most critical applications is social networking, with the market dominated by Facebook. The growth of social networks are still an undeniably essential existence. In 2021, the number of social network users in Vietnam increased to more than 72 million, accounting for 73.7% of the population (Kemp, 2021). Considering the rapid development of social networks, especially during the pandemic, information explosion on these platforms is inevitable. There has been a plethora of freely accessible health information on social media platforms, and it is difficult for users to select and process such a large amount of news. This was particularly true during the outbreak of the Covid-19 epidemic with many complicated and unpredicted developments as the perception about the risks of the coronavirus increased; instead of providing accurate information about the pandemic, a part of online users spread fear with unverified news that confused public opinion. This leads to the fact that sharing false information about the epidemic became even more challenging to control. Current social networking platforms are mostly public platforms, with most of the content being created by users themselves, without verification by the authorities. The more news related to the epidemic, the more people were interested in sharing it, which allowed fake news to spread quickly. Having witnessed such a concerning situation, the authors aim to shed light on the factors which affect the behavior of sharing unreliable information about covid-19.

The growing reliance on social media for news, and the real-world effects of information sharing on both fronts, motivated the authors to ask: why and what are the causes of this behavior and therefore study the factors affecting the perception and intention to share information on social networking platforms to get the most optimal solutions for both the recipients and the spreaders of information.

Therefore, the author's research paper is urgent and can provide knowledge and information related to Covid-19 to help readers be wary of inaccurate and unconfirmed information. Moreover, avoid unpredictable

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consequences, causing negative impacts on the community and society in general and users of social networks in particular.

Research gap

Most previous research articles in the world were done during the early stage of the Covid-19 epidemic: Laato et al. (2020); Thompson et al. (2019); Khan & Idris (2019); which may still not be appropriate in the new normal time. Furthermore, there have been no officially academic research articles on this issue in Vietnam recently, especially in the Covid-19 context. Therefore, it is essential to identify and solve problems related to false and fake news and contribute to the field of media research in Vietnam and around the world to create a professional, free, democratic, and transparent press and media environment.

Theoretical background

To study information sharing behavior and cyberchondria, the authors use the following five theories: (1) Theory of Reasoned Action (TRA), (2) Information Adoption Model (IAM), (3) Theory of Planned Behavior (TPB), (4) Uses & Gratifications (U&G), (5) Health Belief Model (HBM).

Fishbein and Ajzen developed the theory of Reasoned Action (TRA) in 1975. Behavioral intentions are directly affected by individual elements - people's attitudes toward the conduct - and factors reflecting the impact of society - subjective standards around that behavior, according to the theory of rational action (TRA). The more favorable the attitude and subjective norm and the more significant the ability to control perception, the stronger the intention to perform the behavior, according to Silverman et al. (2016). TPB (Theory of Planned Behavior), developed by Ajzen (1991), is an extension of TRA that incorporates the idea of cognitive-behavioral control, allowing it to be used to explain individuals' behavior under incomplete behavioral control.

The Technology Acceptance Model (TAM Model) and the dual-process model of information influence are the foundations of the IAM model, also known as the Information Adoption Model (e.g., elaboration likelihood model - ELM). Sussman et al. (2003) propose the Information Acceptance Model (IAM), which explains how humans interpret information and, as a result, modify their intentions and behaviors in intermediate communication platforms such as computers.

The Uses and Gratifications (U&G) hypothesis, developed by Lazarsfeld and Stanton (1944) in the 1940s, explains why individuals consume mass media and the various gratifications they receive. The research proves the suitability of the U&G method in the context of the online environment and its potential explanatory power in predicting individual news-sharing behavior using the U&G theoretical model developed by Lee & Ma (2012), which is a combination model of many previous models based on the most common point of view.

The Health Belief Model is a social cognitive model of health that arose in the 1950s due to a study into the efficacy of health education initiatives (Sheeran & Abraham, 1996). The model links demographic and psychometric factors to emotional and cognitive states, including perceived sensitivity, severity, health motivation, and perceived benefit awake. After then, they are linked to behavioral reactions (Sheeran & Abraham, 1996).

2. Theoretical framework

2.1. Theory 1

Since the discovery of Covid-19 in 2019, the number of illnesses and deaths has been steadily rising. Many people use social media to get health and medical information to safeguard their health and conquer their fear of disease. With so much fake news on the internet nowadays, it is evident that we cannot trust it completely. Cyberchondria can be caused by excessive searching, information overload, and reliance on internet information. According to previous studies, Cyberchondria syndrome is a health anxiety disorder identified by frequent and excessive searching for health information on the Internet (Vismara et al., 2020; White & Horvitz, 2009). Cyberchondria syndrome refers to an unusual pattern of behavior when individuals excessively or repeatedly search online for health-related information causing distress or anxiety (McMullan

et al., 2019). In addition, Vismara et al. (2020) also looked into the influence of trusting online sources on health anxiety generated by low-quality online information and the unpredictability of the repercussions. According to Laato et al. (2020), if social media users do not have the habit or ability to assess the reliability of online news, combined with the prevalence of misinformation and trust in online information, misleading information can cause redundant concerns about personal health, particularly in a complex context like the Covid-19 pandemic.

H1: Online information trust increases the sharing of fake news about Covid-19.

2.2. Theory 2

In the context of the pandemic, people's ignorance about Covid-19 and the constant evolution of new strains, along with the constant updating of relevant news have fueled the thirst for information. This leads to a proliferation of rumors, fake news and misinformation. According to Chadwick & Vaccari (2019), trust is a mental shortcut, which allows Internet users to make quicker decisions about the quality of news. In the online environment, trust is built from successful experiences of exchanging information among users of social networks (Grabner-Kräuter and Bitter, 2013). When social media users place an excessive amount of trust in online information, it can lead them to disregard the consideration of whether the information is fake or not (Krasnova et al., 2010; Lin and Liu, 2012). It was found that people who strongly believe internet information are more likely to distribute real news while also circulating fake news and misinformation (Khan et al. Idris, 2019; Talwar et al., 2019). Therefore, it can be argued that:

H2: Online information trust increases the sharing of fake news about Covid-19..

2.3. Theory 3

With greater access to the Internet, people are more likely to be overwhelmed by the massive amount of information they encounter on social media. Information overload is defined as the state in which the number of information people is exposed to exceed their ability to process it efficiently (Yang, Chen & Honga, 2003). The increasing frequency of searching about Covid-19 proves that people are thirsty for information to reassure themselves of the pandemic severity (Rogers & Prentice-Dunn, 1997). Cyberchondria is a health anxiety disorder identified by frequent and excessive searching for health information on the Internet (Vismara et al., 2020; White & Horvitz, 2009). This syndrome refers to an unusual pattern of behavior when individuals excessively or repeatedly search online for health-related information, which causes distress or anxiety (McMullan et al., 2019). Husnayain et al. (2020) show that Covid-related search has soared during the pandemic outbreak; as a result, the escalation of Cyberchondria syndrome may result from the perception of the severity and vulnerability of this plague. Thus, we propose the following:

H3: Information overload increases COVID-19-related cyberchondria.

2.4. Theory 4

The complicated developments of the covid-19 have made it more urgent and important to keep oneself updated with new knowledge about the pandemic. However, using social media, users have little control over access to information, information sources and amounts, and their frequency of occurrence, leading to information overload. When overloaded, people will experience fatigue, which leads to a reduction in the ability to verify information (Huang et al, 2015). As the capability of confirming the credibility of information declines, they are more likely to consume and spread inaccurate information. Thus, we propose the following:

H4: Information overload increases the sharing of fake news about Covid-19.

2.5. Theory 5

Since Covid-19 was regarded as a pandemic, most of the information sources on social networks have constantly reported new Coronavirus strains and demonstrated the impact of the disease with inevitable severe consequences, which has increased health concerns among readers (Gao et al., 2020). The Protection Motivation Theory recognizes that the sense of importance will lead to seeking additional information about the associated topic to deal with the problem appropriately. This means the more severe the threat

assessment, the higher the incentive to seek more information (Farooq et al., 2020; Husnayain et al., 2020). Therefore, we propose the hypothesis:

H5: Perceived severity increases COVID19-related cyberchondria.

2.6. Theory 6

Sheeran & Abraham (1996) proposed the health belief model in which the fundamental driver of human action in the face of health threats is the perception of severity. Perceived severity is the subjective estimate of the severity of a health problem and its potential repercussions; individuals who perceive a significant health problem are more likely to engage in behaviors to prevent the problem from developing or reducing its severity (Rosenstock et al., 1994). Furthermore, Huang et al. (2015) discovered that mental and physical anxiety increased the probability of sharing unverified information. Consequently, we propose the following hypothesis:

H6: Perceived severity to Covid-19 increases the sharing of fake news about Covid-19.

2.7. Theory 7

Status-seeking is the gratification of receiving respect or obtaining a specific position in one's network after sharing information (Lee & Ma, 2012; Cheung, Chiu, and Lee, 2011). Studies have shown that one of the strongest motivators for users to engage and use the Internet is the desire for status (LaRose & Eastin, 2004; Marlow). Park et al. (2009) found a significant positive association between status search and social outcomes among social media users. In terms of exchanging information with others, this can affect status-seeking, allowing social network users to build a reputation and feel significant among their peers. Therefore, it is understandable that social media users will be more cautious and deliberate with their intentions to share information because sharing inaccurate information will worsen their image of users and position. This argument is further reinforced by a study by Islam et al. (2019), which states that, during the Covid-19 era, those who aspire to achieve social status on social media become more cautious in sharing information to avoid spreading false or unverified information about the epidemic situation, which could lead to suffered ridicule. As a result, we propose the hypothesis that:

H7: Status seeking gratification decreases the sharing of fake news on COVID-19 pandemic.

2.8. Theory 8

According to the Uses and Gratifications theory, individuals interact with each other to achieve a sense of belonging (Rubin, 1986). The need for connection is called socializing gratification or social interaction gratification. Whiting & Williams (2013) and Lee & Ma (2012) define social contact as the desire to communicate and interact with others, which could help people feel more connected. Papacharissi & Rubin (2000) also found that individuals use the Internet as an alternative medium for interpersonal communication. Some scholars have found that social satisfaction and media use can create new relationships. For example, Howard & Corkindale (2008) found that socialization is positively related to the consumption of online news services.

Regarding social networks, Park et al. (2009) noted that socialization is considered one of the pleasures that motivate university students to participate in Facebook groups. Consistent with this finding, Dunne et al. (2010) concluded that maintaining relationships is the primary motivation for users to use social networking sites. Taken together, we argue that when social media platforms provide features that promote the development and maintenance of relationships for social media users, news sharing on social networks will become a more familiar experience. Moreover, during the outbreak of Covid-19, health problems have become an essential matter of public concern, and staying informed of the pandemic's developments allows people to connect with others. People tend not to consider the information to verify them thoroughly to socialize. Therefore, we make the following hypothesis:

H8: Socializing gratification increases the sharing of fake news about Covid-19.

2.9. Theory 9

Kircaburun (2018) defined pass time as using social media platforms to occupy time and reduce boredom. Vicario (2016) discovered a correlation between pass time and sharing misinformation. When individuals use social media to save time, they are less likely to verify the authenticity and quality of information before transmitting it. Thompson (2019), on the other hand, found no association between free time and news sharing. Choi (2016) found that time satisfaction was the most critical predictor of news sharing behavior. We believe that when social media users utilize social networks for entertainment during the period of social distancing induced by the COVID-19 pandemic, they are less likely to check information regarding COVID-19 before sharing it, which might lead to misinformation being shared. We then propose that:

H9: Pass time gratification increases the sharing of fake news about Covid-19.

2.10. Theory 10

Exposure to misinformation can contribute to the development of health misconceptions because it is challenging to separate fake news from accurate information (Del Vicario et al., 2016). During the Covid-19 epidemic, the rapid evolution of the crisis and the massive abundance of unclear information, some of which is false, have accelerated the establishment of health misconceptions. Cyberchondria syndrome is linked to addiction and obsessive behavior (Ivanova, 2013; Vismara et al., 2020), leading to mental confusion and reduced human ability to fact-check and verify the news. Therefore, it is proposed that:

H10: Cyberchondria increases the sharing of fake news about Covid-19.

2.11. Theory 11

Gender

Gender disparities in the context of the Covid-19 epidemic have been explored and highlighted in several papers, particularly in behaviors and attitudes. According to the World Health Organization (2020), the social and cultural standards, roles, qualities, and behaviors that culture thinks appropriate for men and women, or boys and girls, are referred to as gender. Many research articles have confirmed the importance of gender in spreading fake news, like Wasserman & Madrid-Morales (2019), Rampersad & Althiyabi (2019), and Goyanes (2018). Earlier research by Chen et al. (2015) revealed that females are more likely than males to spread misinformation. Glasso et al. (2020) argued that women consider the Covid-19 outbreak a more significant health issue than males. Following earlier research, **we believe that gender increases the risk of distributing fake news sharing about the Covid-19, thereby increasing the liability of suffering from cyberchondria.**

Age

In the context of the current Covid-19 outbreak, social media is a familiar and essential tool for people who want to keep up with the latest pandemic news. Likewise, as technology advances, the age of exposure to social networking sites is widely extended from the young to the elderly, with no distinction between generations. According to research data from Hruska & Maresova (2020), "In total, 88% of 18 to 29-year-olds report using social media (compared to 78% to 37% of older age groups), and young adults spend more time (averaging over 3 hours daily) on social media than older adults". **As a result, we believe that, given the current frequency of young people's exposure to social networks, their ability to be affected by information overload, resulting in unverified information sharing about Covid-19, as well as their ability to tolerate the impact of their cyberchondria is far greater than that of older adults.**

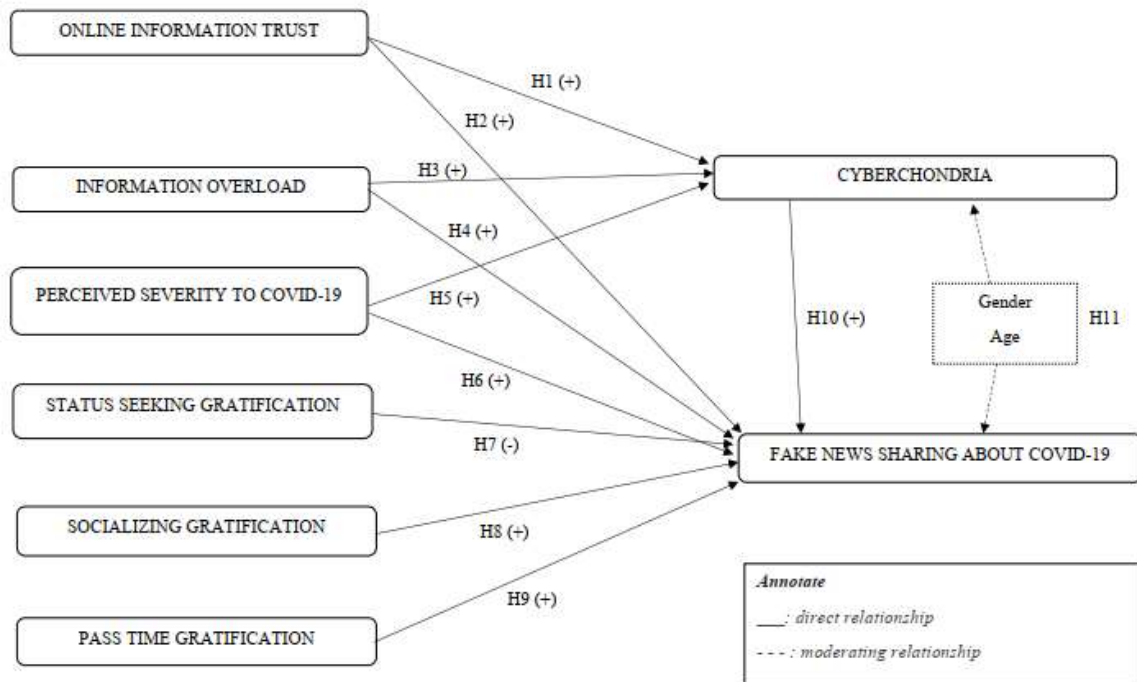


Figure 1. Research Model

3. Research method

3.1. Sample and data collection

We use quantitative research via conducting an online survey based with Google Form used to collect data from Vietnamese Internet users via email and link posted on Facebook in December 2021. We gathered 500 respondents but only 351 were legitimate responses after filtering invalid data. The demographic information of the respondents is summarized in Table 1.

Table 1. Sample demographic information

| Category | | Sample (N=351) |
|----------------------------|--------------------|----------------|
| Gender | Male | 33.33% |
| | Female | 66.67% |
| Age | Under 18 | 11.96% |
| | 18-24 | 64.39% |
| | 25-34 | 6.55% |
| | 35-44 | 8.83% |
| | 45 and over | 8.26% |
| Profession | Student | 65.81% |
| | Employed full-time | 21.65% |
| | Employed part-time | 6.26% |
| | Unemployed | 2.27% |
| | Retired | 2.85% |
| Social media use frequency | Facebook | 90.89% |
| | YouTube | 61.54% |
| | Instagram | 50.14% |
| | TikTok | 45.59% |
| | Zalo | 51.57% |
| | Twitter | 7.40% |

3.2. Measurement Scales

The questionnaire used 5-point Likert-type scales, in which 1 symbolizes strongly disagree, and 5 expresses strongly agree.

We conducted a pre-test with 10 random participants from the authors' own circles and then double-check the wording of the questionnaire to ensure that the questions are understood correctly by survey participants. The feedback was considered to revise and adjust to avoid inconsistencies and misunderstanding before full data collection.

3.3. Data analysis methodology

We analyzed data with SPSS and AMOS version 26 to test the proposed model and hypotheses through the methods of testing Cronbach's Alpha coefficient, exploratory factor analysis (EFA), confirmatory factor analysis. (CFA) and linear structural modeling (SEM).

4. Results and discussion

4.1. Descriptive Statistics

CYBER has the highest mean while those of PT and MS are rather low but have the most significant standard deviation.

Table 2. Descriptive statistics

| Factor | N | Min | Max | Mean | SD |
|--------------------------------------------|-----|------|------|-------|-------|
| Online information trust (OT) | 351 | 1.00 | 5.00 | 2.981 | 0.885 |
| Information Overload (IO) | 351 | 1.00 | 5.00 | 3.550 | 0.863 |
| Cyberchondria (CYBER) | 351 | 1.00 | 5.00 | 3.454 | 0.889 |
| Status seeking (SS) | 351 | 1.00 | 5.00 | 3.063 | 0.952 |
| Pass time (PT) | 351 | 1.00 | 5.00 | 2.897 | 1.026 |
| Socializing (SOCIAL) | 351 | 1.00 | 5.00 | 3.674 | 0.774 |
| Perceived severity to Covid-19 (PS) | 351 | 1.00 | 5.00 | 4.047 | 0.774 |
| Misinformation sharing about Covid-19 (MS) | 351 | 1.00 | 5.00 | 2.852 | 1.209 |

4.2. Cronbach's Alpha Test

By using Cronbach's alpha, we can evaluate the reliability of each scale. The construct will be eliminated if Corrected Item – Total Correlation is less than 0.3 and the CR of scale is less than 0.6 The results show that we accept all constructs for the next step because they all met above requirements.

4.3. The Exploratory Factor Analysis (EFA)

The Exploratory Factor Analysis (EFA) is conducted to identify the underlying relationships between the measured variables. The authors used The Principle Component analysis and Varimax Rotation in this test and Barlett and KMO are used to access the suitability of EFA. Accordingly, EFA is thought to be appropriate when $0.5 \leq KMO \leq 1$ and $Sig < 0.05$. In case $KMO < 0.5$, factor analysis is likely not relevant to the data.

Factor loading illustrates the correlation coefficient for the variable and factor. Factor loadings are standardized regression weights. According to Hair et al, 0.5 or higher factor loading represents the practical meaning. If choosing the minimum of factor loading is 0.3, the sample size must be at least 350. If the observed variable has factor loading of less than or equal to 0.3, it will be eliminated to assure the factor analysis.

We put variables attained in the previous stage to evaluate the exploratory factor of the scale. The result of $KMO = 0.889 > 0.5$ proves that the analyzed factors are appropriate along with the Sig (Bartlett's Test) = $0.000 < 0.05$ so in general, there is a correlation among observed variables.

In the Total Variance Explained table, the cumulative (%) = $71.675\% > 50\%$, interpreting 71.675% of the variability of the data is explained by 8 factors.

4.4. The Confirmatory Factor Analysis (CFA)

This technique allowed us to test our hypothesis by verify the relationship between observed variables and their latent constructs. $Chi\text{-squared}/df = 1.492 < 2$; $CFI = 0.964 > 0.9$; $RMSEA = 0.024 < 0.03$. All the model fit figures satisfied the requirements so our model is statistical significance.

The evaluation of the measurement model was conducted by composite reliability test (internal consistency) and validity (convergent and discriminant validity). As shown in the table 3, the composite reliability of each indicator was all above 0.7 that meet the requirements of internal consistency. In the CFA approach, by extracting Average Variance Extract (AVE) via the Fornell and Larcker (1981) table, we can evaluate the convergent validity and discriminant validity.

Convergent validity is confirmed when AVE of each scale is higher than 0.5 with a below 0.05 p-value. The Standardized Regression Weight of each indicator item satisfied. Besides, if the AVE is greater than the Maximum Shared Variance (MSV) and the Square Root of AVE (SQRTAVE) is also greater than the Inter-Construct Correlations; thus, the proposed concepts are discriminant validity.

Table 3. Composite reliability, convergent validity

| Constructs | Items | Standardized Regression | Cronbach alpha | CR | AVE |
|----------------------------------|---------|-------------------------|----------------|-------|-------|
| Online Information Trust | OT1 | 0.593 | 0.744 | 0.753 | 0.513 |
| | OT2 | 0.615 | | | |
| | OT3 | 0.900 | | | |
| Information Overload | IO1 | 0.743 | 0.816 | 0.820 | 0.603 |
| | IO2 | 0.825 | | | |
| | IO3 | 0.759 | | | |
| Cyberchondria | CYBER1 | 0.821 | 0.845 | 0.829 | 0.596 |
| | CYBER2 | 0.872 | | | |
| | CYBER3 | 0.739 | | | |
| | CYBER4 | 0.634 | | | |
| Status Seeking gratification | SS1 | 0.649 | 0.871 | 0.875 | 0.587 |
| | SS2 | 0.771 | | | |
| | SS3 | 0.835 | | | |
| | SS4 | 0.873 | | | |
| | SS5 | 0.679 | | | |
| Pass Time gratification | PT1 | 0.729 | 0.877 | 0.877 | 0.589 |
| | PT2 | 0.776 | | | |
| | PT3 | 0.774 | | | |
| | PT4 | 0.797 | | | |
| | PT5 | 0.760 | | | |
| Socializing gratification | SOCIAL1 | 0.776 | 0.860 | 0.861 | 0.558 |
| | SOCIAL2 | 0.585 | | | |
| | SOCIAL3 | 0.840 | | | |
| | SOCIAL4 | 0.729 | | | |
| | SOCIAL5 | 0.779 | | | |
| Perceived Severity to Covid-19 | PS1 | 0.811 | 0.823 | 0.853 | 0.617 |
| | PS2 | 0.809 | | | |
| | PS3 | 0.735 | | | |
| Fake news sharing about Covid-19 | MS1 | 0.898 | 0.952 | 0.949 | 0.789 |
| | MS2 | 0.909 | | | |
| | MS3 | 0.873 | | | |
| | MS4 | 0.891 | | | |
| | MS5 | 0.869 | | | |

Table 4. Discriminant validity Fornell & Larcker

| | OT | MS | PT | SOCIAL | SS | CYBER | IO | PS | AVE | MSV |
|----|-------|-------|-------|--------|----|-------|----|----|-------|-------|
| OT | 0.716 | | | | | | | | 0.513 | 0.282 |
| MS | 0.531 | 0.888 | | | | | | | 0.789 | 0.287 |
| PT | 0.269 | 0.464 | 0.768 | | | | | | 0.589 | 0.215 |

| | | | | | | | | | | |
|--------|--------|--------|--------|--------|--------|--------|-------|-------|-------|-------|
| SOCIAL | 0.285 | 0.356 | 0.199 | 0.747 | | | | | 0.558 | 0.253 |
| SS | 0.485 | 0.536 | 0.426 | 0.503 | 0.766 | | | | 0.587 | 0.287 |
| CYBER | -0.110 | -0.158 | -0.217 | -0.142 | -0.238 | 0.772 | | | 0.596 | 0.283 |
| IO | 0.279 | 0.396 | 0.246 | 0.281 | 0.378 | -0.093 | 0.776 | | 0.603 | 0.157 |
| PS | -0.060 | -0.010 | -0.029 | -0.074 | -0.153 | 0.532 | 0.023 | 0.786 | 0.617 | 0.283 |

4.5. Structural Equation Model (SEM)

After CFA, we continued to conduct SEM to explore the relationship between concepts. Out of the 10 hypotheses proposed, H1, H3, H6, H8, and H10 were rejected and the remaining were accepted.

Among the four variables affecting the fake news sharing about Covid-19, the order of decreasing impact is Online information trust (OT), Pass time (PT), Status Seeking (SS), and Information Overload (IO) with regression weights 0.311; 0.244; 0.185; 0.151 respectively.

Table 5. Hypothesis testing results

| Hypothesis | | Standardized Coefficients | P values | Results |
|------------|---------------------------------------------------------------------------------------------------|---------------------------|----------|---------|
| H1 | Online information trust increases cyberchondria | -0.060 | 0.306 | Reject |
| H2 | Online information trust will be positively associated with sharing fake news about the COVID-19. | 0.311 | *** | Accept |
| H3 | Information overload increases COVID-19 related cyberchondria. | -0.099 | 0.093 | Reject |
| H4 | Information overload increases fake news sharing about the COVID-19. | 0.151 | 0.005 | Accept |
| H5 | Perceived severity increases COVID-19 related cyberchondria. | 0.537 | *** | Accept |
| H6 | Perceived severity of Covid-19 increases the spread of fake news about Covid-19. | 0.068 | 0.249 | Reject |
| H7 | Status seeking will be negatively associated with sharing fake news about the COVID-19. | 0.185 | 0.006 | Accept |
| H8 | Socializing gratification will be positively associated sharing fake news about the COVID-19. | 0.083 | 0.126 | Reject |
| H9 | Pass time increases fake news sharing about the COVID-19. | 0.244 | *** | Accept |
| H10 | Cyberchondria related to Covid-19 increases fake news sharing about the COVID-19. | -0.040 | 0.489 | Reject |

T-test and ANOVA were implemented to explore whether demographic characteristics (gender and age) have any effect on Cyberchondria and fake news sharing about Covid-19. Gender has no influence on both dependent factors. Meanwhile, ANOVA test reported that different ages lead to distinct decisions on fake news sharing about Covid-19.

Table 6. ANOVA test by ages

| | Under 18 | | From 18 to 24 | | From 25 to 34 | | From 35 to 44 | | Above 45 | | Sig. Levene | Sig. ANOVA |
|------|----------|-------|---------------|------|---------------|-------|---------------|------|----------|-------|-------------|------------|
| | Mean | SD | Mean | SD | Mean | SD | Mean | SD | Mean | SD | | |
| F_PS | .073 | 1.123 | -.025 | .981 | .0033 | 1.179 | .0928 | .851 | -.012 | 1.021 | .322 | .959 |
| F_MS | .476 | .9618 | -.316 | .875 | .3618 | .948 | .892 | .999 | .5365 | .8757 | .320 | .000 |

Furthermore, among the ages surveyed, the group aged 18 - 24 distinguished from the others. This distinction can be explained by the frequency of social media use of people aged 18-24 is higher than that of other ages. Therefore, they have a higher ability to share fake news online happens than the rest.

Table 7. Post-hoc Tests (Multiple Comparisons)

| Age | Age comparison | Std. Error | Sig. |
|---------------|----------------|------------|-------|
| Under 18 | From 18 to 24 | 0.1516 | 0.000 |
| | From 25 to 34 | 0.2341 | 1.000 |
| | From 35 to 44 | 0.2137 | 0.525 |
| | Above 45 | 0.2179 | 1.000 |
| From 18 to 24 | Under 18 | 0.1516 | 0.000 |
| | From 25 to 34 | 0.1975 | 0.007 |
| | From 35 to 44 | 0.1728 | 0.000 |
| | Above 45 | 0.1780 | 0.000 |
| From 25 to 34 | Under 18 | 0.2341 | 1.000 |
| | From 18 to 24 | 0.1975 | 0.007 |
| | From 35 to 44 | 0.2484 | 0.335 |
| | Above 45 | 0.2520 | 1.000 |
| From 35 to 44 | Under 18 | 0.2137 | 0.525 |
| | From 18 to 24 | 0.1728 | 0.000 |
| | From 25 to 34 | 0.2484 | 0.335 |
| | Above 45 | 0.2331 | 1.000 |
| Above 45 | Under 18 | 0.2179 | 1.000 |
| | From 18 to 24 | 0.1780 | 0.000 |
| | From 25 to 34 | 0.2520 | 1.000 |
| | From 35 to 44 | 0.2331 | 1.000 |

4.6. Discussion

Based on two theories (Cognitive load and U&G), the study proposes 11 hypotheses about factors that directly and indirectly affect cyberchondria and fake news sharing about Covid-19. After using analytical methods, the findings of the study demonstrate that several fundamental elements influence the behavior of sharing fake news about Covid-19, including four factors: Online information trust (OT), Information overload (IO), Status seeking (SS) and Pass-time (PT). Meanwhile, cyberchondria is affected by perceived severity of Covid-19.

After analyzing the obtained data, the research results demonstrate the correlation between online information trust, information overload, status-seeking, and pass time to misinformation sharing about Covid-19. Similar to the previous study by Apuke & Omar (2021), factors such as online information trust, information overload, and status-seeking were the most prominent predictors of untested Covid-19 information sharing. However, on the other hand, our research findings suggest that pass time influences unverified information sharing about Covid-19, contrary to Thompson et al. (2019). Subjectivity, carelessness, and trust in the source of information in which the amount of information is excessive, as well as the fact that individuals have much free time due to the epidemic or the desire to confirm positioning themselves, are all critical factors that influence the dissemination of inaccurate information in cyberspace. These factors are caused by social media, which leads to various harmful behaviors, including the propagation of false information regarding Covid-19.

The results of our study are the same as the results of Laato et al. (2019) when it is said that perceived severity of Covid-19 affects cyberchondria. The "matrix" of information about the epidemic situation was too much and rushed in a short period, including many subjective inferences, causing confusion and fear among the public and exacerbating social media-driven health anxiety. As demonstrated by the UNICEF (2019) report, the COVID-19 pandemic has raised significant concerns for the mental health of an entire generation of children and adolescents. On the other hand, the mediating variable, age, also has a specific effect on this disease. Laato et al. (2019) argue that in comparison to younger individuals, elderly adults have less cyberchondria and disseminate less unverified information due to perceived severity. In line with this

assertion, most of the research group's survey subjects are young people aged 18 to 24, the generation that grew up with social media platforms and is now exposed to them daily. Moreover, social media users may lack experience in evaluating information about Covid-19, thus which has a significant effect on mental health or makes people more concerned about their health.

The results show no correlation between online information trust, information overload, and cyberchondria. Our finding contradicts those of Laato et al. (2019). This can be explained by the fact that with today's rapid technological advancements, persons who possess gadgets connected to the Internet are those who can control and manage a large amount of data. Moreover, the period of Laato et al. (2019) and our study is two years apart, at a time when the Vietnamese government is tightening control over the propagation of false news and raising public awareness of its harmful impacts.

The analysis results, perceived severity of Covid-19 and socializing did not illustrate the correlation between them and misinformation sharing about Covid-19. Our findings are comparable to those of Laato et al. (2019) when the perceived severity of Covid-19 is taken into account. This outcome may be explained by the fact that when individuals are aware of the epidemic's threat, they will be more cautious with the information they get and seek out the most credible source to alleviate anxiety. On the other hand, our research results were identical to those of Thompson et al. (2019) when socializing came to this aspect. The covid pandemic information contains macro-scale information and warnings, but not entertainment or personal information, which is the most common way for people to interact and sustain social relationships.

The results also showed no link between cyberchondria and misinformation sharing about Covid-19, following the research study of Laato et al. (2019). Accordingly, the gender mediator variable plays a vital role in the relationship between unverified information sharing about Covid-19 and cyberchondria. Females are more affected by cyberchondria and are less likely to share unverified information about Covid-19 on social media than males. Nevertheless, the findings reveal that respondents of different genders had the same assessment of the harshness of Covid-19 and the same amount of information transmission (male and female). This might be explained by men and women having equal access to the same knowledge, and sharing is a natural human trait. As a result, when it comes to distributing information on social media, the actions and thinking are similar. Furthermore, our result can be explained by the fact that the more concerned an individual is about their health as a result of information on social media, the more they will search for other relevant information, increasing their chances of seeing, reviewing, and referring to a variety of news sources, as well as their ability to evaluate information. As a result, we believe that gender has little effect on the association between unverified information sharing about Covid-19 and cyberchondria.

5. Conclusion

Practical implications

Based on our findings, there are some recommendations to enable social network users to raise their vigilance and choose and validate information about the Covid-19 outbreak before sharing it with others. Individuals who trust internet sources are more likely to be exposed to and spread fake news. Additionally, due to Covid-19, a long time of social distancing can negatively impact people's psychophysiology. As a result, social network users should verify the sources in terms of individuals. The person who posted the news scrutinizes the content to determine whether the information is accurate or not and compares them to information on other official websites; furthermore, they should take the initiative to look after not only their physical health but also their mental well-being, which can reduce health concerns caused by inaccurate information on the Internet, resulting in a significant decrease in the dissemination of misinformation about Covid-19. In terms of government and administrators of social networking platforms, they should build and develop mechanisms to check and screen erroneous information about the Covid-19 outbreak, thereby assisting in a transparent and safe environment. Simultaneously, the government establishes and modifies specific laws and sanctions to control persons and groups who propagate misinformation to sway public opinion.

Limitations and Suggestions for Further Studies

There are some limitations to our research. The survey data was obtained online from Vietnamese social network users. The sample recruitment was solely for convenience with non-probability sampling methods, resulting in the results and generalizability of the study not being highly accurate. In addition, our research was carried out in the context of Covid-19 and only sampled from one nation country (Vietnam), so the results may not be applied in other territories. Another limitation is that we did not evaluate the respondents' educational level. At the same time, the advanced and modern education program is viewed as a significant factor in decreasing the sharing of misinformation.

Future research has the potential to broaden our research in various ways. First, further studies should be conducted with larger sample sizes and using probability sampling techniques to reduce errors and increase the reliability of research results. Second, studies could consider how education influences the sharing of incorrect information on social media.

6. Appendix

Appendix A. Measurement scale

| Constructs | Code | Items | Source |
|-----------------------------------|--------|------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| Online information trust (OT) | OI1 | The information I get from social media is reliable | Khan & Idris (2019) |
| | OI2 | I can trust information that I got from social media buzzer | |
| | OI3 | I trust information from my social networks, thus I do not have to check it | |
| Information Overload (IO) | IO1 | I am often distracted by the excessive amount of information on social media about Coronavirus (Covid-19) | Apuke & Omar (2021) |
| | IO2 | I find that I am overwhelmed by the amount of information that I process on a daily basis from social media about Coronavirus (Covid-19) | |
| | IO3 | I receive too much information regarding the Coronavirus (Covid-19) pandemic to form a coherent picture of what's happening | |
| Cyberchondria (CYBER) | CYBER1 | After reading information about Coronavirus (Covid-19) online, I feel confused | Samuli et al. (2020) |
| | CYBER2 | I feel frightened after reading information about Coronavirus (Covid-19) online | |
| | CYBER3 | I feel frustrated after reading information about Coronavirus (Covid-19) online. | |
| | CYBER4 | Once I start reading information about Coronavirus (Covid-19) online, it is hard for me to stop. | |
| Status seeking gratification (SS) | SS1 | Because it helps me feel important when sharing news | Thompson et al. (2019) |
| | SS2 | Because it helps me to gain status when sharing news. | |
| | SS3 | Because it helps me to look good when sharing news. | |

| | | | |
|---------------------------------------|------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|------------------------------------------|
| | SS4 | Because I feel peer pressure to participate. | |
| | SS5 | Because it helps me gain support and respect. | |
| Socializing gratification (SOCIAL) | SOCIAL1 | Because I can talk about something with others | Thompson et al. (2019) |
| | SOCIAL2 | Because I feel involved with what's going on with other people. Because I can interact with others when sharing news | |
| | SOCIAL3 | Because I can interact with others when sharing news. | |
| | SOCIAL4 | Because I can exchange ideas with others efficiently | |
| SOCIAL5 | Because it helps me keep in touch with others. | | |
| Pass time gratification (PT) | PT1 | Because I just like to play around on Facebook | Thompson et al. (2019) |
| | PT2 | Because it is a habit just something to do | |
| | PT3 | Because I have nothing to do | |
| | PT4 | Because, it passes the time away, particularly when I am bored | |
| | PT5 | Because everyone else is doing it | |
| Perceived severity to Covid-19 (PS) | PS1 | The negative impact of Coronavirus (COVID-19) is very high | Farooq et al. (2020), Ling et al. (2019) |
| | PS2 | Coronavirus (COVID-19) can be life-threatening | |
| | PS3 | The Coronavirus (COVID-19) is a serious threat for someone like me | |
| Fake news sharing about Covid-19 (MS) | MS1 | I often share information or news on Covid-19 without checking its authenticity | Samuli et al.(2020) |
| | MS2 | I share information or news on Covid-19 without checking facts through trusted sources | |
| | MS3 | I share information or news on Covid-19 without verifying it | |
| | MS4 | I share information or news on Covid-19 even if sometimes I feel the information may not be correct | |

Appendix B. Research results

B.1. Assess the reliability of the scale by Cronbach's Alpha coefficient

Online Information Trust (OT)

| Reliability Statistics | |
|------------------------|------------|
| Cronbach's Alpha | N of Items |
| .744 | 3 |

| Item-Total Statistics | | | | |
|-----------------------|----------------------------|--------------------------------|----------------------------------|----------------------------------|
| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
| OT1 | 5.82 | 3.961 | .537 | .700 |
| OT2 | 5.69 | 3.839 | .555 | .680 |
| OT3 | 6.38 | 2.808 | .644 | .577 |

Information Overload (IO)

Reliability Statistics

| | |
|------------------|------------|
| Cronbach's Alpha | N of Items |
| .816 | 3 |

Item-Total Statistics

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|-----|----------------------------|--------------------------------|----------------------------------|----------------------------------|
| IO1 | 7.12 | 3.371 | .650 | .767 |
| IO2 | 7.02 | 3.305 | .707 | .712 |
| IO3 | 7.16 | 3.081 | .655 | .766 |

Cyberchondria (CYBER)

Reliability Statistics

| | |
|------------------|------------|
| Cronbach's Alpha | N of Items |
| .845 | 4 |

Item-Total Statistics

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|--------|----------------------------|--------------------------------|----------------------------------|----------------------------------|
| CYBER1 | 10.22 | 7.756 | .712 | .793 |
| CYBER2 | 10.22 | 7.526 | .753 | .775 |
| CYBER3 | 10.39 | 7.342 | .683 | .802 |
| CYBER4 | 10.62 | 7.288 | .602 | .845 |

Status-Seeking (SS)

Reliability Statistics

| | |
|------------------|------------|
| Cronbach's Alpha | N of Items |
| .871 | 5 |

Item-Total Statistics

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|-----|----------------------------|--------------------------------|----------------------------------|----------------------------------|
| SS1 | 12.16 | 15.677 | .616 | .863 |
| SS2 | 12.49 | 14.811 | .729 | .836 |
| SS3 | 12.15 | 14.757 | .745 | .832 |
| SS4 | 12.19 | 14.477 | .787 | .822 |
| SS5 | 12.27 | 15.114 | .619 | .864 |

Pass time (PT)

Reliability Statistics

| | |
|------------------|------------|
| Cronbach's Alpha | N of Items |
| .877 | 5 |

Item-Total Statistics

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|-----|----------------------------|--------------------------------|----------------------------------|----------------------------------|
| PT1 | 11.42 | 17.885 | .674 | .859 |
| PT2 | 11.61 | 17.656 | .724 | .847 |
| PT3 | 11.67 | 17.406 | .710 | .850 |
| PT4 | 11.64 | 16.849 | .734 | .844 |
| PT5 | 11.62 | 17.089 | .699 | .853 |

Socializing Gratification (SOCIAL)

Reliability Statistics

| | |
|------------------|------------|
| Cronbach's Alpha | N of Items |
| .860 | 5 |

Item-Total Statistics

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|---------|----------------------------|--------------------------------|----------------------------------|----------------------------------|
| SOCIAL1 | 14.77 | 9.435 | .702 | .824 |
| SOCIAL2 | 14.50 | 11.239 | .549 | .860 |
| SOCIAL3 | 14.71 | 9.331 | .766 | .807 |
| SOCIAL4 | 14.66 | 10.174 | .679 | .830 |
| SOCIAL5 | 14.84 | 9.445 | .696 | .826 |

Perceived Severity to Covid-19 (PS)

Reliability Statistics

| | |
|------------------|------------|
| Cronbach's Alpha | N of Items |
| .823 | 3 |

Item-Total Statistics

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|-----|----------------------------|--------------------------------|----------------------------------|----------------------------------|
| PS1 | 8.08 | 2.671 | .691 | .743 |
| PS2 | 8.01 | 2.648 | .718 | .718 |
| PS3 | 8.20 | 2.514 | .632 | .809 |

Fake news sharing about Covid-19 (MS)

Reliability Statistics

| | |
|------------------|------------|
| Cronbach's Alpha | N of Items |
| .949 | 5 |

Item-Total Statistics

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|-----|----------------------------|--------------------------------|----------------------------------|----------------------------------|
| MS1 | 11.44 | 23.887 | .863 | .936 |
| MS2 | 11.44 | 23.510 | .876 | .934 |
| MS3 | 11.31 | 24.059 | .847 | .939 |
| MS4 | 11.42 | 23.444 | .868 | .935 |
| MS5 | 11.42 | 23.491 | .843 | .940 |

B.2. EFA Analysis:

Rotated Component Matrix

| | Component | | | | | | | |
|-----|-----------|------|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| MS2 | .856 | | | | | | | |
| MS4 | .851 | | | | | | | |
| MS3 | .844 | | | | | | | |
| MS5 | .840 | | | | | | | |
| MS1 | .833 | | | | | | | |
| PT4 | | .814 | | | | | | |
| PT3 | | .811 | | | | | | |
| PT2 | | .779 | | | | | | |
| PT1 | | .772 | | | | | | |
| PT5 | | .762 | | | | | | |

| | | | | | | | | |
|---------|--|--|------|------|------|------|------|------|
| SS2 | | | .837 | | | | | |
| SS4 | | | .774 | | | | | |
| SS3 | | | .773 | | | | | |
| SS1 | | | .771 | | | | | |
| SS5 | | | .699 | | | | | |
| SOCIAL3 | | | | .809 | | | | |
| SOCIAL4 | | | | .788 | | | | |
| SOCIAL5 | | | | .736 | | | | |
| SOCIAL1 | | | | .720 | | | | |
| SOCIAL2 | | | | .603 | | | | |
| PS2 | | | | | .832 | | | |
| PS1 | | | | | .822 | | | |
| PS3 | | | | | .779 | | | |
| PS4 | | | | | .771 | | | |
| CYBER2 | | | | | | .892 | | |
| CYBER1 | | | | | | .843 | | |
| CYBER3 | | | | | | .740 | | |
| IO2 | | | | | | | .851 | |
| IO1 | | | | | | | .814 | |
| IO3 | | | | | | | .787 | |
| OT2 | | | | | | | | .775 |
| OT1 | | | | | | | | .769 |
| OT3 | | | | | | | | .751 |

B.3. CFA Analysis:

CFA Model Fit

| CMIN | DF | P | CMIN/DF | TLI | CFI | RMSEA |
|---------|-----|------|---------|------|------|-------|
| 696.876 | 467 | .000 | 1.492 | .957 | .964 | .024 |

SEM Model Fit

| CMIN | DF | P | CMIN/DF | TLI | CFI | RMSEA |
|---------|-----|-------|---------|-------|-------|-------|
| 676.828 | 470 | 0.000 | 1.508 | 0.956 | 0.963 | 0.024 |

Standardized coefficients

| | Estimate |
|----------------|----------|
| CYBER <--- OT | -0.060 |
| CYBER <--- IO | -0.099 |
| CYBER <--- PS | 0.537 |
| MS <--- SS | 0.185 |
| MS <--- SOCIAL | 0.083 |
| MS <--- PT | 0.244 |
| MS <--- CYBER | -0.040 |
| MS <--- IO | 0.151 |
| MS <--- PS | 0.068 |
| MS <--- OT | 0.311 |
| MS2 <--- MS | 0.908 |
| MS4 <--- MS | 0.890 |
| MS3 <--- MS | 0.872 |
| MS5 <--- MS | 0.868 |
| MS1 <--- MS | 0.897 |
| PT4 <--- PT | 0.797 |
| PT2 <--- PT | 0.777 |

| | |
|---------------------|-------|
| PT3 <--- PT | 0.774 |
| PT5 <--- PT | 0.761 |
| PT1 <--- PT | 0.729 |
| SOCIAL3 <--- SOCIAL | 0.840 |
| SOCIAL5 <--- SOCIAL | 0.779 |
| SOCIAL1 <--- SOCIAL | 0.776 |
| SOCIAL4 <--- SOCIAL | 0.729 |
| SOCIAL2 <--- SOCIAL | 0.585 |
| SS2 <--- SS | 0.771 |
| SS4 <--- SS | 0.872 |
| SS3 <--- SS | 0.835 |
| SS1 <--- SS | 0.649 |
| SS5 <--- SS | 0.680 |
| CYBER2 <--- CYBER | 0.874 |
| CYBER1 <--- CYBER | 0.823 |
| CYBER3 <--- CYBER | 0.736 |
| CYBER4 <--- CYBER | 0.629 |
| IO2 <--- IO | 0.824 |
| IO1 <--- IO | 0.743 |
| IO3 <--- IO | 0.759 |
| PS2 <--- PS | 0.803 |
| PS1 <--- PS | 0.813 |
| PS3 <--- PS | 0.738 |
| OT3 <--- OT | 0.899 |
| OT2 <--- OT | 0.615 |
| OT1 <--- OT | 0.593 |

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“COOLNESS IS IN THE EYES OF THE BEHOLDER”

CHILDREN AS CONSUMERS AND BEHOLDERS

OF BRAND COOLNESS

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ABSTRACT

Being cool is desirable for consumers, and it is getting great attention from branding research and practices. However, previous studies have mainly focused on perceptions of brand coolness from adults' perspective, leaving little is known concerning children's perceptions about the coolness of brands. We adopted a multi-phase research process that employ multiple inquiry techniques: in-depth interviews (with a combination of the Cool Wall, storytelling and completion technique) and surveys (with open-ended questions) to explore how children aged 6-17 perceive brand coolness, form their coolness perceptions, as well as the connection between brand coolness perceptions and healthy consumption. The findings show that children of different ages have diverse perceptions of brand coolness and reactions towards cool brands, with older children reflecting more complicated thoughts. Specifically, while younger children aged 6 to 11 emphasize colors in cool images of brands, the older focus on trendiness and appropriateness. Furthermore, we discover the formations of these perceptions as well as the connection between children's perceptions and their reactions towards cool brands in regard to health concerns. In terms of theoretical implications, we add to the previous literature on brand coolness by illuminating the distinct coolness attributes that pertain to children and their perception formations. We also showed the validity of under-presented and child-friendly qualitative research techniques, especially the Cool Walls method, in studying attributes of brand coolness. Regarding managerial implications, we suggest companies employ brand coolness attributes perceived by children in their marketing campaigns to promote healthy consumption.

Keywords: brand coolness; children; qualitative research; cool wall technique; healthy consumption; dairy.

1. Introduction

Consumers desire to look cool and be cool “in how they act, purchase and consume improves and helps define self-image within peer groups and their projection to the outside world” (Byrne, 2018, p.12). As a result, building brand coolness as a factor of brand image is a viable strategy for companies to be more appealing to customers. Warren and Campbell's (2014, p.544) defined coolness as “a subjective and dynamic, socially constructed positive trait attributed to cultural objects inferred to be appropriately autonomous”. There have been many business cases that successfully leverage the coolness of brands in their business and marketing strategy such as Nike, Apple, Harley-Davidson, etc. (Budzanowski, 2017).

Given that marketing and branding based on the cool factor is a current trend, there has been scholarly effort to study brand coolness. It is important to note that previous studies on brand coolness primarily focused on adult consumers. Moreover, previous studies have explored consumers' perceptions of general coolness for such cultural objects as music, fashion, technologies, interests, food, television/film and humans (Fitton, Read & Horton, 2012). Generally, consumers' perceptions of brand coolness have not been thoroughly researched, particularly in developing countries like Vietnam.

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This study focuses on a noteworthy segment in the consumer market – children. The United Nations Convention on the Rights of the Child defines a child as "a human being below the age of 18 years unless under the law applicable to the child, majority is earlier" (Convention on the rights of the child, 1989). Nowadays, children are richer and better informed than they have ever been (Barber, 2008). McNeal (1992) sums up that children are a primary market in their own right. As a result, many advertisers have attempted to embrace this children market by portraying children prominently in commercial messages to encourage the purchase of many goods and services (Barber, 2008), especially fast-moving consumer goods and foodstuffs. In addition, children can exert great power in their parents' everyday decisions, including buying and consuming ones. With the grown-up of Gen Z and Alpha as the crucial consumer groups in the market (Özkan, 2017; Rani Thomas, Madiya & MP, 2020), being cool in their eyes means that the brand is more likely to create a positive impression among these consumers in particular and publicity in general. This young generation is a source of potential and promising customers for cool brands in the near future.

The journey of children becoming a consumer market has significant implications for some development and social issues. The third of the 17 Sustainable Development Goals (SDGs) is "Good health and well-being". This goal pledges to "ensure healthy lives and promote well-being for all at all ages". One of the industries that have the greatest impact on consumer health is the food industry. Children are regarded as a sensitive and vulnerable population in terms of marketing ethics since they usually lack health literacy as well as awareness of marketing manipulation. In this case, comprehending food-related information will help these customers protect their own health.

In terms of research setting, we decided to examine our research topic in the food and beverages, particularly the dairy industry due to its importance of food and drink to children's health. Milk and other dairy foods are important sources of macronutrients and micronutrients in the diets of children and adolescents and play a role in meeting multiple nutrient intake recommendations (Dror & Allen, 2014). This research setting is also well-known among children of all ages. Therefore, research into children's perceptions of brand coolness for milk and dairy products is regarded as appropriate and relevant.

In short, cool marketing is a current trendy practice for many brands, and children have become an important market segment with significant commercial and social implications, in particular food-related issues for consumer health protection. Children's perceptions of coolness can be strongly related to their consumption (Nairn & Spotswood, 2015), belongingness and depersonalization (Biraglia, Metastasio & Carroll, 2017). Children's reactions to products based on their perceptions of brand coolness have yet to be studied in particular relation to health issues. Therefore, this research is conducted to address the following questions: (1) What are the perceptions of brand coolness in the eyes of children? (2) How do children perceive the coolness of a brand? (3) How do children's perceptions of brand coolness differ across age groups?, and (4) How do children respond to cool brands?

2. Literature review

2.1. Brand image

Brand image is an integral component of brand equity as it conveys the worth of the brand to the consumers (Malik, Naeem & Munawar, 2012). Kotler (2001, p.203) defined image as "the set of beliefs, ideas, and impressions that a person holds regarding an object". In utilizing brands, consumers ascribe a persona or an image to the brand based on subjective perceptions of a set of associations that they have about the brand (Nandan, 2005). These subjective perceptions are organized by the consumer into a succinct picture of the brand which will play a part in that consumer's consumption behavior (Engel, Blackwell & Miniard, 1986). Brand image is proven to have a strategic role in marketing management (Srivastava and Shocker 1991), e.g., designing the marketing mix for the product. Its effective communication assists customers in identifying the demands they seek in any product (Park, Jaworski & MacInnis 1986). It can be communicated in a way that can make it stand different from the competitors in the market (DiMingo, 1988).

2.2. Brand coolness as a specific brand image

Brand coolness has been defined as a gestalt brand image composed of an amalgamation of perceived qualities, particularly authenticity, uniqueness, innovativeness, excitement, and congruence with self-image (Sriramachandra Murthy & A. Hodis, 2010). There are some specific factors that affect consumers' perception of coolness such as autonomy (Warren and Campbell 2014; Warren and Reimann, 2019) or novelty (Im, Bhat, and Lee 2015). According to Sriramachandra Murthy and Hodis (2010), a cool brand has an air of exclusivity but is yet attainable. It reflects an authentic essence, while still being relevant in contemporary life.

Brand coolness is a multidimensional construct (Sriramachandra Murthy & A. Hodis, 2010). Warren et al. (2019) identified and validated the ten characteristics that a brand might use to be perceived as cool by consumers. These ten attributes include useful/extraordinary, aesthetically appealing, energetic, high status, original, authentic, rebellious, subcultural, iconic and popular. These characteristics of brand coolness align with findings from many other studies. For example, research by Loureiro and Lopes (2011) describes coolness as contemporary, remarkable experience, sub-group, emotional relation, preciousness, singularity, unconventional, social conscience, youthful and vintage. In the research by Read et al. (2011), brand coolness is rebellious, anti-social, retro, authentic, rich, innovative and original. Overall, Warren et al.'s (2019) ten characteristics of brand coolness can be considered a synthesis of brand coolness attributes from several perspectives of visual, emotional, and social perspective.

2.3. Children as consumers

Children are a future market for many brands (McNeal, 1992). At a macro level, economic and social development has empowered children to exert greater influence on family decisions (Valkenburg & Cantor 2001). With higher income and better educational level, parents often postpone having children and have fewer of them (Gunter & Furnham, 1998), so that they are more indulgent to and take good care of their children (McNeal, 1992). Another contributing factor is the liberalization of parent-child relationships (Valkenburg & Cantor 2001). It has been demonstrated that children develop brand loyalty at an early age and that favorable attitudes toward brands last well into adulthood (McNeal, 1992). Therefore, marketers and advertisers of children's products have developed a massive and diverse spectrum of strategies to reach the child consumers (Kline, 1993). In general, children go through five development phases on their journey to be "true" consumers, namely: infants and toddlers, preschoolers, early elementary schoolers, later elementary schoolers, and teenagers. These different phases have great differences and changes in children's consumption behavior.

2.4. Healthy food consumption

Healthy eating is an important way to stay healthy and reduce the risk of developing chronic disease (Water, 2015). Food provides the nutrients and energy needed for children's growth and learning. Unhealthy food environments which promote the consumption of energy-rich and nutrient poor foods contribute to childhood obesity (WHO, 2000). A consequence of unhealthy food advertisement and exposure to it is that children request more fast foods, contributing to the increase in children's fast food consumption (Arredondo, Castaneda, Elder, Slymen & Dozier, 2008).

2.5. Brand coolness in the eyes of children – A research gap

Most studies on coolness and brand coolness (e.g., Blanton and Christie, 2003; Bruun et al., 2016; Van Den Bergh and Behrer, 2013; Warren et al., 2019) have primarily focused on adult respondents. The youngest group of respondents that can be found in the literature is teenagers, such as those in the studies by Read et al. (2011), Horton et al. (2012) or McCrickard, Barksdale, and Doswell (2012). Children's perceptions of brand coolness are still poorly studied (Horton et al., 2012). Meanwhile, children's perceptions of the world differ from those of adults because "each generation has its own unique motivations, values, culture, understandings, technologies, and ways of appropriating technologies" (Fitton et al., 2012, p.142). Children, regardless of age, already have their own perspectives so individuals and communities can benefit

from children's participation (Greene and Hill, 2006; Smart, 2002, 2006; Smith, 2002, 2007). As a result, it is difficult to fully transfer study findings on brand coolness in adults to children.

3. Research method

To solve the research questions, this research adopted exploratory research design (Elman, Gerring & Mahoney, 2020) with qualitative research methods. According to Denzin & Lincoln (2005), qualitative research consists of a set of interpretive, material practices that make the world visible and is a situated activity that locates the observer in the world.

Data were collected by multiple methods including surveys and in-depth interviews. During the in-depth interviews, we used a combination of the following techniques:

The Cool Wall: This technique provides an interactive visual tool for allowing pictures to be sorted into four categories ('serious uncool', 'uncool', 'cool', 'subzero') using a touchscreen (Fitton, Read, & Horton, 2012). Inspired by the well-known UK show called Top Gear, The Cool Wall is an interesting way to explore teen meanings of coolness in the original research.

Storytelling: This technique has been widely used to better understand consumer/customer-brand relationships (Adaval & Wyer, 1998; Fournier, 1998; Woodside & Wilson, 2000). When the researchers ask for a storytelling task, self-examination and reconstruction of memory are encouraged for participants.

Completion techniques: This is one of the projective techniques, which is an unstructured and indirect form of questioning that encourages the respondents to project their underlying motivations, beliefs, attitudes, or feelings regarding the issues of concern.

The research process was divided into three phases, including Stimuli selection, Pilot study and Main study.

Stimuli selection (Phase 1): This phase was to select stimuli for the research project. Initially, 50 images were purposefully chosen by the research team as stimuli representing a set of 10 characteristics typically associated with cool brands (Warren et al., 2019). Then, five online in-depth interviews with design experts were undertaken to get their feedback on the images and their compatibility with the characteristics. By surveying 60 respondents (including 20 young consumers aged 18-29, 20 parents having children between the ages of 5-17 and 20 respondents working in the relevant fields such as FMCG, F&B or Marketing industry), 20 stimuli retained.

Pilot study (Phase 2): To test the appropriateness of the methods and techniques, this phase involved in-depth interviews consisting of four steps as follows: (1) Warm-up, (2) Cool Brands walls, (3) Storytelling of the Coolest and the Most Uncool brand stimuli, and (4) Healthy Brands walls. Using an interview guideline, we first conducted demo pilot interviews with two experienced qualitative researchers. We then conducted this phase on a small group of 8 children (specifically: 2 children aged 5 - 6 years old, 2 children in primary school, 2 children in secondary school and 2 children in high school) in Da Nang city and Quang Nam province. Given helpful feedback from the experts and children in this phase, the guideline as well as the interviewing techniques were modified and significantly improved.

Main study (Phase 3): Based on the results of the pilot test, we collected data in this phase to address the research objectives from a small and gender-balanced group of 10 children aged 5-17 years old. The research activities in this phase remained unchanged compared to the pilot study.

Since the information gathered is diverse, rich and unstructured, the collected qualitative data were analyzed by thematic analysis, a popular method for identifying, analyzing and reporting patterns (themes) within data (Braun & Clarke, 2006).

4. Results

Employing the thematic analysis, we identified the themes and the differences of the themes across three groups (i.e., children aged 6-11, 11-15, and 15-17 years old), and presented them as the formulas as follows.

Children's perceptions of brand coolness attributes

For children aged 6-11 years old (Primary school): brand coolness = aesthetically appealing + useful + unfamiliar + unordinary + ungirly.

For children aged 11-15 years old (Secondary school): brand coolness = aesthetically appealing + luxurious + dynamic + unique + unfamiliar + unusual.

For children aged 15-17 years old (High school): brand coolness = aesthetically appealing + creative + impressive + appropriate + breakthrough + unfamiliar + unusual + exciting.

Formation of children's perceptions of brand coolness

For children aged 6-11 years old (Primary school): perceptions of brand coolness are based on: colors + the quantity of colors + poses of characters (illustrated in the images) + previous experiences.

For children aged 11-15 years old (Secondary school): perceptions of brand coolness are based on: colors + the quantity of colors + characters + functions + origin + details.

For children aged 15-17 years old (High school): perceptions of brand coolness are based on: colors + patterns of the illustrations in the image + trends + elicited feelings + characters (in the image) + image size + message content.

Age difference in children's perceptions of brand coolness

The number of themes used to evaluate brand coolness increases gradually with the respondents' age. Each respondent has complex and diverse perceptions of coolness. If respondents in group 1 categorize the images as cool or uncool primarily based on color, the remaining two groups agree that the familiar images are uncool. They value images that are one-of-a-kind, imaginative, and distinctive. While group 2 based their opinion on their previous experience with commercials in the media, the others rely on current social trends for young people. In terms of the ability to associate, the respondent group aged 5 to 11 years old exhibited better ability compared to the other two groups.

Children's responses to cool brands

All respondents would ask their parents, the vendors, or check the information in the packaging of cool products to see whether they were healthy or not. When given the choice between a cool product and a healthy one, 100 % chose the healthy option. Younger respondents place a high value on safe choices when making purchase decisions based on the advice of reference groups and personal experience. In contrast, the 15-17-year-old age group is open to new experiences and not afraid to try items that impress them.

Putting all together, a conceptual framework of children's perceptions of brand coolness is proposed as illustrated in the figure below.

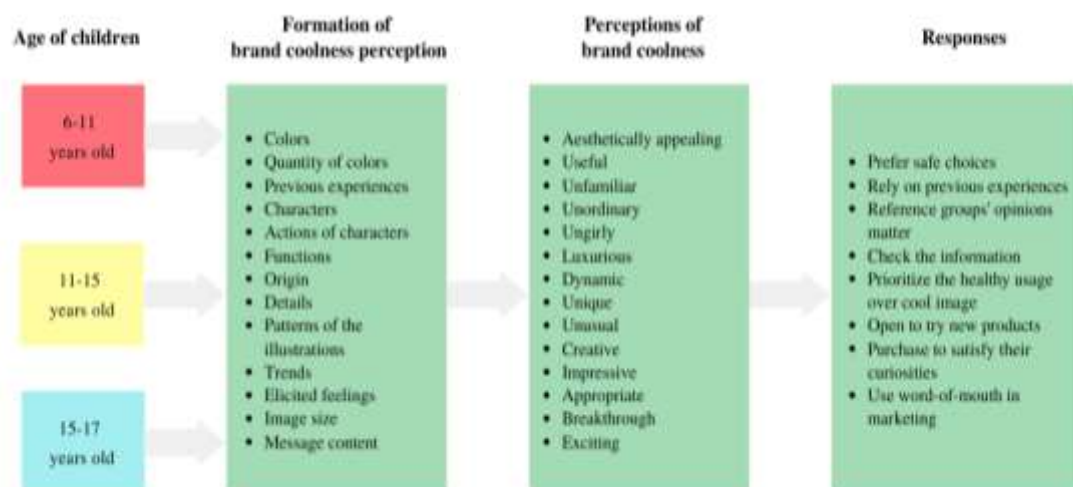


Figure 1. A conceptual framework of children's perceptions of brand coolness.

5. Discussion

Our research not only explores characteristics of brand coolness, but also explores the formation of this perception, the difference in perceptions of brand coolness across ages, and children's responses to brand coolness. Therefore, this study contributes to the brand image literature in general and brand coolness in particular by providing a comprehensive view of the perceptions of brand coolness from the children's perspective.

Compared to previous studies, our study focused on exploring children's (6 to 17 years old) perceptions of brand coolness in the context of the FMCG industry - specifically the dairy industry. According to our findings, most children know and have certain perceptions about brand coolness. A brand is cool in the eyes of children if it is aesthetically appealing, useful, unfamiliar, unordinary, ungirly, luxurious, dynamic, unique, unusual, creative, impressive, appropriate, breakthrough and exciting. These characteristics, however, are not appropriate for all brands or children. Brand coolness will be seen differently by children of different ages, at least for milk and related products. In addition, colors, the quantity of colors, quantity of colors, previous experiences, characters, actions of characters, functions, origin, details, patterns of the illustrations, trends, elicited feelings, image size and message content are used by children to judge whether a brand is cool or not.

Another contribution of this study lies in the integration of brand coolness and health promotion research, which is both novel and socially significant. Children's health is one of the top concerns for sustainable development (goal 3 of SDG). Based on the research findings, we argue that healthy consumption among children can be encouraged (yet not necessarily) by leveraging the coolness perceptions. As evidenced, children respond well to healthy foods in this research. They value healthy products over cool products. For cool products, they still seek product information from parents, merchants, packaging, and previous experiences to determine whether or not it is healthy, and only make a buying decision after the information search. It is clear that social relations have a significant impact on children's purchasing decisions. Therefore, a brand that is cool by itself is not enough to drive awareness and purchase behavior in children. However, a brand that is both cool and healthy and appreciated by those around them is more likely to promote buying behavior in children. Thus, the findings demonstrate the validity of the four key agents shaping children's perceptions and behaviors according to socialization theory, including family, school, peers, and mass media (Hastings, Utendale & Sullivan, 2007). Socialization is a life-long process in which individuals embrace and interact with the values and social norms of a certain society and culture (Genner & Süss, 2017). Children learn how to behave outside of the family by joining and identifying with a social group (Harris, 1995).

6. Implications

6.1. Theoretical implications

Firstly, the findings of our study contribute to the brand coolness literature by complementing the current knowledge that is solely from adults' perspective with the perceptions of brand coolness among children aged 6-17 and how these perceptions form. Secondly, we detected the distinction in children's perception and responses to brand coolness due to their age differences. Thirdly, we determined the relationship between children's perception of brand coolness and their responses to healthy or unhealthy products. Our research shows that coolness is not a key component in promoting business sales and profitability for the children market. Instead, a combination of cool images and high quality products will do its job and help brands maximize their performance in the industry. Finally, this research demonstrates the usefulness and appropriateness of under-studied qualitative research techniques (especially the Cool Wall technique) to examine an emerging topic of brand coolness with children being the research subject.

6.2. Practical implications for cool brands

The research findings offer useful recommendations for cool brands targeting children. Cool brands can use our findings to draft guidance on how to improve their brand coolness in the eyes of children, which is customized to each age group of children for their strategy development and planning. The findings can

help companies to determine whether their products and brands are perceived to be cool by children, and if so, to measure how cool it is. We also suggest that brands need to find the balance point where they can position the quality products as crucial as their own cool images. Lastly, the results suggest some considerations for selecting brand ambassadors and advertising images that reflect brand coolness for sub-segments in the children market.

6.3. Social implications

Findings from this research can offer fresh and novel directions for societal activities to protect children and their rights in consumption. For example, we highlight the importance of emerging a new and appealing media orientation for non-governmental and nonprofit organizations through cool images and messages. Moreover, due to the significance of opinions from reference groups, social organizations should consider hosting events or campaigns that can affect people's awareness of health concerns, including children's parents and relatives. For the authorities such as Vietnam Consumers Protection Association VICOPRO, a foundation should be set up for this association to strengthen regulations that can prevent companies from marketing unhealthy products by using cool factors.

7. Limitations and future research directions

This research, like any other, has limitations. Participants in the research were chosen using judgmental sampling. Also, due to time and resource constraints, the number of respondents remains modest, with most of them living in the city area. It should be noted that living conditions and family upbringing have an important role in children's cognitive development and variances in viewpoint (Crookston, Forste, McClellan, Georgiadis, & Heaton, 2014). Therefore, future research can broaden and diversify the sample in terms of sampling technique, size, participant age, and their living environments.

Regarding the research context, we explore children's perceptions of brand coolness in the dairy industry. Meanwhile, other FMCG items, such as candy and soft drinks, are common options in children's lives. Furthermore, as children grow up in the digital era, they are increasingly interested in technological items such as electronics and telephones. Future studies might expand the findings to such other sectors recognizable and popular to youngsters.

Finally, the analyses and results in this research are unavoidably influenced by the authors' subjective viewpoints and background knowledge. However, this disadvantage is an inherent characteristic of qualitative research as opposed to quantitative research. To minimize this bias, future researchers could employ more objective methods such as observations or environmental audits (Carins et al., 2016).

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THE IMPACTS OF AUTHENTIC LEADERSHIP ON EMPLOYEE'S SATISFACTION

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ABSTRACT

The purpose of this study is to demonstrate the impact of an authentic leadership style on individual and group creativity by using organizational culture as a mediating factor. Research data was collected from 303 employees in three regions of Vietnam: The Central, Northern, and Southern regions. The results revealed that authentic leadership has a significant impact on creativity. Furthermore, the organization's adaptive culture mediates the relationship between AL and creativity. Using a multilevel approach, this is the first study to our knowledge to quantitatively examine the relationship between authentic leadership and creativity through mediation, and using the regression scale in SPSS 20.0 is the step of testing the research model after running a series of Cronbach's analysis, Alpha, EFA, and Correlations to select the independent variables to satisfy the conditions for the return requirements. In addition, unlike previous research on related topics that relied on only one source of information, we test authentic leadership with empirical data collected from both team leaders and employees. Through a novel linking model, this study provides industry executives with a clearer, more insightful, and coherent method of understanding the mediation mechanism between AL and creativity. Finally, based on the regulation of AL, the study discovered that individual creativity influences collective creativity.

Keywords: authentic leadership, creativity, organizational culture.

Keywords: Authentic leadership, Creativity, Organization culture.

1. Introduction

In today's globally competitive business world, firms invest significant resources in developing their workers' creative talents (Ali et al., 2019; Imam et al., 2020;). Researchers have shown that leadership is critical in increasing innovation and performance results (e.g. Cheng and Yang, 2019). They have also investigated the use of several leadership styles, such as servant leadership (Yoshida et al., 2014), genuine leadership (Shang et al., 2019), transformational leadership (Gumusluoglu and Ilsev, 2009), visionary leadership (Zhou et al., 2018), and empowered leadership (Ali et al., 2018). Because the studies on the association between leadership styles and creativity is extremely substantial, scholars have lately moved their focus to more thoroughly understanding how leadership styles might increase creativity (Shang et al., 2019). However, although most research has sought to investigate the antecedents of employee creativity (Zhou et al., 2018), little academic attention has focused on genuine leadership (AL) and how it is related to creativity (Nasab & Sarkar, 2019). (Imam et al., 2020). The fundamental processes through which AL increases creativity deserve additional exploration at both the employee and team levels (Chaudhary and Panda, 2018). Scholars have already asked for greater study focused on the many intermediary factors to understand the prescribed relationships between AL and alternate outcomes (Ribeiro et al., 2018). The function of an inventive organizational culture and creative self-efficacy in moderating the link between AL and creativity (at the individual and team levels). This study aims to respond to demands for more research by investigating these mediating effects. Conversations concerning the factors that foster team innovation are scarce (Ma et al., 2017), particularly in the context of developing economies (Zhou et al., 2018). Although several studies have addressed some of the concerns raised above, they do not study the entire process in a holistic model of creative enterprises. Creativity has been increasingly significant in Vietnam, particularly in defining the processes underpinning the recent shift in emphasis from "Made in Vietnam" to "Created in Vietnam" (Keane, 2006). While the idea of a "creative industry" is "defined principally by the labor inputs of creative

workers, and is surrounded by a degree of hyperbole regarding their value," it remains a "comparatively under-researched area" (Chaston and SadlerSmith, 2012).

In this study, we specifically focus on AL, since it is recognized as an effective method due to its capacity to create good employee behaviors (e.g., creativity), as well as advantages for specific workgroups and, indeed, whole companies (Lee et al., 2019a; Ribeiro et al., 2017). This type of leadership style promotes increased awareness, an internalized moral viewpoint, more balanced information processing, and relational transparency between leaders and their followers, all while encouraging positive self-development (Walumbwa et al., 2008). AL encourages followers to acquire, assimilate, and share information, allowing them to channel their innate desire into creative pursuits (Ahmad et al., 2015). A leader who has adopted the AL style communicates decision-making information, allows feedback from others, and discusses their values, reasons, and opinions (Wang et al., 2014b). AL also has a favorable influence on followers' attitudes and behaviors, as well as their creative output (Xu et al., 2017). More importantly, AL not only transforms the connection between follower and leader, but it also enhances employee creativity, employee self-efficacy, and team performance (Bai et al., 2016).

Leadership style, according to certain studies, is a mediating factor in the relationship between the individual and team creativity. According to some studies, leadership styles lead to different levels of creativity, including individual and team creativity. Creativity is associated with leadership style (Delia, B, 2013). According to Jin (2015), (1) transactional leadership behaviors will enhance responsive creativity, (2) transformational leadership behaviors will enhance responsive creativity and contributing creativity, and (3) Empowerment leadership behaviors will enhance the ability to creatively respond, contribute to creativity, create expectations, and take initiative to create. Finally, AL is a relatively new leadership style that has been widely adopted in numerous firms throughout the world. Authentic leadership is one of the emerging pillars of the field of leadership in the last decade (Busra. M et al, 2013). AL is a factor that strongly promotes individual and team creativity. Authentic leadership has a great role in knowledge sharing and employee creativity by providing an environment of psychological safety and trust to the employees (Ali et al, 2019).

Many studies have demonstrated the impact of AL on individual and team creativity. It is reasonable to expect AL to strengthen the relationship between creative self-efficacy and individual-level creativity (Delia et al, 2013). Many leadership variables have been examined as predictors of workplace creativity and innovation (Hughes et al, 2018). Firstly, AL is not only a necessary precondition to creativity but also an important precursor to creativity. Furthermore, an atmosphere based on group-level innovation mediates the theoretical relationship between AL and individual creativity. However, self-creation efficiency at the individual level does not mediate this relationship. The study also found that AL modulates the relationship between self-creative performance and individual creativity (Muhammad et al, 2021). Next, AL directly affects an employee's creativity and partially mediates the psychological contractual relationship (Tran, H, P & Kiyoshi, K, 2020). Thirdly, one of the mediators in the relationship between AL and individual creativity (Meng & Cheng et al, 2016), is self-efficacy, and team creativity in a group atmosphere (Shen and Qin et al, 2021). Furthermore, "shared leadership has a direct effect on the individual motivational state of creative self-efficacy, which in turn increases individual creativity and team creativity" (He et al., ,2018). However, there are almost no research papers on the correlation between individual creativity and group creativity under the influence of AL. Assembling a group of highly creative individuals would be ineffective without group interaction. (Simon, 2002). The mediating role of an innovative team atmosphere and creative self-efficacy in the relationship between AL and creativity (individual- and team-level) is still underexplored (Susan and Zheng et al, 2021). Besides, the studies on the impact of AL on team and individual creativity are mainly done in Western countries and developed countries. Therefore, this study will show whether in Vietnam, under the influence of AL, team or individual creativity will be more important and prominent in Vietnamese enterprises.

Organizational culture, according to Schein (1985), offers a system of expectations that establishes norms and a standard of behavior for employees, as well as a purpose for leadership action. As a result, there may be a link between authentic leadership and corporate cultures that support authentic leadership. The

notion of adaptability and flexibility should be interpreted as follows: leadership and management must ensure that the national culture, high principles, dynamism and inventiveness, and sensitivity to the new are all in sync. Flexible organizational cultures that focus on employee support and development, as well as the encouragement of innovation, may give a competitive edge in the face of an economic downturn. (Azanza, 2013). According to the relationship between a culture of flexibility and authentic leadership, the core characteristics of real leaders are believed to inspire employee engagement through honest and transparent interactions with employees. Others might pick up on an employee's creativity and originality. As a result, we suggest that true leaders who promote followers' innovative behavior are more likely to emerge in a highly inventive company culture. Furthermore, in support-oriented communities, participation, collaboration, equality, and interpersonal relationships are cherished and appreciated (Maier, 1999). Genuine leadership can convey those values to employees, and the authenticity of the genuine leader's relationship may act as a catalyst for employee support and good progress. Every organization has respect, trust, transparency, honesty, sincerity, vulnerability, openness, sharing, culture, and so on. Any organization, as well as the individuals that comprise it, must be genuine to themselves. That organization will certainly prosper if you supply what you have with authenticity and flexibility.

Our paper aims to add to the literature on AL and organizational culture in the following areas: First, it investigates the role of organizational culture in moderating the relationship between authentic leadership and employee creativity. Thirdly, it examines how AL style influences individual creativity and group creativity. Finally, the correlation between individual creativity and group creativity will be studied. Finally, it adds to the research map additional information about AL in the Vietnamese context.

2. Theoretical framework

According to Gerhart and Fang (2015), in the context of organizations increasingly competing on the basis of knowledge and innovation, employee creativity has become an important factor in developing and implementing competitive

2.1. The Theory of Authentic Leadership

Henderson and Hoy (1983) were the first to attempt to explicitly define and operationalize the conceptions of leadership authenticity and leadership inauthenticity. These authors argue that leadership authenticity consists of three components: accepting personal and organizational responsibility for actions, results, and mistakes; the lack of management by subordinates; and self-respect relative to role requirements. Bhindi and Duignan (1997) defined AL as consisting of four components: authenticity, intention, spirituality, and receptivity. However, in view of Begley (2001) who argued that AL with effective and ethical leadership is limited to the educational administration context, this is an alternative view that is both broad in scope and narrow in focus. In the context, he argues that “authentic leadership implies a genuine leadership style—a hopeful, open-minded, foresight-filled, and creative response to circumstances.”

George's book is one of the most important contributions to AL theory (George, 2003; George & Sims, 2007). The five characteristics of AL, according to this author, are: Pursuing a purpose with passion; practicing solid values; leading from the heart; establishing long-term connections; and showing self-discipline. One of these criteria is also supported by Kernis and Goldman's research (Kernis, 2003; Kernis & Goldman, 2006). They also agree that relationship orientation and the practice of solid principles, as well as real behavior, are necessary for developing long-term relationships.

The theory of ALs has been evolved via extensive research to reflect both conceptual and empirical insights into their composition. Walumbwa's expanded AL definition. et al. (2008), which was operated and validated by the Authentic Leadership Questionnaire, was the culmination of the GLI study effort. This perspective identifies four main components of AL, including self-perception, balance processing, and relationship transparency. Kernis and Goldman (2006) describe the intrinsic ethical perspective-perception-based, unbiased processing, relational orientation, and behavioral/action components. advantage strategies.

2.2. Hypothesis and research model

2.2.1. Authentic leadership and creative employees

Making fresh and helpful ideas in a certain domain is what creativity entails (Woodman, Sawyer, & Griffin, 1993; Amabile, Conti, Coon, Lazenby, & Herron, 1996; Amabile, 1997; Ford, 2000; Oldham & Cummings, 1996; Shalley, 1991; Zhou, 2015). Much recent empirical research, such as Madjar, Oldham, and Pratt (2002); Shalley, Gilson, and Blum (2000); and Zhou and Shalley (2000), supports this viewpoint (2003). Novelty and usefulness are two important aspects of creativity (Shalley & Zhou, 2008). The term "novelty" refers to the process of mixing existing items in novel ways to create entirely new products (Oldham & Cummings, 1996). According to some research, AL boosts employee creativity. As an example, Malik et al. (2016) investigated AL's influence on nursing staff creativity and discovered that AL was positively associated with employee creativity, mediated through knowledge exchange and information technology. Employee behavior may be influenced by leadership's effects on organizational citizenship behavior and job engagement. (Walumbwa et al., 2014), employee trust (Giallonardo et al., 2010), and notably, employee inventiveness (Walumbwa et al., 2014). (Cerne et al., 2013; Malik et al., 2016; Rego et al., 2012; Ribeiro et al., 2018).

Balanced processing is one of the characteristics of authentic leaders that allows them to objectively assess all relevant information before making judgments (Walumbwa et al., 2008). Because they are less likely to be thrown off by potentially risky ideas, authentic leaders with high levels of self-regulation would be more tolerant of uncertainty and open to experience and change. These are the qualities that Patterson (1999) identifies as essential for leadership that encourages staff to produce innovative results. This is why authentic leaders excel at encouraging team members to build on one another's ideas, as well as merging various group members' ideas and applying them as a group outcome:

H1: Authentic leadership has a close relationship to employee creativity.

H2: Authentic leadership is positively related to group creativity.

2.2.2. Authentic leadership and creativity through moderating variables: culture and organizations

Corporate culture refers to the whole cultural value built up over the course of a company's life and development, resulting in well-established norms and practices in the operation of the business. All members of the organization's attitudes, thinking techniques, and behavior are guided in their pursuit and accomplishment of goals. Without an effective organizational culture, creative activities cannot be expected (Syed, R, S, A; AbbasAli, Q; Mohammad, S; 2017). Organization culture plays a vital role in fostering creativity in the workplace. The important role of creativity in organizations is attracting an increasing amount of attention from both practitioners and researchers (Paul, E, T; James, L, Farr; Stephanie, R, K; 1997). According to Gosh (2015), organizational creativity climate had a positive significant impact on both individual employee creativity and workplace innovative orientation that are the primary sources of competitive advantage. However, the role of leaders is rarely mentioned in this process. According to Elenkov and Manev (2005, p. 384) and others (Bundy, 2002; Henry, 2001), leader behavior can stimulate employee engagement and esteem while also encouraging new ideas in the innovation process. Individualized Concerns and motives arising from the leader's vision and principles contribute to a culture that facilitates organizational innovation. Elenkov & Manev, 2005; Nutt, 2002). Agbor (2008) shows that organizational leaders frequently make decisions about what happens in the company and provide the direction, vision, and momentum that lead to success. As a result, leaders are the catalysts for creating and managing the environment, organizational culture, and tactics that promote and sustain the organization's creativity, effectiveness, and success.

We suggest the following hypothesis:

H3: Authentic leadership and organizational culture influence individual creativity.

H4: Authentic leadership and organizational culture influence group creativity.

2.2.3. Individual creativity and group creativity

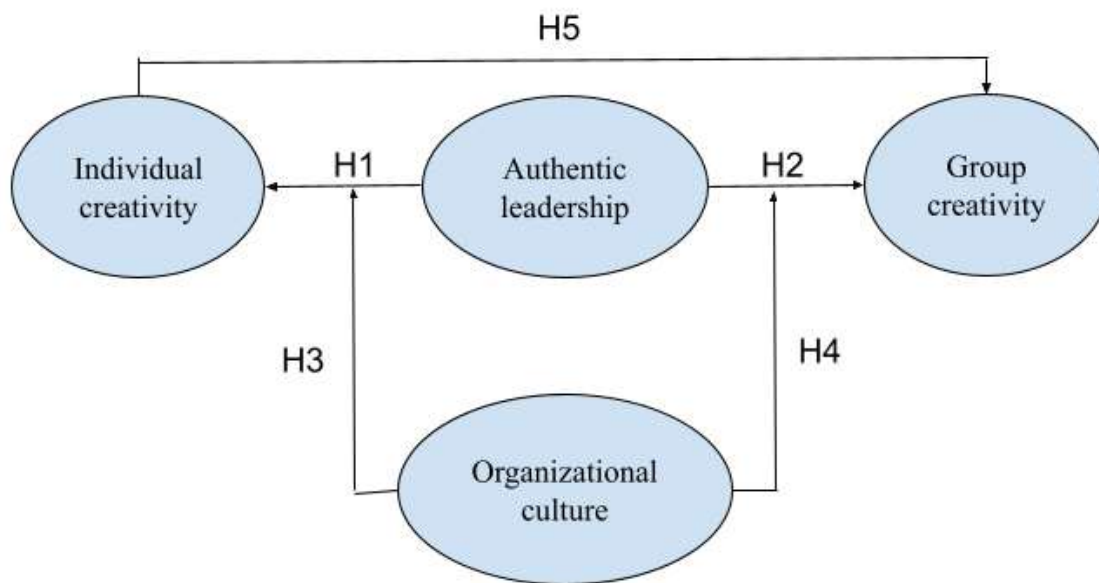
Individual creativity and group creativity have a close relationship with each other. Furthermore, individual creativity has a positive impact on group creativity. According to Amabile (1988), innovation in an organization is significantly influenced by the extent of creativity-relevant skills possessed by its employees, and these creativity-relevant skills can be developed, sustained, and enhanced through formal and informal mechanisms such as training and education.

However, according to some studies, group creativity is affected by individual creativity. The relationship between individual and group creativity during a specific time period was investigated. It was expected that a team member's creativity for a specific time period would be highly correlated with the average of ratings of team member creativity for the same period (Sundar, Anil, 2000).

So, we propose the hypothesis:

H5: Individual creativity has a positive impact on group creativity

The research model is as follows:



3. Research method

3.1. Sample

Online questionnaire responses were gathered. The questionnaire was distributed to people living and working in Vietnam, and 302 replies were received. There were 57.6% males, 39.7 % females, and 2.7 % of the opposite sex among the 302 responders. The majority of respondents (68.2 percent) describe themselves as "staff level," while 15.9 percent are junior managers, and 9.3 percent are middle managers. Senior management accounts for 6.6 percent. The vast majority (83.4 percent) of those who responded to the survey live in Vietnam's north. The participants in this study had an average age of 23.5 years, with a standard deviation of 10.5. The youngest is 18 years old, and the oldest is more than 60.

3.2. Measure

For this research, we use two data streams, which are the qualitative division of categorical (attribute) categories, for example, men, women, residents, ... In addition, there is continuous quantitative data collected from measurements such as age, and probability (proportion) is loved from data after using a different scale.

For the scale, we use the Cronbach reliability coefficient (or alpha coefficient), which was developed by Lee Cronbach in 1951, to measure reliability or internal consistency.

The second is the linear scale (correlation matrix), which considers two types of relationships: the correlation between variables that depend on independent variables and the correlation between independent

variables. With the correlation between independent variables and dependent variables, when developing a research model, we have carefully learned to find independent variables that have an impact on dependent variables.

Finally, using the regression scale in SPSS 20.0 is the step of testing the research model after running a series of Cronbach's analysis, Alpha, EFA, and Correlations to select the independent variables to satisfy the conditions for the return requirements. Regression to determine the weight of each independent factor affecting the dependent the purpose of the research is to arrive at a regression equation, thereby providing a factor. Determine the level of influence of each independent factor on the dependent factor.

Table 1. Cronbach's Alpha

| | N of items | Cronbach's Alpha |
|----------------------|------------|------------------|
| Authentic Leadership | 8 | 0,881 |
| Individual Creative | 13 | 0,936 |
| Group Creative | 11 | 0,795 |
| Organization culture | 2 | 0.826 |

4. Results and discussion

4.1. Correlation matrix

The Pearson correlation coefficient (r) has a value ranging from -1 to 1. According to Andy Field (2009), while the Pearson correlation coefficient may be used to assess the linear relationship between two variables, we must also analyze whether or not this correlation value is statistically significant.

The following hypothesis is proposed: H0: r = 0.

Pearson correlations will be displayed in the correlations table below. Examine the symbols in this table: Pearson Correlation denotes the Pearson correlation coefficient (r), Sig. (2-tailed) is the sig value of the t-test used to determine whether or not the Pearson correlation coefficient is statistically significant, and N denotes the sample size.

Table 2. Correlations

| | | Authentic Leadership | Individual Creative | Group Creative | Organization culture |
|----------------------|---------------------|----------------------|---------------------|----------------|----------------------|
| Authentic Leadership | Pearson Correlation | 1 | .696** | .565** | .587 |
| | Sig. (2-tailed) | | .000 | .000 | .000 |
| | N | 302 | 302 | 302 | 302 |
| Individual Creative | Pearson Correlation | .696** | 1 | .650** | .624** |
| | Sig. (2-tailed) | .000 | | .000 | .000 |
| | N | 302 | 302 | 302 | 302 |
| Group creative | Pearson Correlation | .565** | .650** | 1 | .502** |

| | | | | | |
|----------------------|---------------------|--------|--------|--------|------|
| | Sig. (2-tailed) | .000 | .000 | | .000 |
| | N | 302 | 302 | 302 | 302 |
| Organization culture | Pearson Correlation | .587** | .624** | .502** | 1** |
| | Sig. (2-tailed) | .000 | .000 | .000 | |
| | N | 302 | 302 | 302 | 302 |

***. Correlation is significant at the 0.01 level (2-tailed).*

According to the Pearson correlation results in the table above, SIG checked the Pearson correlation between independent variables and dependent variables to be Sig=0.000<0.05, so these pairs of variables have a linear relationship with each other.

For the Pearson correlation coefficient, we can see that all Pearson correlation > 0.4, so the pairs of variables have a strong correlation. According to the coefficient in the table above, all 3 variables dependent on IC, GC, and OC are linearly correlated with the independent variation of AL, of which the IC variable has the strongest linear correlation of 0.696 and vice versa. In addition, the IC variable has the strongest linear correlation for 2 variables, GC and OC are 0.650 and 0.624 respectively. All variables with Pearson correlation are 99% reliability...

4.2. Regression

Table 3

| Hypothesis | β | Se | P | Decisions |
|--------------|---------|-------|-------|-----------|
| AL → IC | 0.688 | 0.41 | 0.000 | Support |
| AL → GC | 0.508 | 0.043 | 0.000 | Support |
| AL x OC → IC | 0.068 | 0.12 | 0.000 | Support |
| AL x OC → GC | 0.043 | 0.013 | 0.000 | Support |
| IC → GC | 0.592 | 0.040 | 0.000 | Support |

The statistical significance of the link between the independent and dependent variables is determined by the non-standardized estimation of the key parameters in the theoretical model. The standardization coefficients show how many independent and dependent variables influence each other.

H1: The hypothesis that individual creativity has a positive impact on genuine leadership is supported by the data. The results show that this hypothesis is accepted at the 95% confidence level because the P-value = 0.000 < 0.05.

H2: The hypothesis that group creativity has an impact on genuine leadership is supported by the data. The results show that this hypothesis has a P-value = 0.000 < 0.05,

As a result, there is a statistically significant link between individual and group innovation and authentic leadership.

Table 4

| Dependent variable: IC | | | | | |
|------------------------|---------|-------|----------------------|---------|-------|
| Independent variable | β | sig | Independent variable | β | sig |
| AL | 0.688 | 0.000 | AL | | 0.000 |
| | | | AL x OC | 0.104 | 0.000 |
| Adjusted R^2 | 0.483 | | Adjusted R^2 | 0.514 | |
| Dublin Watson | 1.611 | | Dublin Watson | 1.450 | |
| Collinearity | 1.000 | | Collinearity | 1.000 | |
| Dependent variable: GC | | | | | |
| Independent variable | β | sig | Independent variable | β | sig |
| AL | | | AL | | 0.000 |
| | | | AL x OC | 0.075 | 0.000 |
| Adjusted R^2 | 0.317 | | Adjusted R^2 | 0.322 | |
| Dublin Watson | 1.649 | | Dublin Watson | 1.717 | |
| Collinearity | 1.000 | | Collinearity | 1.000 | |

The results analysis of variance (Table 4) shows the significance with Sig. = 0.000 (< 0.05) means that the given linear regression model is consistent with the actual data collected and the included variables are statistically significant, at the 5% level of significance.

These results reveal that, adjusted R^2 by 0.485, suggest that the variance of independent variables is AL explains 48.5% of the variance of IC, and 51,5% is explained by the variation of 2 independent variables, AL, ALxOC. With dependent variable GC, adjusted R^2 is 0,317; 0.322 respectively, explaining the variation of 31,7%% of the independent variable AL, and 32, 2% of AL, ALxOC.

It can be seen that the Dublin Watson values in the table ... are all in the range from 1.5 to 2.5, which means autocorrelation does not exist (according to Yahua Qiao, 2011). Using the variance exaggeration inflation factor VIF (= 1.00), there is no multicollinearity and therefore no correlation between this independent variable and any other variable.

4.3. Discussion

The results of the study demonstrate that all theories are supported. It means that authentic leadership affects all factors, including team creativity, individual creativity. Besides, individual creativity affects team creativity, and organizational culture has a positive impact on authentic leadership. When we raise the authentic leadership factor in an organization in combination with an increase in the organizational culture factor, this will promote both team creativity and individual creativity.

5. Discussion

The results of the study demonstrate that all theories are supported. It means that authentic leadership affects all factors, including team creativity, individual creativity. Besides, individual creativity affects team creativity, and organizational culture has a positive impact on authentic leadership. When we raise the authentic leadership factor in an organization in combination with an increase in the organizational culture factor, this will promote both team creativity and individual creativity. The result of this study is agreement with the results of the previous studies. All the hypotheses posed in this study have been proven and are also in agreement with the results of previous studies that we refer to.

6. Limitations and further research

The research has significant shortcomings that must be resolved, and we also propose future research topics. For new research, sample data is limited to the three regions of Vietnam (the North is the majority, and the survey results are dominated by women more than men), implying that the conclusion must be solved. The impacts are enough from many sides; the results also raise generalized issues.

Second, this study was confined to data from individuals, employees, and teams, which may not properly reflect the link between AL and industry-level innovation. Future research may include data generation at the organizational level from additional sectors and nations.

Thirdly, we only consider the individual and the group's innovative environment as intermediaries. Future research may want to integrate mechanisms based on identity to better grasp the relationship between leadership and creativity (Hughes et al., 2018). Finally, because we only use subjective scale data, we cannot assess the effect of AL on creativity in a more objective way, specifically due to time limitations and resources. Therefore, future studies may consider objective and expanded research.

7. Conclusions and recommendations

In conclusion, our findings show that a genuine leader's style has a significant influence on all employees' creativity in the workplace and in departments, small groups, and role models, illustrating the management process in which a corporation, business, or organization leads all of its personnel. Furthermore, the work environment has an impact on each individual as well as the company's collective creativity. Each creative individual contributes to the creation of a creative collective.

Several recommendations are provided for organizations that aim to stimulate employee creativity based on the findings of this study. First, when it comes to inspiring the creativity of employees, true leadership is critical in an organization. Based on Kernis' (2003) multidimensional idea of authenticity, which consists of awareness, unbiased processing, relational orientation, and behavior/action components, more precise definitions of authentic leadership followed (Avolio & Gardner, 2005; Gardner et al., 2005; Ilies et al., 2005). The concept of authentic leadership (Walumbwa et al., 2008) is the pinnacle of this approach. It is based on Kernis and Goldman's (2006) notion of authenticity and highlights four key components of authentic leadership: self-awareness; balanced processing; relational transparency, and internalized moral perspective.

Second, an organizational culture must be established in order to support the interaction between leadership and employee innovation. According to Schein (1985), leaders have a significant impact on the establishment of organizational culture. Their views, values, and assumptions are instilled in new members and form the foundation of the organization's culture. They can employ organizational symbols, slogans, and other cultural expressions to create an environment conducive to innovation.

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RESEARCH IMPACT OF FINANCIAL LITERACY ON STUDENTS' USE OF BLACK CREDIT IN HANOI CITY

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ABSTRACT

The study assessed the impact of financial literacy on the use of black credit by students of Universities in Hanoi by clarifying factors affecting students' black credit loan plans and needs as well as evaluating the black credit behavior of students in different disciplines. Data analyzed through a linear regression model showed that there were significant gender differences in black loan options, men tended to use black credit higher than women because female students had higher financial literacy scores, had better financial knowledge than male students. The study also pointed to the level of financial understanding associated with the academic sector and the ability to manage student spending. Since then, the research team has made a number of recommendations for education that combines families and schools, and the government should put in place stricter policies for interest-heavy lenders to prevent their access to students.

Keywords: financial literacy, black credit/unofficial credit

1. Opening

Vietnam is an emerging and developing country; however, the level of financial literacy of Vietnamese people is still low, especially students - the young future generation of the country. Inexperienced in financial allocation, it is easy to get entangled in black credit, negatively affecting the study and life of individual students in particular and society in general. Therefore, Vietnam has begun to have financial education programs for a specific audience (Luong Minh Ha et al., 2019). The World Bank and its partners also selected Vietnam as one of the priority countries to focus on efforts to financial inclusion in the Universal Financial Access (UFA) initiative by 2020. However, the current PE programs in Vietnam are still limited, not synchronized, and follow a specific and unified roadmap nationwide to increase the community's financial literacy.

In the context of the imperfect financial market, such as information asymmetry and limited resources, university students face difficulties accessing loans. According to statistics in 2011 from the Ministry of Education and Training, 1,163 students (0.13%) dropped out of university due to financial constraints (Khanh Vu, 2012). Not only students who have difficulty with study costs but also students with high spending needs, who indulge in gambling, betting, etc., need loans. However, with strict and time-demanding conditions and limited access to official credit, access to black credit is inevitable. Therefore, students ask for help from black credit loans with early disbursement and quick procedures, which also results in considerable risk with high-interest rates. Black credit is a significant and hidden concern in the university environment and a popular method for students in Nha Trang city (Ky Nam et al., 2018). Many studies show that bad credit surrounds students and impacts negatively on students' academic performance and their mind.

The study evaluates the impact of financial literacy on students' use of black credit at universities in Hanoi by clarifying the factors affecting the intention and need for black credit students as well as evaluating the behavior of using black credit by students of different disciplines through survey data by a questionnaire designed based on OECD and INFE. The main conclusions of this study are as follows. Firstly, the data analyzed through the linear regression model shows a significant difference in gender in the selection of black credit loans; the rate at which male students tend to use black credit is higher than that of female

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students. Female students have higher financial literacy scores and have better financial knowledge than male students. Secondly, the study also shows that financial literacy is related to the ability to manage student spending. Specifically, students who have a wide knowledge of economic fields are more aware of spending than students in other fields, therefore, they tend to use fewer black credit loans.

Besides the introduction, the study is divided into three parts. In the second part, the authors focus on researching domestic and foreign studies on black credit activities, the factors affecting black credit, and the impact of financial knowledge on black credit.

2. Research overview

Hao's study (2018) mentioned black credit in China from a negative perspective when the impact of usury on organizations and individuals has indirectly affected China's micro-economy. This issue in China has become of great concern because of the lack of legality, freedom, and uncivilization affecting people and society in the country. Debt collection forms become illegal, creditors use force to collect debts, and debtors cannot do anything but run away or borrow more money to pay exorbitant debts, which causes disorder in social security. The above author has proposed to ban usury in China again because of its abuse.

For Kislak's (2015) study, which focuses on the non-traditional borrowing of poor households in Thailand, the author concludes that poor households will tend to borrow from friends so that they have quick money to meet their needs instead of choosing a bank loan because the procedure is complicated and time-consuming. This study argues that this is a positive action for poor households when the government does not have enough allowances for poor households. However, the above studies focus on households that need essential financial support, and students have not yet paid attention.

The study, conducted by the World Bank (WB), measures the financial literacy of students of universities in Hanoi on three dimensions: financial knowledge, financial skills, and behavioral finance, in which the part where financial attitudes affect decision making is included in the behavioral financial section. This study shows that the personal financial understanding of students in Hanoi is at average or even low level. This result is consistent with a survey of students at the University of Southern Mississippi in the study by Floyd (2015) or a study by Nidar & Sandi (2012) at the University of Padjadjaran in Indonesia. The above compilation is by Le Hoang Anh (2018). Author Nguyen Thi Hai Yen (2015), when applying an objective test to measure the financial literacy of university students in Vietnam, it shows gender, place of residence, field of study, experience Academic experience, students' financial dependence on their families, and students' need for education have a significant effect on their financial literacy at all levels. Most students majoring in economics have learned the basics of finance in their first years, and even for non-economics students, their financial knowledge can also be improved in the learning process due to the increasing need to study finance to enter the financial market after graduation. Another critical factor that determines a student's financial literacy is the need for financial literacy. However, only 50% of the participating students have this need. Research by Le Hoang Anh (2018) focusing on factors affecting students' financial knowledge has an overview of student knowledge, but all domestic studies have not reached the concept of black credit.

Domestically, the research about informal borrowing by Cuong Viet Nguyen et al. (2014) only focuses on poor households borrowing from other organizations and individuals such as family, friends, and individual financial institution and focus on the equality of richness and poverty. This form supports poor households if the government subsidy is insufficient but has not mentioned the risks of non-traditional borrowing from financial institutions lending usury to the economy and society.

According to Nguyen Dang Tue (2017), the survey which researches the factors affecting the adults' financial knowledge, also shows the similarity between the spending and saving ways of people who live in Hanoi and Nghe An. These are the two big cities, so most of them have to bear the income and expenditure for their families. The financial knowledge of the respondents in the above study is not high, only 60% of people get 4-6 correct questions, more than 20% complete 3/10 questions, and the rest can do at least 8/10

questions. As a result, the study shows that the knowledge of financial management of the previous generation has not been focused on, so it needs to be improved for the next generation.

Researcher Trinh Thi Phan Lan (2018)- Financial education for children towards national financial universalization, discusses the issue of early childhood education for young generations because financial knowledge is constantly changing and should be updated early to help people universalize world knowledge. Parents should encourage their children to enter suitable educational environments as well as participate in many practical activities to consolidate their background knowledge and improve their skills financial knowledge.

Thus, it can be seen that, compared with previous studies, our study has the following specific differences. First, the study assesses the impact of financial literacy on the use of black credit among students of universities in Hanoi, an aspect that has not or has had very few research topics on this topic access. Second, the study uses both methods simultaneously. Quantitative scientific research runs a linear regression model based on primary data collected from a survey of 353 students from universities in Hanoi City. It also clarifies the impact of financial education on the use of black credit by students in Hanoi city. Third, the study compares the factors affecting the behavior of having and will use black credit among students of different universities in Hanoi.

3. Research Methods

3.1. Evaluation model of factors affecting students' use of black credit

Based on a research paper by T.O. Sebopetji et al. (2009) on the factors affecting the decision to use credit of a small number of farmers in South Africa, the authors built the following research model:

$$\ln \left[\frac{P(Y = 1)}{P(Y = 0)} \right] = \beta_0 + \beta_1 \text{FIELD} + \beta_2 \text{FLS} + \beta_3 \text{GENDER} + \beta_4 \text{INCOME} + \beta_5 \text{YEAR} + u_i$$

The dependent variable on ever used black credit is defined as follows:

Y=1 if the student has taken out a black credit loan,

Y=0 if the student has not taken out a black credit yet

The independent variables include:

(i) FIELD: Field of Study

1: Student in the field of economics.

0: Students in other majors.

(ii) FLS: Financial Literacy Score

The financial literacy score is calculated according to a 10-question set of questions about all financial knowledge, from basic to advanced. The questions are in the form of multiple-choice questions, with 100 points. In the process of answering, students do not use supporting devices such as computers, phones, etc., to access the internet, except for computers that support calculating the data in the questionnaire. Respondents were all guided by the author group on how to do it, and they all answered the questions voluntarily and cooperatively.

(iii) GENDER: Gender

1: Male

0: Female

(iv) INCOME: Student Income

1: Income less than 1 million

2: Income 1-2 million.

3: Income 2-3 million.

- 4: Income 3-4 million.
- 5: Income 4-5 million.
- 6: Income greater than 5 million.
- (v) YEAR: School year
 - 1: The student is a freshman.
 - 2: The student is a sophomore.
 - 3: The student is a third-year student.
 - 4: The student is a fourth-year student.
 - 5: Students have graduated.

3.2. Evaluation model of factors affecting students' intention to use black credit

$$\ln \left[\frac{P(\text{DECISION} = 1)}{P(\text{DECISION} = 0)} \right] = \beta_0 + \beta_1 \text{FIELD} + \beta_2 \text{FLS} + \beta_3 \text{GENDER} + \beta_4 \text{INCOME} + \beta_5 \text{YEAR} + \beta_6 \text{OVERPAYMENT} + u_i$$

Dependent variables include:

DECISION=1 if the student intends to use black credit

DECISION=0 if the student is not planning to use black credit

The independent variables include:

- (i) FIELD: Field of Study
- (ii) FLS: Financial Literacy Score
- (iii) GENDER: Gender
- (iv) INCOME: Student Income
- (v) YEAR: School year
- (vi) OVERPAYMENT: Spending exceeds the income
 - 1: Student spending exceeds income.
 - 0: Student spending has not exceeded income.

3.3. Description of data

Table 1 summarizes the financial literacy scores of 348 students in Hanoi city after answering a set of survey questions (10 questions) about financial literacy. The group of students with good results accounted for the highest proportion (31.9%), followed by 29.6% of students with average results, and the number of excellent students who answered all questions correctly was 7 (2.01. %). In the group of weakly classified students (22.7%), only one student scored 0 points. Specifically, the number of students with 40 points accounted for the highest number (28 students). The number of students above the weak level is 77.3%, based on the survey 29.6% of students achieved the average score, and the student's understanding score was quite good at 31.9%. For the group of students with high scores from 85-100 points on financial literacy, accounting for 15.8%, 31 students scored 90 points out of 348 students surveyed.

Table 1: Statistics of students' financial literacy scores

| | Score | Number (348) | Student Score Ratio | Classification |
|--------------------|-----------|--------------|---------------------|----------------|
| Financial literacy | 0 points | 1 | 22.7% | Weak |
| | 10 points | 6 | | |
| | 15 points | 1 | | |
| | 20 points | 11 | | |
| | 25 points | 7 | | |
| | 30 points | 15 | | |

| | | | | |
|------------|-----------|----|--------|------------------|
| | 35 points | 4 | 29.6% | Average |
| | 40 points | 28 | | |
| | 45 points | 6 | | |
| | 50 points | 28 | | |
| | 55 points | 12 | | |
| | 60 points | 46 | | |
| | 65 points | 17 | 31.9% | Good |
| | 70 points | 39 | | |
| | 75 points | 20 | | |
| | 80 points | 52 | 13.79% | Excellent |
| | 85 points | 15 | | |
| | 90 points | 31 | | |
| | 95 points | 2 | 2,01% | High Distinction |
| 100 points | 7 | | | |

Source: Survey data of the research team

Table 2 shows students' monthly amount each month, and most students will receive 2-3 million VND/month (25%). 20.69% of students receive 1-2 million VND/month; similarly, it is more than 5 million VND/month, 12.36% of students receive 3-4 million VND/month, 12.07% students receive 4-5 million VND/month, the rest is 9.2% students receive less than 1 million VND/month. Most of their money comes from their families (49.16%) because they are still in school and from part-time jobs (41.12%). They also come from receiving university scholarships (8.79%). Students who have ever spent more than their income (78.45%) will often choose to apply from family (57.67%) or borrow from friends and acquaintances (49.14%). The rest use a card credit (6.32%) with black credit (6.9%). Out of the total number of surveyed students, the number of students who have used black credit (10.34%) chooses to borrow because of the easy and convenient way (75%) and need the money to respond immediately (72.2%). When borrowing black credit, students mortgage mainly with an ID card, student card, and driver's license (73.90%). In addition, they can use motorbikes (50%), laptop phones (50.9%), jewellery (53.7%) and some other valuables as collateral. Borrowing purposes are mainly due to debt (68.1%), gambling (68.7%), loss (51.4%), and the rest want to buy favourite things (54.3%).

Table 2: Statistics of responses to the black credit section of the survey

| | | | |
|---------------------------|-----------------------------------------------------------|-----|--------|
| Income | Less than 1 million | 32 | 9,20% |
| | 1-2 million | 72 | 20,69% |
| | 2-3 million | 87 | 25,00% |
| | 3-4 million | 43 | 12,36% |
| | 4-5 million | 42 | 12,07% |
| | More than 5 million | 72 | 20,69% |
| Funds | Family | 263 | 49,16% |
| | Part-time jobs | 220 | 41,12% |
| | Scholarship | 47 | 8,79% |
| | Other | 5 | 2,59% |
| Spending exceeds income | Already | 273 | 78,45% |
| | Not yet | 75 | 21,55% |
| Whom do you borrow money? | Family | 201 | 57,67% |
| | Friends and Acquaintances | 171 | 49,14% |
| | Use credit card | 22 | 6,32% |
| | Black credit (mortgage, loan with high interest rate,...) | 24 | 6,90% |
| | Other | 9 | 3,90% |
| Are you planning to | Yes | 36 | 10,34% |

| | | | |
|------------------------------------|------------------------------------------------------------------------------------|-----|--------|
| borrow black credit? | No | 312 | 89,66% |
| Why decide to borrow black credit? | You are in dire need of money, and a black credit loan meets your needs right away | 26 | 72,20% |
| | An easy and convenient way to borrow | 27 | 75% |
| | Other | 3 | 8,40% |
| Mortgage any objects? | Citizen ID, Student card, License | 257 | 73,90% |
| | Motorcycle | 174 | 50% |
| | Phones, laptops, ... | 177 | 50,90% |
| | Jewelry | 187 | 53,70% |
| | Other | 17 | 4,80% |
| Purpose | Want to buy favourite things | 189 | 54,30% |
| | Due to debt | 237 | 68,10% |
| | Due to loss | 179 | 51,40% |
| | Due to gambling | 239 | 68,70% |
| | Other | 9 | 2,70% |

Source: Survey data of the research team

4. Research results

4.1. Assessing the impact of financial literacy on students' use of black credit in Hanoi city

Based on the model identified in part 3, the research team obtained the following results:

Table 3: Impact of financial literacy on the use of black credit among students in Hanoi

| Variable | Use black credit |
|----------|------------------|
| C | 3.115883*** |
| FIELD | -0.393059 |
| GENDER | 0.459819* |
| YEAR | -0.028859 |
| FLS | -1.159354*** |
| INCOME | -0.044361 |

Note: * $p < 0.1$, ** $p < 0,05$, *** $p < 0,01$

Source: Results obtained from the Eviews model

Firstly, gender positively affects the use of black credit by students at the 10% significantly. This factor shows that male students have used black credit more often than female students. The research also shows the results that 24 students have ever borrowed black credit when they need money immediately, of which 17 male friends have used pawnbroking and usury. Besides, the study also proves that women are more financially savvy than men. Firstly, as suggested by the authors, the level of interest in financial literacy has a better index for male students, with 131 male students interested while 217 female students are interested. When asked about financial knowledge, female subjects have more positive and enthusiastic attitudes when asking and carefully calculating questions about medium and difficult financial knowledge. Secondly, to reinforce the above point, female students with above-average scores (from 50 points or more) account for 85.26%, while male students have only 64.12%, and you have scores ranging from 50 to 100 points. More specifically, there are five girls with perfect scores and only two boys with perfect scores. In addition, women are more concerned about saving and personal spending, and they list more specific and total expenditures, and those items are calculated in detail. At the same time, the savings item is always positive compared to male friends. Through a survey on financial knowledge at universities in Hanoi, the authors have shown that the reason men borrow black credit more than women is because of weak financial knowledge and a caring attitude. The problem of using black credit is not severe compared for women.

Second, financial literacy scores harm students' black credit usage at a 1% significance level. The results obtained from the model show that the financial literacy variable has the right impact on the expected sign in theory and practice. Accordingly, this statistic shows that students who have ever borrowed black credit have scores below the average. With 24 borrowers, there are 21 of you with below-average financial scores, accounting for 87.5% of the group that used to use pawnbrokers, usury. However, the remaining 12.5% have expenditures that exceed their incomes, so that must be the reason for the decision to borrow black credit. Those with poor financial knowledge will not be able to manage expenses such as saving and spending correctly every month, so 100% of the borrowers with black credit will exceed their research spending limit on the lack of financial management skills in student loan sharks or pawnbrokers. This group of subjects all need money quickly due to an urgent need to spend or pay expenses, but this is a high-risk action because, with high-interest rates, it will be difficult for students to pay. in the short term. The results demonstrate that a lack of financial knowledge will lead to a higher decision to borrow black credit than having good financial knowledge.

4.2. Assessing the impact of financial literacy on students' intention to use black credit in Hanoi city

Based on the model identified in Chapter 2, the research team has obtained the following results:

Table 4: Impact of financial literacy on intention to use black credit among students in Hanoi

| Variable | Intended use of Black Credit |
|-------------|------------------------------|
| C | 2.373614*** |
| FIELD | -0.813934*** |
| GENDER | 0.776766*** |
| YEAR | 0.008620 |
| FLS | -1.130487*** |
| INCOME | 0.013374 |
| OVERPAYMENT | 0.624219* |

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Source: Results obtained from the Eviews model

Firstly, the results obtained from the model show that the discipline has a statistical confidence level of 1%, so the FIELD variable has a high statistical significance. Moreover, the Coefficient between the FIELD variable and the DECISION variable is -0.813934, and a negative correlation coefficient shows a negative relationship. It means that students who are not in the economic sector intend to use black credit higher than those in the economic sector. It is pretty reasonable and supports the point of view of Le Hoang Anh et al. (2018) that students in the economic sector have sound financial knowledge compared to those in the non-economic sector. Because students in the economic sector are often equipped with financial knowledge and financial management skills, students in this group will make less risky decisions in consumer loans.

Second, the sex independent variable has a statistical confidence level of 1%, so the gender variable is statistically significant. The model shows that the Coefficient between GENDER and DECISION variables is 0.776766; a positive correlation coefficient indicates a positive relationship, meaning that male students are more likely to use black credit than female students. . This result can be explained because female students have better financial understanding and management ability than male students (Le Hoang Anh et al., 2018), so female students will be less likely to use credit. Everyday use.

Third, the independent variable FLS also has a statistical confidence level of 1%, so the FLS variable is statistically significant. However, the statistical results from the model show that the Coefficient is -1.130487, showing a negative correlation. The lower the financial literacy score, the higher the student's intention to borrow black credit with the opposite case. This result is quite reasonable with reality and supports the view of Davtyan (2010) that the lack of financial knowledge leads to the lack of money management skills and thereby leads to the behavior of using black credit of the poor. Student.

Fourth, the independent variable expenditure exceeds income and has a statistical confidence level of 10%, so this variable is statistically significant. Statistical results from the model show that the Coefficient is 0.624219, which means that the variable spending exceeds income and the variable intending to use credit have a positive relationship. It means that if a student spends more than his or her income, there is a possibility of using black credit. Uncontrolled spending results from a lack of financial knowledge leading to a lack of money management skills, thereby leading to the possibility of students planning to use black credit. From lack of financial understanding can lead to many consequences for the future of borrowers students because they do not understand, do not understand the consequences associated with their behavior but only see the surface Popular as the easy and fast loan methods of black credit, the advertising of low-interest rates, but the fact is that the interest rates are incredibly high, the interest rate can make the borrower never pay off the debt. Not to mention there are black credit users who also risk affecting the safety of themselves and their families.

5. Conclusion and Policy recommendations

The study assesses the impact of financial literacy on the use of black credit and the intention to use black credit of university students in Hanoi based on the primary data set obtained by the survey. The study found empirical evidence that financial literacy positively affects the use of black credit among students in Hanoi city. This result shows that students with a good level of financial literacy are less likely to take out a bad credit loan. It implies that it is necessary to improve the financial understanding of the people in general and students in particular, to minimize the use of black credit. Therefore, the research team proposes the inclusion of finance subjects at all levels of education from primary school, junior high school, high school, and university with different levels to improve understanding. Know your finances.

However, because the length of subjects at universities is decided by the Science and Training Council and cannot be easily changed, it will often focus on the students' specialized subjects. Therefore, non-economic students in Vietnam will not have financial knowledge and behavior subjects in the regular curriculum. Therefore, non-economic students need extracurricular programs on personal financial management and financial literacy. These extracurricular programs can be organized by the Student Union, the Youth Union of the school or the student clubs of economic schools. Extracurricular programs can be organized in activities with topics on money management skills, financial planning and basic investing skills for university students. It will create a premise to help students, even without studying economics, still have a certain level of understanding in managing their spending, avoiding bad management leading to spending excess income that uses black credit.

Financial literacy courses should focus on three main goals: money management skills, financial planning, and basic investment skills. This prevents students who have no financial management skills from overspending, which may lead to black credit. Teaching students basic investing skills will be the foundation for creating the experience for their future. Besides, it is necessary to supplement students with knowledge about the harmful effects of improper use of money to avoid unfortunate consequences.

In addition, the data analyzed through the linear regression model shows a significant gender difference in the selection of black credit loans; the rate that men tend to use black credit is higher than that of women because female students have higher financial literacy scores and have better financial literacy than male students. Since then, the research team has made some recommendations for schools and families on student education. Additionally, the government should issue stricter regulations and policies to prevent black loan lenders from accessing students.

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THE IMPACT OF COVID-19 ON VIETNAMESE UNDERGRADUATES' STUDY-LIFE BALANCE: THE MEDIATING ROLE OF SOCIAL SUPPORT AND MENTAL HEALTH

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ABSTRACT

There has been little research about the issue of work-life balance among university students. Considering the stress that undergraduates face during their first independent time in life and the impact of COVID-19 on reducing the border between work and life, we conduct this study to explore the study-life balance among college students in Vietnam. An online survey was completed by 491 university students who participated in the study. The perception of COVID-19, perceived social support, mental health, and perceived study-life balance is evaluated using structural equation modelling (SEM) analysis. Students' perceived study-life balance is found to be influenced by mental health and perceived social support. The indirect link between the pandemic outbreak and undergraduates' study-life balance is mediated by social support and knowledge of COVID-19. Undergraduates' academic and personal lives are affected by the pandemic. Practical implications for parents, educational institutions, students, other stakeholders and contributions for future research are discussed.

Keywords: COVID-19, mental health, social support, study-life balance, Vietnamese undergraduate

1. Introduction

The outbreak of the COVID-19 pandemic has changed the face of the world rapidly and intensely. Not only are people's mental health affected, but lots of life aspects are influenced, namely economics, politics, and education. To reduce the effect of this pandemic, governments execute lockdowns, and people have nowhere to go but their own homes. This situation has led to many consequences, but one of the biggest changes is the teleworking policy or the working from a home issue (Kramer & Kramer, 2020). As a result, the borderline between work and life is blurred. People want to be effective at work, but at the same time, enjoy their personal life. However, being distanced from others and worrying about the virus might affect people's productivity and eventually impair their ability to work and live fully. Work-life balance is not a brand-new topic. Studies about work-life balance have been conducted on full-time working adults, and results show that balancing work and non-work activities brings mental, physical, and attitudinal benefits (Haar et al., 2014). Moreover, research reveals that work-life balance has a significant effect on job satisfaction during COVID-19 (Irawanto et al., 2021). In the relationship with mental health, work-life balance is negatively related to anxiety and depression (Sprung & Rogers, 2020). However, little attention is paid to another subject that we believe also suffers from the pressures of work-life activities - university students. Given that university life is the first experience people learn to handle everything independently, undergraduates might struggle to meet different demands from their study and personal life (Loughlin & Barling, 2001).

Nevertheless, this experience in university will help shape their ability to live and work later in life. Therefore, balancing these multiple roles can help undergraduates thrive and perform well, leading to a much better overall well-being. Considering the importance of work-life balance in the context of COVID-19 and among college students, our research is conducted to explore the effect of the pandemic on undergraduates' perceived study-life balance. Specifically, we are examining the effect of undergraduates' perceived severity,

perceived controllability, and their knowledge of COVID-19 on their study-life balance, with mental health and perceived social support playing the mediating roles.

2. Literature Review

2.1. Theoretical background

Social Cognitive Theory, Cognitive Appraisal Theory, and Conservation of Resources Theory are three main theories providing a foundation for explaining the research model in this present study.

The first theory, Social Cognitive Theory (SCT), explains psychosocial functions in triadic reciprocal causation (Bandura, 1989). In other words, this theory introduces a model in which personal factors, behaviors, and environmental factors closely interact in a bidirectional flow. Indeed, the mechanism within this framework is that elements of the person and the environment interact in ways that aid the formation of future motivations, behavior, and well-being (Bandura, 2004).

The second theory, Cognitive Appraisal Theory (CAT), describes the individual interpretation of a situation through which the person evaluates how the condition will influence their mental health. The assessment process consists of two stages. Primary appraisal is the initial evaluation of whether the person will be irrelevant, beneficial (benign-positive), or threatened from a specific situation. For instance, when the government implies social distancing, people's first thought is to assess how it will affect their mental health. The conclusion drawn from primary appraisal will determine the following stage - secondary appraisal - regarding harm, threat, or challenge. Secondary appraisal refers to the individual evaluation of how they respond to that situation (Lazarus, 1991). If the experience is viewed as challenging rather than threatening, an individual's response will be more adaptable (Lazarus, 1991).

The third theory, Conservation of Resources (COR) theory, offers a theoretical framework for understanding stressful conditions (Hobfoll, 2001). This theory posits that individuals strive to obtain, retain, foster, and protect what they value. These things are termed resources, including objects, conditions, personal characteristics, and energy resources. According to COR theory, stress emerges depending on whether individuals find a balance between resources and demands. Therefore, the imbalance, which means resources loss and gain, happens if enrichment or conflict of work and non-work areas occur (Au & Ahmed, 2015). As a result, conserving resources or finding new ones is useful for handling stress to sustain a good work-life balance.

2.2. Perception of COVID-19 and college students' mental health

Before the COVID-19 pandemic occurred, the cognitive appraisal was used to examine the public's mental health during outbreaks of emerging public health concerns such as SARS (Vartti et al., 2009; Dorfan & Woody, 2011) and Ebola (Yang & Chu, 2016). Currently, some studies have directly investigated cognitive appraisal factors that affect mental health during the outbreak of COVID-19.

Different cognitive appraisal factors may be conflated from a methodological aspect, inflating the correlation between a single cognitive appraisal factor and the outcomes when not considered simultaneously (Li et al., 2020). Our study examines three different cognitive appraisal factors concurrently (i.e., perceived severity, knowledge, and perceived controllability), which enables us to account for covariance across these factors and obtain a more nuanced estimation of the correlations between these appraisal factors and mental health.

2.2.1. Knowledge of COVID-19 and mental health

Recent research has established that a lack of knowledge about the pandemic might increase mental health problems by raising stress, depression, and anxiety (Du et al., 2020; Wang et al., 2020). Inadequate knowledge and false beliefs propagated by the media, such as "overwhelmed hospitals," "panic in the epicenter," and "epidemic rumors," can have a detrimental effect on mental health (Rubin & Wessely, 2020). Additionally, the literature implies that mental health is related to the amount of information about COVID-19, as inaccurate information might increase mental health problems (Wang et al., 2020). Our study hypothesized that knowledge about COVID-19, the cognitive appraisal factor, was associated with students'

mental health. It refers to students' awareness of transmission routes, severity of infection, details on symptoms, efficacy of COVID-19 vaccines, updates on confirmed cases and deaths, potential treatments for infection, prevention advice, overseas experience with COVID-19, and information on outbreaks in the local area (Wang et al., 2020).

H1: Knowledge of COVID-19 affects college students' positive mental health.

H2: Knowledge of COVID-19 affects college students' negative mental health.

2.2.2. Perceived severity and mental health

In previous research, Li et al. (2020) revealed that individuals' perceived severity of the COVID-19 pandemic - as the primary appraisal - is associated with greater adverse emotional and behavioral outcomes, suggesting that the perceived severity of COVID-19 may have a significant detrimental influence on mental health outcomes. In addition, people take protective actions when they perceive a great danger and severity of disease (Bandura, 1990), heightened by an increasing number of confirmed cases and fatalities, rumors, and strangeness. Hence, Yıldırım & Güler (2020) indicated that perceiving COVID-19 as severe was related to a greater risk for mental issues (e.g., depressive symptoms and anxiety) and increased preventative behavior. Thus, we hypothesized that the perceived severity of COVID-19 - an individual's assessment of how dangerous the pandemic is and its consequences - was associated with students' mental health.

H3: Perceived severity affects college students' positive mental health.

H4: Perceived severity affects college students' negative mental health.

2.2.3. Perceived controllability and mental health

Meanwhile, Li et al. (2020) found that the perceived controllability of COVID-19 - the secondary appraisal - was the protective factor against mental health issues. Sobkow et al. (2020) revealed that the controllability of the pandemic is related to the intentions to take preventive behaviors. Oliver & Brough (2002) indicated that perceived controllability was a predictor of an individual's well-being. Compas et al. (1991) show that emotional distress is lower when perceived controllability is high and vice versa in young adolescents (Compas et al., 1988) and college students (Forsythe & Compas, 1987). In our study, perceived controllability relates to an individual's conviction in their ability to exert influence over internal states and behaviors, as well as the external environment (Pagnini et al., 2016) during the COVID-19 pandemic.

H5: Perceived controllability affects college students' positive mental health.

H6: Perceived controllability affects college students' negative mental health.

2.3. Mental health and perceived study-life balance

Work-life balance has been given much attention over time, and that is why different researchers have defined it in different ways. For example, work-life balance, according to Clark (2000), is defined as satisfaction and good functioning at work and home with a minimum of role conflict. At the same time, Kirchmeyer (2000) explained work-life balance as achieving satisfying experiences across all life domains, which requires the well-distribution of personal resources such as energy, time, and commitment across domains. Despite various definitions proposed, it can be generalized that work-life balance is described as the capability to allocate available resources to gain satisfaction without conflicts between work and non-work roles.

A majority of research is conducted on the work-life balance among adults while this topic in college students receives little attention. Therefore, this study explores factors that impact life roles among college students by replacing "work" with "study." For both concepts, it is the situation that an individual is satisfied with the equilibrium between the various roles in an individual's life (Drago, 2007). College students often face role conflicts in school-related activities and personal factors, including relationships, physical and mental fitness (Kumar & Chaturvedi, 2018). Thus, we define perceived study-life balance in this study as the perception of balancing professional demands (work, school, extracurricular requirements) with their leisure activities and personal needs.

Prior research has examined the link between college students' mental health and their study life balance. According to Sprung and Rogers (2020), students who have an imbalance between their academic and personal lives are more prone to experience anxiety and depression. Maintaining a healthy balance between different life domains may be beneficial to the dynamic of young adult students. According to the literature, people who have better compatibility in managing various life domains are happier and have lower neuroticism (Gröpel & Kuhl, 2009). In addition, Hill et al. (2018) suggested that inadequate balance of study and personal life contributes to increased stress levels. A more satisfied student performs better, is more engaged, and feels less fatigued (Babenko et al., 2020). Our study seeks to advance the hypothesis that college students' mental health predicts their study-life balance.

However, previous studies have not considered mental health an essential antecedent of college students' perceived study-life balance. The social cognitive theory provides theoretical support for this relationship. Two essential factors influence how people respond in every scenario or context: the environment's modifiability and individuals' self-efficacy to modify their setting through their behavior (Bandura, 1986). According to Yusuf et al. (2020), personal efficacy influences mental health and can be impacted by other challenges that the subject is dealing with - in this context, it is COVID-19. Our study suggests how undergraduate students view themselves during the pandemic and their perceived self-efficacy in their mental health has implications for how they perceive their study- life balance.

H7: College students' positive mental health affects perceived study-life balance.

H8: College students' negative mental health affects perceived study-life balance.

2.4. Perception of COVID-19 and perceived social support

Besides students' mental health, we believe that the perception of COVID-19 also affects the social support that they perceive to receive. The pandemic poses a greater risk than ever before, and in such a situation, we believe the students' perceived social support becomes much more sentimental.

2.4.1. Knowledge of COVID-19 and perceived social support

According to SCT, the environment affects people's cognition. In this case, we suggest that the outbreak of the COVID-19 pandemic exerts an influence on people's perception of the social support they receive. Specifically, having a good knowledge of the pandemic such as understanding transmission routes, risk, and severity of infection, details on symptoms, availability, and efficacy of COVID-19 vaccines, makes people feel that they are receiving lots of social support because they now understand that preventive behaviors like following 5K rules, executing lockdowns and social distancing, though can render them uncomfortable, even stressed are protecting them and other people against the virus. Therefore, we propose that knowledge of COVID-19 affects perceived social support.

H9: Knowledge of COVID-19 affects college students' perceived social support.

2.4.2. Perceived severity and perceived social support

The perception of students on the severity of COVID-19 might be related to the extent that they perceive social support. Indeed, Asian people in at-risk conditions tend to show strong support for others, and college students are no exception. This characteristic is exclusive to Eastern cultures, especially Vietnam. Thus, when the COVID-19 pandemic seems increasingly severe, people are likely to care more about each other as a result of cultural preference in tightly knit communities, and therefore they will acknowledge higher social support. Based on the above deduction, this present study assumes that the perceived severity of COVID-19 has an impact on perceived social support.

H10: Perceived severity affects college students' perceived social support.

2.4.3. Perceived controllability and perceived social support

The COVID-19 outbreak has posed increasingly fatal threats to people worldwide due to its deadly effects. Based on the cognitive appraisal theory, once people are concerned about threatening situations, they will consider how to control them in response to the situations. Combining with the COR theory, when

people are motivated to seek new resources under stressful conditions, they will find support from the environment to fight against the situations. And one of the potential resources people may need in such circumstances is social support (Hobfoll, 2001). In this present study, the perceived controllability of COVID-19 is considered as one's perception of how to handle and prevent the incident. Accordingly, the more controllable the pandemic is, the more social support an individual perceives and vice versa. Although people stay at home, much psychological distress is caused by excessive exposure to negative coronavirus coverage via social media. Thus, seeking support from family members, friends, or people in the community can help them to relieve stress and maintain life satisfaction during the outbreak.

H11: Perceived controllability affects college students' perceived social support.

2.5. Perceived social support and perceived study-life balance

Social support has been explored in many stress-related studies, including work-life balance. Indeed, Yusuf et al. (2020) claimed that social support is a major theme in graduate education research, particularly mental health, work-life balance, and student success. Kahn & Antonucci (1980) once explained social support as interpersonal transactions that include one or more of the following key elements: effect, affirmation, and aid. Sarason et al. (1983) argued that social support refers to the presence or availability of people on whom one can rely, as well as people who demonstrate that they value and love us. Similarly, social support in the present study is considered assistance from other people in interpersonal relationships and combines four forms based on House's division (House, 1981), namely emotional (e.g., caring, love, trust), instrumental (e.g., money, labor, time), informational (e.g., advice, suggestions), and appraisal support (e.g., affirmation, feedback).

Based on the COR's second principle, individuals are motivated to conserve resources or seek new ones when facing resource loss. Because of stress derived from that loss, finding a resource to aid the process of stress resistance is understandable. Accordingly, Hobfoll (2001) suggested social support for achieving that goal, which is useful for study-life balance, especially in the context of the COVID-19 pandemic. Indeed, prior research has presented the same arguments. For instance, Bakker & Oerlemans (2016) argued that social support had been identified as strategies for reducing the strain and the role conflicts between home and work. In addition, social support serves as effective means of attaining a greater balance (Achour et al., 2017). Social support improves employee well-being, reduces stress, improves work and family satisfaction, and improves mental and physical health (Brue, 2018). In conclusion, COR theory sheds light on the relationship between social support and perceived study-life balance, which is followed by this hypothesis:

H12: Perceived social support affects perceived study-life balance.

2.6. The relationship between perceived social support and mental health

Numerous studies have found a significant association between perceived social support and mental health. COVID-19 outbreak has imposed many challenges in the ways college students manage their lives. Anxiety over COVID-19 exposure limits many physical activities such as having face-to-face communication, doing outdoor sports, etc. Such restrictions have a negative impact on the mental health of adults including the undergraduate age group (Yu et al., 2021). Therefore, any support received from parents, teachers, peers, or other significant ones can help them to overcome those challenges and alleviate their mental health problems (Grey et al., 2020; Qi et al., 2020; Huang & Zhang, 2021). This means that the more social support they conceive, the better their mental status is. Following that assumption, this present study proposed this hypothesis:

H13: Perceived social support affects college students' positive mental health.

H14: Perceived social support affects college students' negative mental health.

2.7. Linking COVID-19 factors, mental health and perceived study-life balance

In addition to the above-proposed hypotheses, we suggest that mental health plays a mediating role in the relationship between the COVID-19 factors (perceived severity, perceived controllability and knowledge

of COVID-19) and perceived study-life balance. The mechanism is clear when we consider the cognitive appraisal theory. According to the theory, when an event happens, people usually go through two stages: evaluating the effect of the event on themselves and adapting their behavior to respond to the change. In this case, we propose that undergraduates' perception of the pandemic affects their study-life balance by influencing their mental health. Indeed, (Fisher et al., 2021) claimed that social support was found to be a mediator between individuals' stress levels caused by the perceived COVID-19 uncontrollability and satisfaction with life.

H15: Positive mental health mediates the relationship between knowledge of COVID-19 and perceived study-life balance.

H16: Negative mental health mediates the relationship between knowledge of COVID-19 and perceived study-life balance.

H17: Positive mental health mediates the relationship between perceived severity and perceived study-life balance.

H18: Negative mental health mediates the relationship between perceived severity and perceived study-life balance.

H19: Positive mental health mediates the relationship between perceived controllability and perceived study-life balance.

H20: Negative mental health mediates the relationship between perceived controllability and perceived study-life balance.

2.8. Linking COVID-19 factors, perceived social support and perceived study-life balance

Besides mental health, we also suggest that perceived social support is the mediator between COVID-19 factors (perceived severity, perceived controllability, and knowledge of COVID-19) and perceived study-life balance. According to the COR theory, people tend to maintain a balance between resources and demands. In this study, we propose that when the pandemic happens, undergraduates' balance is affected, leading to them finding social support to foster and retain the balance.

H21: Perceived social support mediates the relationship between knowledge of COVID-19 and perceived study-life balance.

H22: Perceived social support mediates the relationship between perceived severity and perceived study-life balance.

H23: Perceived social support mediates the relationship between perceived controllability and perceived study-life balance.

2.9. Conceptual framework

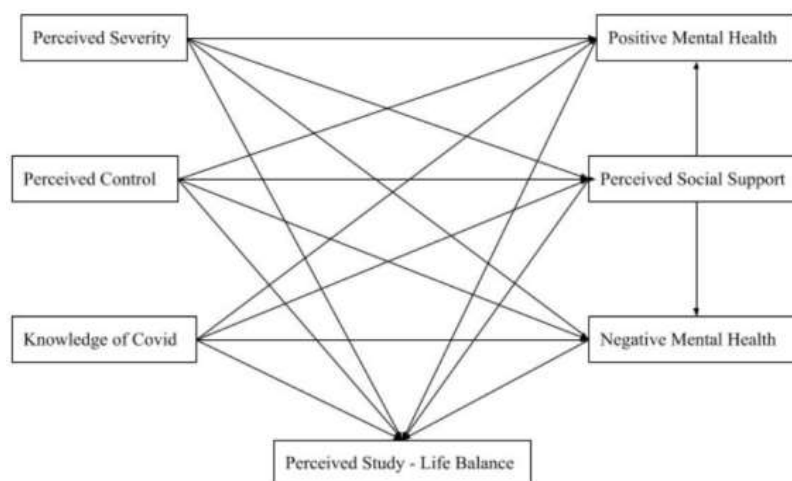


Figure 1. Conceptual framework

3. Research method

3.1. Participants and procedure

Our sample consists of full-time undergraduates at the UEH university, Ho Chi Minh City, Vietnam. A total of 491 undergraduates participated in the study, and they were asked to complete an online survey. After completing the survey, participants were rewarded with online academic materials and e- books in different fields. Besides, there was no personally identifying information being collected. Another characteristic to mention is that most of the students at the UEH university major in the field of economics and business. After purifying the data, our sample consists of 476 responses.

Table 1. Summary of demographic variables.

| | | Frequency (N) | Percentage (%) |
|----------------|--------|---------------|----------------|
| Biological sex | Male | 369 | 77,5 |
| | Female | 107 | 22,5 |
| | Total | 476 | 100 |
| Age | 18 | 134 | 28,2 |
| | 19 | 144 | 30,3 |
| | 20 | 179 | 37,6 |
| | 21 | 17 | 3,6 |
| | 22+ | 2 | 0,4 |
| | Total | 476 | 100 |
| Batch | 44 | 13 | 2,7 |
| | 45 | 185 | 38,9 |
| | 46 | 144 | 30,3 |
| | 47 | 134 | 28,2 |
| | Total | 476 | 100 |
| Birthday | Urban | 294 | 61,8 |
| | Rural | 182 | 38,2 |
| | Total | 476 | 100 |

The sample consists of 77,5% female and 22,5% male. This ratio represents the overall population of the UEH university. However, there were only 13 final-year students participating in our survey, compared to 185 seniors, 144 sophomores, and 134 freshmen. Our sample also includes most of the students from the urban areas (61,8%), compared to 38,2% of those growing up in rural areas.

3.2. Measures

3.2.1. Perceived severity, Perceived controllability and Knowledge of COVID-19

These three COVID-19 factors are adopted from the scale of Li et al. (2020). Participants' perceived severity about COVID-19 was measured with the original 5 items. The statements are about how severe the

participants think the infection rate, the mortality rate, of COVID-19 are. Participants rate each statement on a rating scale from 1 (least severe) to 5 (most severe).

Participants' perception of the control level of COVID-19 is measured with 7 items instead of 9 items in the original scale. We eliminated 2 items about COVID-19's ways of transmission and developmental trends, because it is hard to indicate the severity of the ways of transmission and it is difficult to predict the trends of the pandemic. The scale for perceived controllability is also measured on a five-point rating scale, ranging from 1 (least controlled) to 5 (most controlled).

The knowledge about COVID-19 of participants was measured by a 7-item scale which was adapted from the original 11-item scale. The 4 items being eliminated are the infectiousness, diagnostic criteria, recovery criteria and the mortality of the confirmed cases because we consider them hard to assess and they are not common knowledge. Again, the items are on a five-point scale, from 1 (least known) to 5 (most known).

3.2.2. Perceived social support

The scale for social support was adapted from the Multidimensional Scale of Perceived Social Support (MSPSS). The items indicate the perceived support an individual can receive from their family, friends, and their significant others. Our scale for this consists of 6 items being evaluated on a five-point Likert scale, from 1 (strongly disagree) to 5 (strongly agree).

3.2.3. Mental health

The scale for mental health is adapted from the Short General Health Questionnaire (GHQ 12). In our study, the scale for mental health consists of 10 items measuring the positive and negative dimensions of mentality. Each dimension was measured with 5 items. Again, the participants' rate each item on a five-point Likert scale, ranging from 1 (strongly agree) to 5 (strongly disagree).

3.2.4. Perceived study - life balance

For study-life balance, we adopt the items from the scale of Haar et al. (2014). The scale consists of three items measuring the overall work-life balance on a 5-point scale with 1 being "strongly disagree" and 5 being "strongly agree".

4. Results and discussion

4.1. Results

We analyze the data using SmartPLS 3. First, we test the construct reliability and validity as well as the discriminant validity. Then, we conduct a Structural Equation Modeling (SEM) method to test the hypotheses that we proposed above.

4.1.1. Scale reliability and validity

a) Cronbach's alpha

The reliability of the scales is tested using SmartPLS. The result shows that all the scales used in this study are reliable with Cronbach's alpha greater than 0.6. The detailed result is shown in table 2.

Table 2. Cronbach's alpha.

| Factor | Cronbach's Alpha |
|--------------------------------|-------------------------|
| Perceived Severity (PS) | 0.673 |
| Perceived Controllability (PC) | 0.830 |
| Knowledge of COVID-19 (KC) | 0.814 |
| Positive Mental Health (PM) | 0.762 |
| Negative Mental Health (NM) | 0.830 |

| | |
|-----------------------------------|-------|
| Perceived Social Support (PSS) | 0.874 |
| Perceived Study-life balance (PB) | 0.843 |

b) Discriminant reliability

The discriminant reliability of the scales being used is confirmed with the detailed result shown in table 3. The scales are valid and reliable as the square root of AVE (Average Variance Extracted) is greater than the correlation coefficient between the factors.

Table 3. Discriminant validity

| | KC | NM | PC | PS | PM | PB | PSS |
|-----|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| KC | 0,712 | | | | | | |
| NM | 0,076 | 0,763 | | | | | |
| PC | 0,336 | 0,123 | 0,719 | | | | |
| PS | 0,179 | 0,081 | 0,031 | 0,752 | | | |
| PM | 0,295 | -0,301 | 0,204 | 0,11 | 0,717 | | |
| PB | 0,32 | -0,219 | 0,253 | 0,091 | 0,632 | 0,872 | |
| PSS | 0,271 | -0,225 | 0,199 | 0,184 | 0,511 | 0,492 | 0,784 |

Note: KC = Knowledge of COVID-19; NM = Negative Mental Health; PC = Perceived Controllability; PS = Perceived Severity; PM = Positive Mental Health; PB = Perceived Study-life Balance; SS = Perceived Social Support

4.1.2. Hypotheses test

As mentioned above, we use Structural Equation Modeling (SEM) method to test our hypotheses. SmartPLS 3 is utilized to analyze the SEM model.

Table 4. Results for hypotheses test

| Hypotheses | Path coefficient | P-value | Conclusion |
|------------------------------------------------------------|------------------|---------|------------------|
| H1. Knowledge of COVID-19 -> Positive mental health | 0.178 | 0.000 | Supported |
| H2. Knowledge of COVID-19 -> Negative mental health | 0.049 | 0.378 | Not supported |
| H3. Perceived severity -> Positive mental health | -0.028 | 0.572 | Not supported |
| H4. Perceived severity -> Negative mental health | 0.105 | 0.097 | Not supported |
| H5. Perceived controllability -> Positive mental health | 0.049 | 0.249 | Not supported |
| H6. Perceived controllability -> Negative mental health | -0.146 | 0.007 | Supported |
| H7. Positive mental health -> Perceived study-life balance | 0.513 | 0.000 | Supported |
| H8. Negative mental health -> Perceived study-life balance | -0.014 | 0.701 | Not supported |
| H9. Knowledge of COVID-19 -> Perceived social support | 0.216 | 0.000 | Supported |

| | | | |
|--------------------------------------------------------------------------------------------|--------|-------|------------------|
| H10. Perceived severity -> Perceived social support | 0.147 | 0.001 | Supported |
| H11. Perceived controllability -> Perceived social support | 0.128 | 0.003 | Supported |
| H12. Perceived social support -> Perceived study-life balance | 0.225 | 0.000 | Supported |
| H13. Perceived social support -> Positive mental health | 0.453 | 0.000 | Supported |
| H14. Perceived social support -> Negative mental health | -0.293 | 0.000 | Supported |
| H15. Knowledge of COVID-19 -> Positive mental health -> Perceived study-life balance | 0.091 | 0.001 | Supported |
| H16. Knowledge of COVID-19 -> Negative mental health -> Perceived study-life balance | -0.001 | 0.765 | Not supported |
| H17. Perceived severity -> Positive mental health -> Perceived study-life balance | -0.014 | 0.583 | Not supported |
| H18. Perceived severity -> Negative mental health -> Perceived study-life balance | -0.001 | 0.759 | Not supported |
| H19. Perceived controllability -> Positive mental health -> Perceived study-life balance | 0.025 | 0.269 | Not supported |
| H20. Perceived controllability -> Negative mental health -> Perceived study-life balance | -0.002 | 0.714 | Not supported |
| H21. Knowledge of COVID-19 -> Perceived social support -> Perceived study-life balance | 0.049 | 0.001 | Supported |
| H22. Perceived severity -> Perceived social support -> Perceived study-life balance | 0.033 | 0.009 | Supported |
| H23. Perceived controllability -> Perceived social support -> Perceived study-life balance | 0.029 | 0.013 | Supported |

The result suggests that among 23 hypotheses being proposed, 13 hypotheses are supported, and 10 hypotheses are not supported. The R square adjusted for perceived study-life balance is 0.434, which means that 43,4% variation of the perceived study-life balance variable is explained by the predictor variables. Variance inflation factor (VIF) of all variables is smaller than 3, indicating that the model does not have multicollinearity issue.

Hypotheses 1 and 2 indicate that knowledge of COVID-19 affects undergraduates' positive and negative mental health. These statements are supported as the result shows that knowledge of COVID-19 has a small effect on positive mental health ($r = 0.178$, $p = 0.000$), but no effect on negative mental health. For other COVID-19 factors, the result indicates that perceived controllability has an insignificant negative effect on negative mental health ($r = -0.146$, $p = 0.007$), but has no effect on positive mental health. Meanwhile, perceived severity is found to have no influence on mental health. Therefore, hypotheses 3 and 4 are not supported and hypothesis 5 is not supported while hypothesis 6 is supported. Hypotheses 7 and 8 propose that undergraduates' positive and negative mental health affect perceived study-life balance.

Hypothesis 7 is supported while hypothesis 8 is not because only positive mental health exerts a strong effect on perceived study-life balance ($r = 0.513$, $p = 0.000$).

Hypotheses 9, 10 and 11 are all supported, indicating that knowledge of COVID-19, perceived severity and perceived controllability all have an influence on undergraduates' perceived social support ($r = 0.216$, $p = 0.000$; $r = 0.147$, $p = 0.001$; and $r = 0.128$, $p = 0.003$ respectively). Hypothesis 12 says that university students perceived social support affects their perceived study-life balance. This statement is fully supported with perceived social support having a medium positive effect on perceived study-life balance ($r = 0.225$, $p = 0.000$).

Hypotheses 13 and 14 propose that students perceived social support affects their positive and negative mental health. They are supported because the result shows that perceived social support has a significant positive effect on positive mental health and a medium negative effect on negative mental health ($r = 0.453$, $p = 0.000$ and $r = -0.293$, $p = 0.000$ correspondingly).

Hypothesis 15 is supported and 16 is not supported as we only find the indirect effect of knowledge of COVID-19 on perceived study-life balance through positive mental health ($r = 0.091$, $p = 0.001$). The same effect does not exist with negative mental health. While hypothesis 17 to 20 are not supported, hypotheses 21, 22 and 23 are all supported proving that COVID-19 factors including knowledge of COVID-19, perceived severity and perceived controllability affects perceived study-life balance indirectly through perceived social support ($r = 0.049$, $p = 0.001$; $r = 0.033$, $p = 0.009$ and $r = 0.029$, $p = 0.013$ sequentially).

4.2. Discussion

This study was conducted to examine the link between the pandemic and undergraduates' study-life balance. To accomplish this, we examine the link between COVID-19 factors including knowledge of COVID-19, perceived severity, and perceived controllability of the pandemic, perceived social support, mental health, and perceived study-life balance. Our study advances the literature on work-life balance by conducting this topic on university students and under the context of COVID-19 in Vietnam. We discuss the findings and contributions of this study below.

First, our study concludes that university students' perception of the pandemic has an insignificant effect on their mental health. Specifically, our findings only indicate that knowledge of COVID-19 affects positive mental health, and perceived controllability of COVID-19 affects negative mental health. This result is consistent with (Li et al., 2020) which finds that the outbreak of COVID-19 affects people's mental health slightly and opposite to (Liang et al., 2020) which concludes that COVID-19 has an immense effect on youth mental health. This might be due to the different current pandemic situations in Vietnam and China. In Vietnam, the pandemic becomes quickly under control and the government executes multiple policies to keep the country safe. Secondly, our findings show that the pandemic affects undergraduate's perceived social support. As expected, the outbreak of COVID-19 affects our need for support from others. Specifically, our findings point out that knowledge of COVID-19, perceived severity, and perceived controllability of the pandemic influence perceived social support in a positive way.

Thirdly, our study reveals that mental health and perceived social support affect perceived study-life balance. Positive mental health is found to have a strong effect on perceived study-life balance, while perceived social support poses a medium positive effect on perceived study-life balance. This result is consistent with (Kumar & Chaturvedi, 2018; Fisher et al., 2021) in pointing out the effect of perceived social support on work-life balance. Meanwhile, previous studies usually examine the effect of work-life balance on mental health and overall well-being (Kumar & Chaturvedi, 2018; Yusuf et al., 2020; Sprung & Rogers, 2020), this study sheds the light on the effect of mental health on university students' study-life balance.

Finally, for the indirect effects, on the one hand, we find that negative mental health does not mediate the relationship between perceived severity, perceived controllability, and perceived study-life balance. Meanwhile, positive mental health is the mediator between knowledge of COVID-19 and perceived study-life balance. On the other hand, perceived social support is found to play the mediating role between all three COVID factors and perceived study-life balance. This study might take the initiative to examine the indirect

relationship between the COVID-19 outbreak and perceived-study life balance through both mental health and perceived social support.

5. Conclusion

Overall, our study examines the potential impact of the pandemic outbreak on undergraduates, especially their study-life balance. Given that our research might be one of the first studies in Vietnam to do this topic, we encourage future research to further expand these findings in three possible ways. Firstly, the two-way relationship between mental health and perceived study-life balance should be tested several times to be confirmed. Secondly, the effect of the COVID-19 outbreak on perceived study-life balance can be examined in multiple and diverse contexts as the situation can be varied in different countries and regions. Finally, students' study-life balance may be affected by many other factors which need to be examined.

This study has two practical implications for higher educational institutions, parents, and other stakeholders involved in the experience of the study-life balance of undergraduates. To start with, it is important for universities to equip their students with knowledge about COVID-19 to keep their mental health stable during the pandemic. Online events, webinars, or talk shows about psychological well-being should be given more attention as to create a place where students can look for good advice, effective tips to stay positive in the time of the pandemic. Besides, teachers, instructors and parents also need to assist students to help them adapt better to the sudden change from traditional classes to online classes. The reason is that such an instant switch might make students feel nervous, strange and find it hard to connect with others given the geographical and technological barriers. Creating more opportunities where students can talk about their difficulties in social distancing time and providing services such as student support is also super vital.

Furthermore, in order to help students, thrive in the time of online education and achieve study-life balance, education institutions should conduct career consulting services in which students are given advice on how to focus on a career that matches their strengths and how to gain new skills that fit the current demands of the labor market. Supporting students in increasing their employability can help them set clear priorities in life, and minimize negative feelings like confusion, fear, and nervousness of losing their future jobs as the pandemic outbreak ruins the global economy and leaves many new graduates jobless. Preparing university students for incoming changes is crucial in making them calm and flexible, even in the worst situations.

For future researchers, we believe that this study paves the way for diving into the study-life balance among undergraduates as well as allocates the attention to mental health issues, especially among gen Z - the so-called "depressed generation" and in a developing country like Vietnam where psychological fields are still under-developed.

However, this research is not without its limitations. The first limitation is that our data is self-reported. However, the reliability test shows that the scales that we use are valid and trustworthy. The second limitation is that our sample consists of only a small percentage of last-year students because of the difficulty in approaching them, although we believe that the effect on perceived study-life balance will emerge much more obvious on them. We encourage future studies to further expand this research and solve these gaps.

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FACTORS INFLUENCING THE BEHAVIORAL INTENTION TO USE MOBILE LEARNING IN ONLINE LEARNING OF STUDENTS STUDYING AT UNIVERSITIES IN HO CHI MINH CITY

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ABSTRACT

The objective of this study is to determine the factors affecting the intention to use mobile learning methods in the online learning of students at local universities in Ho Chi Minh City. The authors apply the theoretical framework of the technology acceptance model (TAM), the unified theory of the acceptance and use of technology model (UTAUT), and the DeLone model in building the research model. Besides, the authors used exploratory factor analysis (EFA) and regression analysis to test and measure theoretical models. However, due to differences with actual results, the authors used quantitative methods to conduct formal research. Research results show that attitude, system quality, perceived ease of use, and perceived usefulness are factors that have a great influence on behavioral intention to use mobile learning according to the level of impact reduction. gradually.

Keywords: Mobile Learning, Behavioral Intention to Use, TAM, TPB, UTAUT, DeLone.

1. Introduction

With the increasingly outstanding development of science and technology, the education system is becoming more and more perfect with the application of many tools for learning, helping to acquire knowledge as well as connect people. Teaching and learning have become much easier and more lively than before. Especially during the current COVID-19 pandemic, the application of science and technology in education has become an inevitable trend. In order to ensure the health and safety of lecturers and students in the face of the complicated situation of the pandemic, all universities in Ho Chi Minh City have switched from direct training to direct training. Indirect In fact, there are many tools for online learning for students, such as desktop computers, tablets, laptops, smartphones, and televisions. Depending on the conditions and needs, students will choose a suitable tool for online learning. Each type of tool will bring students different benefits and limitations. According to Sarrab et al. (2012), M-Learning is a technique of using mobile and wireless technology for learning and education. M-Learning allows learners to combine their learning experiences in a shared, collaborative environment.

However, there are also many opinions that do not support the use of M-Learning because, as such, learners will be easily distracted in the learning process. Since an internet connection is required during class, announcements, messages, etc., may cause you to shift your attention to some other content (Linh, 2022); Studying online for a long time, students have to spend a lot of time sitting in front of a computer screen. There is a lack of communication between lecturers and students, leading to the psychological fatigue of most students (Dung, Phuong & Nhi, 2020).

So, knowing the factors that influence the intention to use M-Learning, why is M-Learning so popular? This study is not only to study the factors affecting the choice of M-Learning for online learning but also to serve as a basis for improving the quality of e-learning software and contributing to the completion of online learning. This will promote the quality of online education. That is also the reason for forming the research topic "Factors affecting the intention to use M-Learning in online learning of students at universities in Ho Chi Minh City".

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2. Theoretical framework

2.1. Theory of Planned Behavior – TPB

The Theory of Planned Behavior (TPB) of Ajzen (1991) was developed from the Theory of Rational Action (TRA) of Ajzen and Fishbein (1975). TPB assumes that a behavior can be predicted or explained by the intention to perform that behavior. Accordingly, the TPB assumes that intention is assumed to include motivational factors and is defined as the degree of individual effort to perform the behavior; Intention is the closest antecedent of behavior and there are 3 factors affecting behavioral intention, which are Attitude Toward Behavior (AB), Subjective Norm (SN) and Perceived Behavioral Control (PBC).

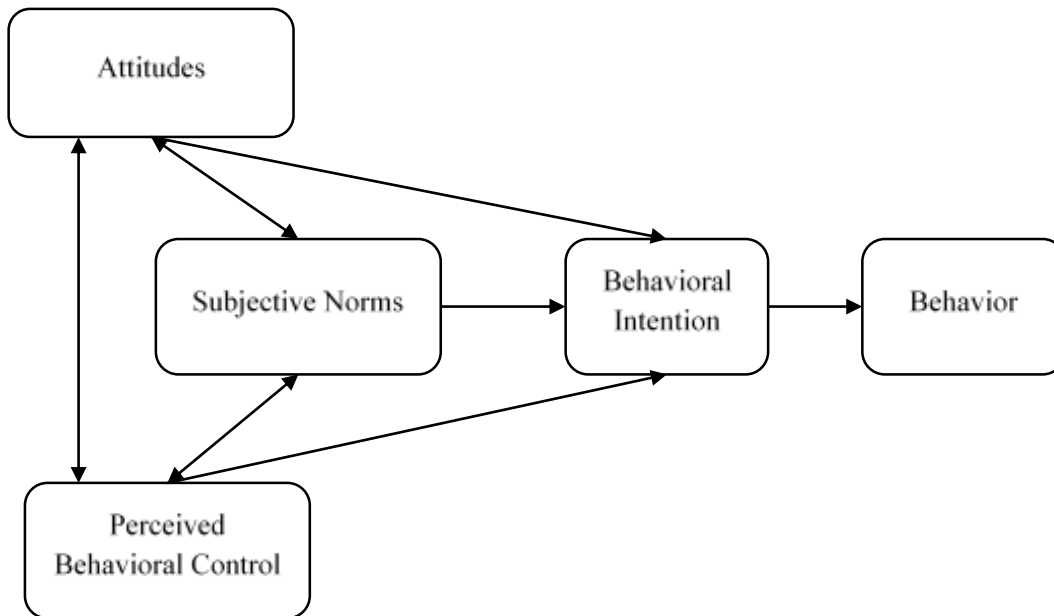


Fig 1. Model of the theory of intended behavior - TPB

2.2. Technology Acceptance Model (TAM)

The Theory of Technology Acceptance Model (TAM) of Davis (1989) is a model built on the basis of the Theory of Rational Action (TRA) used to explain the intention to perform the action in the field of information technology. TAM believes that two factors: perceived usefulness (PU) and perceived ease of use (PEOU) are two main factors that are closely related to the accepting behavior of users' consumption in the information technology sector. Where perceived usefulness (PU) is understood as the degree to which a person believes that using a particular system will enhance their job performance. This comes from the definite meaning of the word useful: "capable of being used advantageously" (Davis, 1989). Perceived ease of use (PEOU) is the degree to which a person believes that using a particular system will be effortless i.e. effortless when using the system. This comes from the definition of the word easy: "freedom from difficulty or great effort" (Davis, 1989). The TAM model successfully predicted about 40% of the use of a new system (Legris et al. 2003).

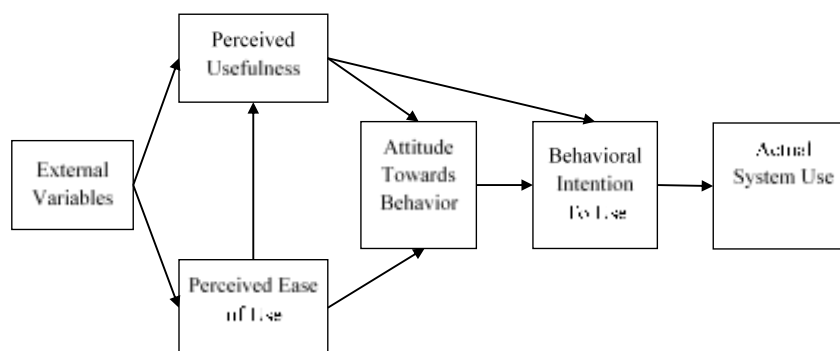


Fig 2. Original Technology Acceptance Model

2.3. Unified Theory of Acceptance and Use of Technology (UTAUT)

The UTAUT model is one that is used in the field of information and acceptance communication technology model developed by (Venkatesh, Morris, Davis, & Davis, 2003) based on the TAM model, which tries to solve problems like the user's behavioral intention to use the new information system and subsequent usage behavior. Furthermore, UTAUT was able to explain 70% of technology acceptance behavior (Masrom, M., & Hussein, R. 2008), including four structural keys that are: Performance Expectancy (PE), Effort Expectancy (EE), Social Influence (SI), and Facilitating Conditions (FC), all of which directly influence the behavioral intention to use technology (Masrom, M., & Hussein, 2008). This model is shown in Figure 3:

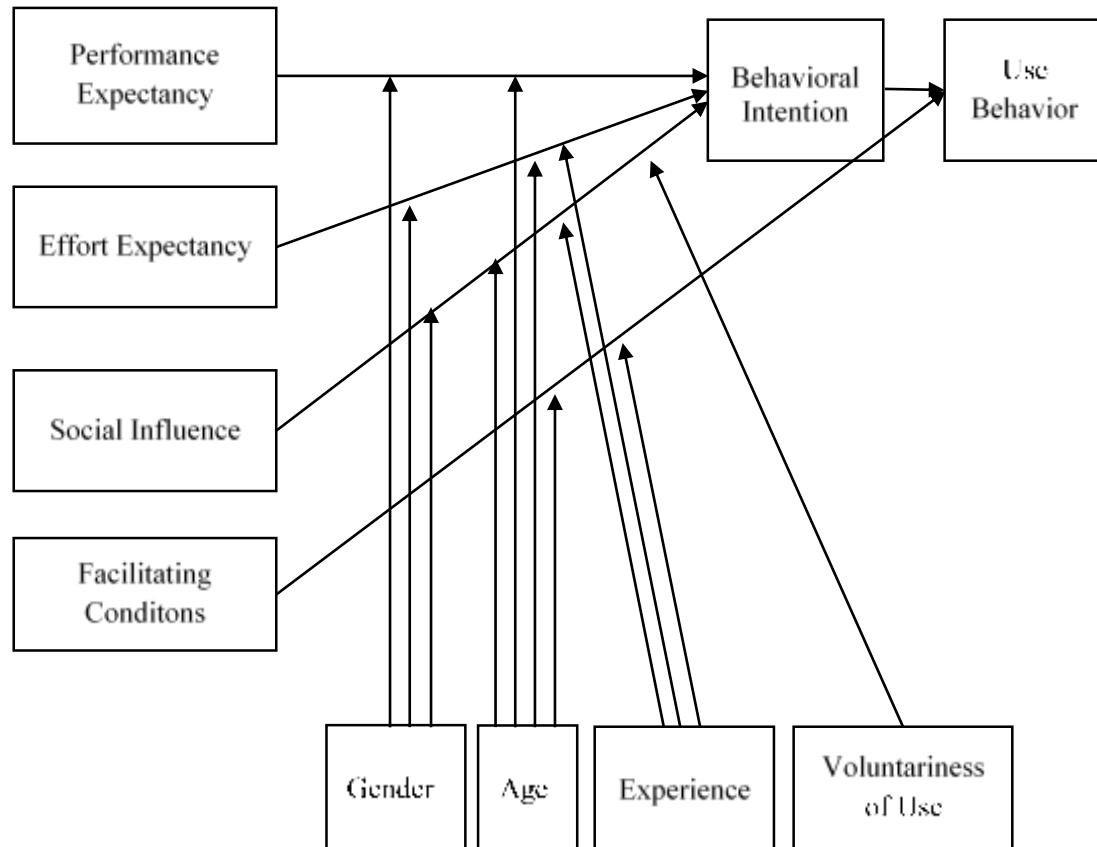


Fig 3. Unified Theory of Acceptance and Use of Technology Model

2.4. DeLone and McLean Information Systems Model: A 10-Year Update (2003)

Ten years ago, DeLone and Mclean presented the DeLone and McLean Information Systems (IS) Success Model as a framework and model for measuring the complex dependent variable in IS research. In this paper, DeLone and Mclean discuss many of the key IS contributions that have contributed to successful research over the past decade, with a particular focus on the study of adoption efforts, validation, challenges, and suggestions for improvement. according to the original model. Based on an assessment of those contributions, DeLone and Mclean recommend minor improvements to the model and successfully recommend an updated DeLone and McLean IS Model. DeLone and McLean discuss the utility of an update model to measure the success of an e-commerce system. Finally, McLean and DeLone make a series of recommendations regarding the measurement of current and future IS success (DeLone & McLean, 2003).

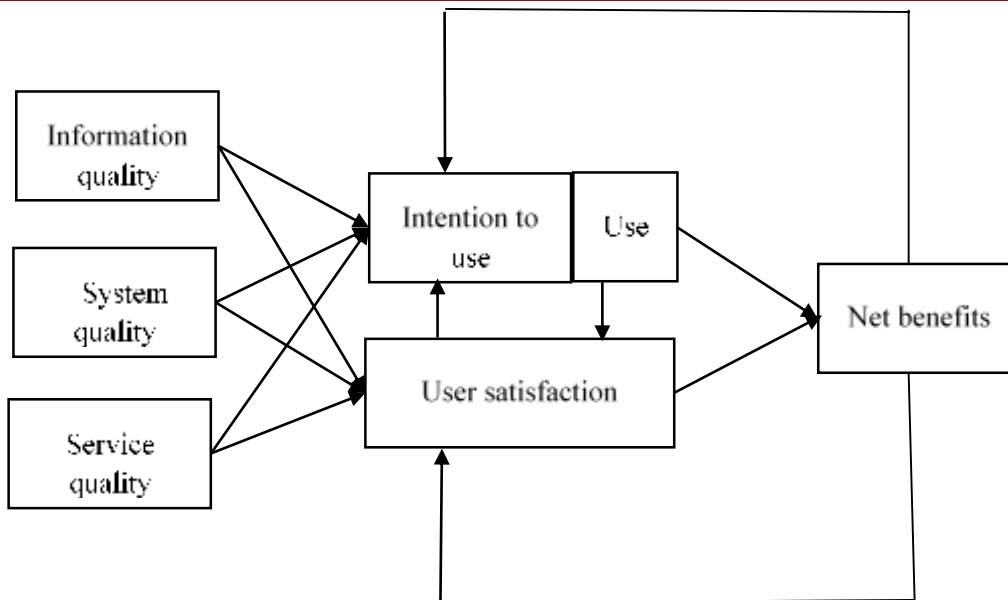


Fig 4. DeLone and McLean Information Systems Model Success: 10 Year Update

3. Research method

3.1. Qualitative research methods

3.1.1. Grounded Theory method

GT is the method used to formulate data-based scientific theory through systematic collection and analysis throughout the research process. In the process of formulating the theory, the collection, analysis of data and even theories are placed in close relationship with each other (A Strauss, 1997). The topic uses this method to study an overview of the theories and theoretical foundations related to factors affecting students' intention to use M - Learning.

3.1.2. Interview method

Simple conversation with purpose (Berg, 2001). In particular, the topic uses semi-structural interview techniques to be carried out at the preliminary research stage to adjust and supplement the scale to suit the research context in Vietnam.

3.2. Quantitative research methods

3.2.1. Reliability analysis method Cronbach's Alpha

In assessing the reliability of the scale, many researchers agree to use the alpha coefficient of the author Cronbach (1951) according to Churchill Jr (1979); Nunnally & Bernstein (1994); De Vellis (2003); (Jr et al. (2014) and Creswell (2014) This method is used by the author to evaluate the reliability of the scale in the preliminary and official quantitative research step.

3.2.2. Exploratory factor analysis method

The EFA method is frequently used to evaluate the Churchill Jr scale (1979); Nunnally & Bernstein (1994); Jr et al. (2014). This method is used to evaluate the value of the scale at the preliminary and official quantitative research step, to clean the scale as well as to discover the group of factors.

3.2.3. Multiple Linear Regression Analysis Method

In the study, the authors used a multiple regression model with the aim of determining the factors (independent variables) affecting the intention to use M-Learning in the online learning of students in high schools. university in the city. Ho Chi Minh City as well as the importance of each of those factors. The multiple regression model proposed by the authors has the following form:

$$Y = \beta_0 + \beta_1F_1 + \beta_2F_2 + \dots + \beta_nF_n + \varepsilon_i$$

In there:

Y is the dependent factor (dependent variable).

F₁, F₂,... F_n are the factors (independent variables) affecting the intention to use M-Learning in online learning of students at universities in Ho Chi Minh City (Y).

β₁, β₂,..., β_n The authors employ unnormalized coefficients in this study.

ε is a normally distributed random error with a mean of 0, constant and independent variance.

4. Results and discussion

4.1. Results

4.1.1. Preliminary result of quantitative research

Results of preliminary quantitative research with a sample of 150 observations. Thereby, 1 variable independent observation were excluded from the research model because the scale value was not obtained as measured in the EFA analysis. After 1 evaluation, scale reliability, the standardized Cronbach's Alpha coefficient of the perceived ease of use (PEOU) variable is 0.886, perceived usefulness (PU) variable is 0.779, quality system (QS) variable is 0.799, social influence (SI) is 0.730, quality service (QS) variable is 0.799 (A) is 0.837, and the behavioral intention to use (BI) variable is 0.802. Besides, after 2 times of evaluation, the scale value of the observed variables with the KMO coefficient reached 0.757 (satisfactory) and the scale value of the dependent variable (BI) reached 0.755 (satisfactory). Again, the set of 29 observed variables was put into practice in the quantitative formal study.

4.1.2. Official research results

a) Characteristics of the official study sample

The official survey sample after filtering includes 379 observations, in which the subject has female accounted for 53.56%, male accounted for 46.44%. The school year of surveyed students mainly focused on year 3, accounting for 30.08%. Regarding schools, the University of Finance - Marketing accounts for about 18.98%. Similarly, other characteristics of the study sample are described in Table 1.

Table 1. Statistical results on demographic characteristics of the official study sample

| | Frequency | % |
|---------------------------------------------------------|-----------|-------|
| Gender | | |
| Nam | 176 | 46.44 |
| Nu | 203 | 53.56 |
| Year | | |
| First-year student | 89 | 23.48 |
| Second-year student | 95 | 25.07 |
| Third- year student | 114 | 30.08 |
| Final-year student | 81 | 21.37 |
| Schools | | |
| University of Finance – Marketing | 72 | 18.98 |
| Ho Chi Minh City University of Economics | 46 | 12.14 |
| Ton Duc Thang University | 38 | 10.03 |
| Banking University HCMC | 37 | 9.76 |
| University of Medicine and Pharmacy at Ho Chi Minh City | 42 | 11.08 |
| Vietnam National University, Ho Chi Minh City | 45 | 11.87 |
| Ho Chi Minh City University of Industry | 36 | 9.5 |
| University of Technical Education Ho Chi Minh City | 31 | 8.18 |
| Other | 33 | 8.7 |

b) Evaluate the reliability and validity of the scale

The results of the first scale reliability assessment show that PEOU's Cronbach's Alpha coefficient is 0.702 (satisfactory), PU is 0.750 (satisfactory), QS is 0.718 (satisfactory), and SI is 0.761 (satisfactory), A is 0.620 (satisfactory), BI is 0.720 (satisfactory), and the total correlation coefficient of most variables is

satisfactory (> 0.3). The total correlation coefficient of the variables PEOU2, PU5, QS4, A1, and BI3 is, however, unsatisfactory (< 0.3). Therefore, the authors removed the above variables from the research model and analyzed the results of the second scale reliability assessment with 24 observed variables.

The results of the second scale reliability assessment show that the Cronbach's Alpha coefficient of PEOU is 0.719 (satisfactory), PU is 0.792 (satisfactory), QS is 0.744 (satisfactory), and SI is 0.761 (satisfactory). A is 0.655 (satisfactory), BI is 0.780 (satisfactory), and the total correlation coefficient of most variables is satisfactory (> 0.3). Next, evaluate the scale value of EFA; the scale value of the observed variables with the KMO coefficient reached 0.896 (satisfactory) with the total variance extracted of 59.101% and the scale value of the dependent variable (BI) with a KMO coefficient of 0.765 (satisfactory) with a total variance extracted of 60.351%.

Table 2. Cronbach's Alpha results on factors in the research model in the second official quantitative study

| Observed variables | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|--------------------------------------------------------------------------------|----------------------------|--------------------------------|----------------------------------|----------------------------------|
| Factor scale Perceived Ease of Use (PEOU) $\alpha = .719$ | | | | |
| PEOU1 | 11.67 | 3.988 | .604 | .596 |
| PEOU3 | 11.69 | 4.658 | .329 | .767 |
| PEOU4 | 11.67 | 4.386 | .581 | .620 |
| PEOU5 | 11.72 | 4.130 | .548 | .632 |
| Factor scale Perceived Usefulness (PU) $\alpha = .792$ | | | | |
| PU1 | 11.67 | 4.498 | .494 | .792 |
| PU2 | 11.88 | 4.052 | .602 | .741 |
| PU3 | 11.88 | 4.112 | .647 | .718 |
| PU4 | 11.89 | 4.017 | .671 | .706 |
| Factor scale Quality System (QS) $\alpha = .744$ | | | | |
| QS1 | 11.79 | 4.088 | .570 | .667 |
| QS2 | 11.92 | 4.099 | .539 | .684 |
| QS3 | 11.95 | 4.257 | .521 | .694 |
| QS5 | 11.95 | 3.976 | .522 | .696 |
| Factor scale Social Influence (SI) $\alpha = .761$ | | | | |
| SI1 | 11.74 | 3.896 | .544 | .714 |
| SI2 | 11.81 | 3.964 | .590 | .691 |
| SI3 | 11.86 | 4.036 | .555 | .708 |
| SI5 | 11.77 | 3.636 | .557 | .709 |
| Factor scale Attitudes (A) $\alpha = .655$ | | | | |
| A2 | 11.68 | 4.293 | .536 | .528 |
| A3 | 11.68 | 4.439 | .485 | .560 |
| A4 | 12.06 | 3.584 | .342 | .714 |
| A5 | 11.56 | 4.723 | .486 | .570 |
| Factor scale Behavioral Intention to use (BI) $\alpha = .78$ | | | | |
| BI1 | 11.96 | 4.284 | .550 | .744 |
| BI2 | 11.94 | 4.261 | .609 | .716 |
| BI4 | 12.05 | 4.045 | .587 | .726 |
| BI5 | 11.92 | 4.068 | .595 | .721 |

Table 3. 1st factor rotation matrix in formal quantitative research

| Observed variables | Factor scale | | | | |
|--------------------|--------------|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| QS5 | .705 | | | | |
| QS1 | .673 | | | | |
| QS2 | .662 | | | | |

| | | | | | |
|-------|------|------|------|------|------|
| QS3 | .630 | | | | |
| A4 | .618 | | | | |
| PU2 | | .788 | | | |
| PU3 | | .768 | | | |
| PU4 | | .762 | | | |
| PU1 | | .550 | | | |
| SI5 | | | .773 | | |
| SI2 | | | .716 | | |
| SI3 | | | .662 | | |
| SI1 | | | .601 | | |
| PEOU4 | | | | .754 | |
| PEOU1 | | | | .729 | |
| PEOU5 | | | | .693 | |
| PEOU3 | | | | .605 | |
| A2 | | | | | .761 |
| A3 | | | | | .692 |
| A5 | | | | | .684 |

Table 4. Observable variable measuring “Behavioral Intention To Use –BI”

| | Component |
|------------|-----------|
| | 1 |
| BI2 | .794 |
| BI5 | .783 |
| BI4 | .781 |
| BI1 | .749 |

c) Analysis results

Table 5. The level of acceptance M-Learning

| | N | Minimum | Maximum | Mean | Std. Deviation | Level |
|--------------------|-----|---------|---------|--------|----------------|-------|
| PEOU | 379 | 2.00 | 5.00 | 3.8958 | .66020 | High |
| PU | 379 | 2.00 | 5.00 | 3.9433 | .65824 | High |
| QS | 379 | 1.80 | 5.00 | 3.8939 | .67459 | High |
| SI | 379 | 1.75 | 5.00 | 3.9321 | .63217 | High |
| A | 379 | 2.00 | 5.00 | 4.0193 | .63104 | High |
| BI | 379 | 2.00 | 5.00 | 3.9894 | .65659 | High |
| Valid N (listwise) | 379 | | | | | |

d) Regression analysis results

Regression analysis was performed to evaluate the relationship between the five main factors and Behavioral Intention to use M-Learning. Figure 6 illustrates the graphical representation of the β value for each factor.

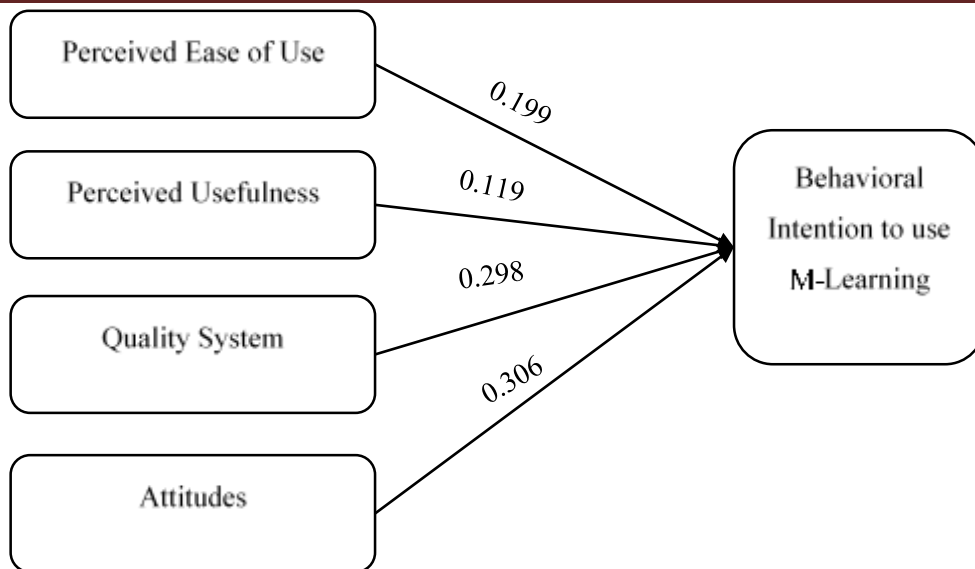


Fig 5. Graphical representation of the value of β

4.1.3. Hypothesis test results

a) Hypothetical conclusion

Table 6. Hypothesis test results

| Hypothesis | Content | Result | Conclusion |
|------------|-------------------------------------------------------------------------------------------|---------------------------|---------------|
| H1 | Perceived Ease of Use has a positive (+) effect on Behavioral Intention to use M-Learning | Beta = 0.199, Sig < 0.001 | Supported |
| H2 | Perceived Usefulness has a positive (+) effect on Behavioral Intention to use M-Learning | Beta = 0.119, Sig < 0.05 | Supported |
| H3 | Quality System has a positive (+) effect on Behavioral Intention to use M-Learning | Beta = 0.298, Sig < 0.001 | Supported |
| H4 | Social influence has a positive (+) effect on Behavioral Intention to use M-Learning | No: Not Significant | Not Supported |
| H5 | Attitudes has a positive (+) effect on Behavioral Intention to use M-Learning. | Beta = 0.306, Sig < 0.001 | Supported |

b) Gender test

Table 7. Show the results of the average statistics of use intention by gender

| | PI3 | N | Mean | Std. Deviation | Std. Error Mean |
|----|-----|-----|--------|----------------|-----------------|
| BI | Nu | 203 | 3.9704 | .66822 | .04690 |
| | Nam | 176 | 4.0114 | .64410 | .04855 |

Table 8. The results of independent samples tests

| | | BI | | |
|-----------------------------------------|----------------------------------|-------------------------|-----------------------------|---------|
| | | Equal variances assumed | Equal variances not assumed | |
| Levene's Test for Equality of Variances | F | .028 | | |
| | Sig. | .866 | | |
| t-test for Equality of Means | t | -.605 | -.606 | |
| | df | 377 | 372.774 | |
| | Sig. (2-tailed) | .546 | .545 | |
| | Mean Difference | -.04092 | -.04092 | |
| | Std. Error Difference | .06768 | .06750 | |
| | 95% Confidence of the Difference | Lower | -.17400 | -.17366 |
| | | Upper | .09216 | .09182 |

Sig value of the Levene test = 0.866 > 0.05 and looking at table 8, the Sig value of the t test in the part that does not assume equal variance is 0.545 > 0.05, so it can be concluded that there is no difference in the mean behavioral intention to use M-Learning by gender.

c) School year Test

Table 9. Check the homogeneity of the variance of the factor groups by school year

| | Levene Statistic | df1 | df2 | Sig. |
|-----------|------------------|-----|-----|------|
| BI | .587 | 4 | 374 | .673 |

Through the results of the Levene test analysis (table 9), the authors found that Sig = 0.673 > 0.05, that is the variance of the factor groups by school year is not statistically significant, so they are eligible for further analysis of ANOVA.

Table 10. ANOVA

| | | Sum of Squares | df | Mean Square | F | Sig. |
|-----------|----------------|----------------|-----|-------------|-------|------|
| BI | Between Groups | 2.923 | 4 | .731 | 1.708 | .148 |
| | Within Groups | 160.035 | 374 | .428 | | |
| | Total | 162.958 | 378 | | | |

The results of one-way analysis of variance (one-way ANOVA) have Sig = 0.148 > 0.05. It is demonstrated that there is no difference in behavioral intention to use M-Learning between groups of variables determined by school year (mean is not equal).

d) School Test

Table 11. Checking the homogeneity of the variance of the factor groups by field.

| | Thống kê Levene | df1 | df2 | Sig. |
|-----------|-----------------|-----|-----|------|
| BI | 1.551 | 8 | 370 | .138 |

The results of the Levene test analysis (table 11) showed that Sig = 0.138 > 0.05, that is, the variance of the groups of variables according to the students' schools is not different, so it is sufficient for the analysis. continue to accumulate ANOVA.

Table 12. ANOVA

| | | Sum of Squares | df | Mean Square | F | Sig. |
|-----------|----------------|----------------|-----|-------------|-------|------|
| BI | Between Groups | 7.414 | 8 | .927 | 2.204 | .027 |
| | Within Groups | 155.544 | 370 | .420 | | |
| | Total | 162.958 | 378 | | | |

The authors found that the results of one-way analysis of variance (One Way ANOVA) had Sig = 0.027 < 0.05. It is demonstrated that there is a difference in behavioral intention to use M-Learning between groups of variables defined by school (mean is not equal). So, let's move on to the KRUSKAL-WALLIS analysis.

Table 13. Test Statistics

| | BI |
|--------------------|-----------|
| Chi-Square | 18.316 |
| df | 8 |
| Asymp. Sig. | .019 |

Looking at the table, the authors found that the analysis results sig=0.019 < 0.05. It is demonstrated that there is a difference in behavioral intention to use M-Learning between groups of variables defined by school (mean is not equal).

Table 14. KRUSKAL - WALLIS

| | PI2 | N | Mean Rank |
|----|---------------------------------------------------------|----------|------------------|
| BI | University of Finance – Marketing | 72 | 225.82 |
| | Ho Chi Minh City University of Economics | 45 | 185.97 |
| | Ton Duc Thang University | 38 | 179.95 |
| | Banking University HCMC | 37 | 176.81 |
| | University of Medicine and Pharmacy at Ho Chi Minh City | 42 | 212.07 |
| | Vietnam National University, Ho Chi Minh City | 45 | 148.59 |
| | Ho Chi Minh City University of Industry | 36 | 170.68 |
| | University of Technical Education Ho Chi Minh City | 31 | 193.27 |
| | Other | 33 | 190.09 |
| | Total | 379 | |

e) Hypothesis testing of demographic factors

Based on the results of tables 8, table 9, table 10, table 11, table 12, table 13, the authors conducted statistical analysis of hypothesis H6, with only a few variables. Personal characteristics affect intention to use M-Learning. As follows

Table 15. Hypothetical conclusion about “demographic factors” have different impact on intention to use M – Learning

| Hypothesis | Content | Conclude |
|-------------------|-------------------------------------------------------------------------|------------------------|
| H6 | Different gender has different influence on intention to use M–Learning | There is no difference |
| | Different school years affect intention to use M–Learning | There is no difference |
| | Different schools affect the intention to use M–Learning | Difference |

4.2. Discussion

The initial research model accepts five hypotheses: H₁, H₂, H₃, H₄, and H₅. After conducting EFA analysis, the regression analysis of the accepted hypotheses is H₁, H₂, H₃, H₅. In which, the factors with the strongest impact are: Attitudes, Quality System, Perceived Ease of Use, and finally, Perceived Usefulness. In which the attitude factor, the study showed similar results with the research University students' behavioral intention to use mobile learning: evaluating the technology acceptance model by Park et al (2012). For the quality system factor, the study gives similar results to the studies Factors Affecting the Intention to Adopt M-Learning by Senaratne & Samarasinghe (2019), and An Empirical Study on Factors Influencing the Intention to Use Mobile Learning by Gharaibeh & Gharaibeh (2020). In terms of perceived ease of use, the study gave similar results to the research papers A Preliminary Study of Students' Attitude on M-Learning: An Application of the Technology Acceptance Model” of Afzaal et al. (2015), An Investigation of Mobile Learning Readiness for Post-School Education and Training in South Africa using the Technology Acceptance model of Mutono & Dagada (2016). And the perceived usefulness factor, the study showed similar results to the research articles Factors Influencing Mobile-Learning Adoption Intention An Empirical Investigation In High Education by Khanh & Ghim (2014), A Preliminary Study of Students' Attitude on m-Learning: An Application of Technology Acceptance Model by Afzaal et al (2015), An investigation of Mobile learning readiness for Post-School Education and Training in South Africa using the Technology Acceptance model by Mutono & Dagada (2016).

The results of the study suggest a number of solutions aimed at promoting students' intention to use M-Learning in online learning. The authors suggest companies that produce technology products with higher durability, long batteries, strong configurations at affordable prices to attract students. For university leaders, it is necessary to develop a curriculum suitable for the form of online learning such as the use of online learning applications, manuals for lecturers and students, policies to support disadvantaged students, many forms of student evaluation. In addition, universities need to conduct surveys on the current state of use of M-Learning by students and organize training support programs from the perspective of students to serve as the basis for conducting reviews.

Although the study has yielded results and contributed somewhat to the further increase in students' intention to use M-Learning. However, as with many other studies, the study still has many inevitable limitations. The research model is only surveyed for students studying in Ho Chi Minh City. The group of subjects conducting the survey had different thoughts and assessments than the group of subjects studying in other provinces and cities. Besides, observational variables are surveyed through questionnaires, largely through the perception of the survey subject. Due to the relatively short study time of the authors, the sample collected little resulted in insufficient accuracy in estimation and testing. In addition, because the sample of this study was selected according to the non-probability method (i.e. random selection), the sample size is small compared to the number of students in the city. This limits the generalization of the topic.

Currently, models related to the application of technology in education are always the topic of interest to all educators, parents, technology companies and students. This study only looked at a few minority factors that influenced the intent to use M-Learning in students, and the study was limited. Therefore, the authors also encouraged larger-scale research on this topic in Vietnam to take a broader perspective to come up with more effective solutions to promote the application of technology in rapidly evolving education.

5. Conclusion

In this study, the authors used the theoretical framework of technology acceptance model (TAM), unified theory of acceptance and use of technology model (UTAUT) and DeLone model to build the research model. In addition, the authors used qualitative research methods and quantitative research methods to conduct the research.

This research result has great significance for the organization and implementation of the M-Learning learning model for students at universities in Ho Chi Minh City. Ho Chi Minh. Understanding the factors affecting the intention to use M-Learning is very important because it helps universities have a basis to accelerate the implementation of expanding the M-Learning model in other areas. City University, Ho Chi Minh City. At the same time, he proposes management implications with high feasibility and meaningful application in practice. Research results have also assessed the current use of M-Learning.

6. Appendix

OFFICIAL QUANTITY RESEARCH QUESTIONS

“Hello Sir/Madam!

The authors are currently students from the University of Finance - Marketing!

Currently, the group of authors is carrying out a research project: "**FACTORS INFLUENCING THE BEHAVIORAL INTENTION TO USE MOBILE LEARNING IN ONLINE LEARNING OF STUDENTS STUDYING AT UNIVERSITIES IN HO CHI MINH CITY**". The study was conducted to assess the impact of factors affecting the intention to use M-Learning in online learning of students studying at universities in Ho Chi Minh City. Besides, this study also provides possible governance implications for universities who want to apply M-Learning in education. the following topics to help the group complete the research well.

All of your comments are extremely valuable to the group's research topic. The author team commits that all information collected will be kept confidential and used only for research purposes.

Sincere thanks to you!”

Part A: Selecting objects

1. Are you currently a student?

- Yes (continue survey)
- No (Stop survey here)

2. Are you studying at universities in Ho Chi Minh City? Ho Chi Minh?

- Yes (continue survey)
- No (stop survey here)

3. Are you/have you ever studied online?

- Yes (continue survey)
- No (stop survey here)

4. Do you intend to use M-Learning?

- Yes (continue survey)
- No (stop survey here)

B. Survey content

Please indicate the degree of impact of the following factors on the intention to use M-Learning in online learning of students attending universities in Ho Chi Minh City.

The meanings and equivalent options are as follows:

1. Totally disagree = Totally wrong / Not at all true / Always wrong / Totally wrong
2. Disagree = Usually Not True / Usually False
3. Normal
4. Agree = Usually true
5. Totally agree = Totally true / Always true

| STT | SURVEY FACTORS | LEVEL | | | | |
|-------------|------------------------------------------------------------------------------------------------------------|-------|-----|-----|-----|-----|
| | | (1) | (2) | (3) | (4) | (5) |
| B2.1 | Group of questions related to Perceived Ease of Use | | | | | |
| | Learning with M-Learning is easy. | | | | | |
| | It's easy to learn how to use M-Learning | | | | | |
| | The operations when using M-Learning are clear, easy to understand | | | | | |
| | Easy to use master M-Learning | | | | | |
| | Your interactions with the online learning service is clear and understandable. | | | | | |
| B2.2 | Group of questions related to the element of perceived usefulness | | | | | |
| | M-Learning saves travel costs. | | | | | |
| | M-Learning improves learning productivity. | | | | | |
| | M-Learning helps maintain learning during the COVID-19 pandemic. | | | | | |
| | Using M-Learning can be learned anytime, anywhere. | | | | | |
| | M-Learning saves time learning. | | | | | |
| B2.3 | Group of questions related to the System Quality factor | | | | | |
| | The learning app can quickly load learning materials. | | | | | |
| | Learning apps provide quick information. | | | | | |
| | Fast learning data processing speed. | | | | | |
| | The information is secure. | | | | | |
| | The arrangement of the information displayed on the interface of the online learning system is very clear. | | | | | |
| B2.4 | Group of questions related to the factor Social influence | | | | | |
| | The Covid-19 epidemic affects the intention to use M-Learning | | | | | |
| | Lecturers at the university are encouraged to use M-Learning | | | | | |
| | Your friends encourage you to use M-Learning | | | | | |
| | Family (parents, cousins) think you should use M-Learning. | | | | | |
| B2.5 | Group of questions related to attitude factors | | | | | |
| | Using M-Learning is a good idea. | | | | | |
| | You like to use M-Learning | | | | | |
| | Using M-Learning is necessary in learning. | | | | | |
| | You are interested in using M-Learning. | | | | | |
| | You are happy to use M-Learning | | | | | |

| | | | | | | |
|-------------|----------------------------------------------------------------------------------------------|--|--|--|--|--|
| B2.6 | Group of questions related to Behavioral Intention to use M-Learning | | | | | |
| | The above factors have an effect on your intention to use M-Learning | | | | | |
| | Because of the above factors, you will definitely use M-Learning. | | | | | |
| | Because of the above factors, you plan to use M-Learning | | | | | |
| | The above factors cause you to mobilize friends/family/everyone around you to use M-Learning | | | | | |
| | Based on the above factors, you will continue to use M-Learning in the future | | | | | |

Part C: Personal information:

Question 1: What year are you currently a student?

- Year 1
- Year 2
- Year 3
- Year 4

Question 2: What school are you currently a student at?

- University of Finance - Marketing
- Ho Chi Minh City University of Economics
- Ton Duc Thang University
- Bank University HCMC
- University of Medicine and Pharmacy at Ho Chi Minh City
- Vietnam National University, Ho Chi Minh City
- Ho Chi Minh City University of Industry
- University of Technical Education Ho Chi Minh City
- Other

Question 3: What is your gender?

- Male
- Female

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THE INFLUENCE OF EMOTIONAL INTELLIGENCE ON ACADEMIC RESULTS OF UNIVERSITY STUDENTS IN VIETNAM

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ABSTRACT

Choosing to study the influence of emotional intelligence on learning outcomes of university students in Vietnam is necessary to clarify the influence of emotional intelligence on student learning outcomes. The study was conducted to evaluate five factors: Self-awareness; Emotional self-regulation; Empathy; Self-motivation; social skills and How they affect academic performance of university students in Vietnam. The research model was tested with a survey data set of 225 students from universities in Vietnam. From the research results, recommendations are made to help Vietnamese universities and students become more aware of emotional intelligence, thereby improving learning outcomes.

Keywords: Emotional intelligence, learning outcome, undergraduates.

1. Introduction

EQ- Emotional Intelligence or Emotional Quotient is a form of intelligence that demonstrates the right awareness and ability to manage emotions that contribute to determining the success of people in all fields of life. “The ability to succeed is 20% dependent on IQ and the remaining 80% includes EQ (emotional intelligence) and other factors”. (Daniel Goleman, 1995). Improving emotional intelligence plays an important role in a college student's development, especially as it can affect academic performance. Great emotional intelligence helps maintain a state of harmony within oneself and ultimately more confidence in dealing with the challenges and learning in educational institutions. “Students with high emotional intelligence will promote positive learning motivation, improve intellectual ability, thereby achieving higher learning results.” (Seifert, 2004). In contrast, “students with inferior emotional intelligence did not believe that they could achieve the set goals, leading to unmotivated learning and depressed results” (Linnenbrink, 2007). Students' high academic results will be the foundation for students' professional work when getting access to the labor market.

Students' learning outcomes partly reflect the process of living and learning, accumulating knowledge and skills. The achievement of each student is not only influenced by the students themselves, but also includes effects from many sides. The performance of students at a school, a region, a country will reflect the quality of education and training of the school, of the region, of that country. From the learning results of students, families, schools and society will have bases to adjust appropriate measures to further improve the learning quality of students.

The conducted foreign studies suggest a framework for expressing emotional intelligence components that predict academic performance of university students. This is useful for educators in higher education institutions in their efforts to improve student outcomes in psychology and related fields, as well as to improve academic outcomes. Especially in the context of comprehensive reform of higher education and training in Vietnam today, setting out the goal of comprehensive development of the Vietnamese person, augmenting the potential and creativity of each individual. As the foundation for the goal of a rich people and a strong country, along with the increasing autonomy of universities, respecting the interests of learners is the determination of many higher education institutions. As the foundation for the goal of a prosperous country, along with the rising independence of universities, respecting the interests of learners is the determination of many higher education institutions. Blended Learning method has also grown strongly

associated with the achievements of the “4.0 Revolution” and with the development of Gen Z university students. Therefore, the requirements for today's student generation are increasing. requires to be improved in both knowledge and skills to keep up with the times. Emotional Intelligence needs attention not only for academic interest but also for future success in life.

2. Research methods and overview

Emotional intelligence began to be mentioned in the 1920s. However, "emotional intelligence" only become widely known after 1995 thanks to Daniel Goleman's publication of "Emotional Intelligence". Some notable research projects include:

Grace A. Fayombo (2012) “Relation between emotional intelligence and academic performance of college students in Barbados” investigated the relationship between emotional intelligence and academic achievement among 151 students with psychology major at the University of the West Indies (UWI), Barbados. The study concluded that emotional intelligence components also contributed to 48% of the difference in academic achievement. Emotional attentiveness was the best predictor of academic achievement while positive expression, negative expression, and empathy were other essential predictors.

Azizi Yahaya, Ng Sar Ee Juriah Daing Junaidah Bachok, Noordin Yahaya, Yusof Boon, Shahrin Hashim, Goh Mo Lee (2012) conducted a study on “Effect of emotional intelligence on learning outcomes”. Research shows a significant relationship between elements of emotional intelligence and academic achievement. The findings only show that factors such as self-perception, self-motivation, and empathy have a significant relationship as a predictor of academic achievement. This study implies that emotional intelligence levels contribute to and enhance students' cognitive abilities.

Michael Ewela Ebinagbome, Ismail Nizam (2016), “Impact of emotional intelligence on student learning outcomes – a Malaysian university study” examining the impact of emotional intelligence on student learning outcomes student majoring in information technology and business administration at the University of Malaysia. The research results show that only empathy and self-motivation factors have a strong influence on the learning outcomes of Malaysian university students, the remaining three factors are self-perception and emotional management, social skills had no significant effect on academic performance.

Maizatul Akmal Mohd Mohzan, Norhaslinda Hassan, Norhafizah (2013), “Effect of emotional intelligence on learning outcomes” investigated the influences of emotional quotes on academic achievement of students from Faculty of Education, University learn Teknologi Mara (UiTM). Research results show that the students of the Faculty of Education, UiTM Shah Alam have a high level of emotional intelligence. However, no significant relationship was found between emotional intelligence and student achievement

Table 1: Summary of general research models

| Num | Authors | Research variable | Research methods | Result |
|-----|---------------------------|-----------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Grace A. Fayombo (2012) | Positive expression; Negative expression, Emotion-focused, Emotion-based decision-making, Joy response, Sadness response, empathy | Using quantitative research through survey method. Survey of 151 undergraduate psychology students at the University of the West Indies (UWI), Barbados | Emotional attentiveness was the best predictor of academic achievement while positive expression, negative expression, and empathy were other important predictors. Emotion-based decision making, response to joy, response to sadness did not have any relatively significant contributions to academic achievement. |
| 2 | Azizi Yahaya et al (2012) | Self-awareness; Emotional self- | Using the quantitative research method | The factors of self-perception, self-motivation, and empathy |

| | | | | |
|---|---------------------------------------------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| | | regulation; Self-motivation; Communication skills; Empathetic; Self-awareness. | through the tool is a survey on a sample of 370 students. | had a significant relationship as a predictor of academic achievement. |
| 3 | MichaeEwela Ebinagbome, Ismail Nizam (2016) | Self-awareness; Managing emotions; Empathetic; Self-motivation; Social skills. | This study adopts descriptive and explanatory research design, using cross-sectional survey method using survey questionnaire. The sample includes 123 students from the University of Malaysia. | New factors of empathy and self-motivation have a strong influence on the academic performance of Malaysian university students, the remaining three factors of self-awareness, emotion management, and social skills have no influence. significantly on learning outcomes. |
| 4 | Maizatul Akmal et al (2013) | Assess your own feelings; Assess the feelings of others; Use emotions; Adjust emotions. | Using quantitative research method, the tool used to collect data is a questionnaire with a sample of 278 students. | No significant relationship was found between factors of emotional intelligence and student achievement. |

Source: Compiled by research team

Through the synthesis of research results, it is found that there is still controversy and difference between research results on the influence of emotional intelligence on learning outcomes. Although the influence of emotional intelligence on learning outcomes has been discussed enthusiastically from scholars associated with the context of developing countries, in Vietnam this is a brand-new subject. Therefore, the group's research on the influence of emotional intelligence on the learning outcomes of students in Vietnam.

3. Theoretical basis

3.1. Some basic concepts

Emotional intelligence: According to Mayer and Salovey (1999): "Emotional intelligence is the ability to control and regulate emotions in oneself and others and to use those emotions to orientation of thought and action". According to Reuven Bar-On (2005): "Emotional intelligence is a set of skills and qualities that influence success in understanding and expressing oneself, understanding and relating to others, and adapting. with the requirements of everyday life". In this study, the team determined: Emotional intelligence is the ability to understand the emotions of oneself and others, and thereby manage emotions well in oneself and in relationships with others.

Learning outcomes: According to Sudjana in Sujarwo and Delnitawati (2013), learning outcomes are the results that learners get after their learning process. According to Nguyen Duc Chinh (2004), "Learning outcome is the level of knowledge, skill or perception achieved by learners in a certain field (subject)." The authors introduce the concept of learning outcomes as follows: Student learning outcomes are the knowledge, skills and degree of autonomy that learners accumulate through the learning process.

3.2. Research model and hypothesis

Inheriting the research of the authors: Michael Ewela Ebinagbome, Ismail Nizam (2016), Azizi Yahaya et al. (2012), Erum Shahzadi, Zahoor Ahmad (2011), Duong Thi My Dung (2019), Eleonora Gullone and John Taffe (2011), R. Nathan Spreng, Margaret C.McKinnon, Raymond A and Brian Levine (2009),

Jerald C. Moneva, Jeanelyn S. Arnado, Ildebrando N. Buot (2020), Sana Hamid, Ayesha Jabeen, Zahid Mahmood (2019).

Research model of the influence of “Emotional intelligence” on “Learning Outcomes” includes:

- The dependent variable is "Learning Outcomes" (KQHT) with 4 scales (from KQH1 to KQHT5) inherited and developed from the research of Erum Shahzadi, Zahoor Ahmad (2011).
- 05 independent variables are: The variable "Self-perception" (TNT) has 6 scales inherited from Duong Thi My Dung (2019); The variable "Emotional self-regulation" (TDC) has 5 scales inherited from Eleonora Gullone, John Taffe (2011); The variable "Empathy" (DC) has 6 scales developed from the original scale of R. Nathan Spreng, Margaret C. McKinnon, Raymond A and Brian Levine (2009); The variable "Self-motivation" (TTDL) has 5 scales from Jerald C. Moneva, Jeanelyn S. Arnado, Ildebrando N. Buot (2020); The variable "Social skills" (KNXH) has 5 scales developed from the original scale of Sana Hamid, Ayesha Jabeen, Zahid Mahmood (2019).
- 2 control variables are: GPA and Gender

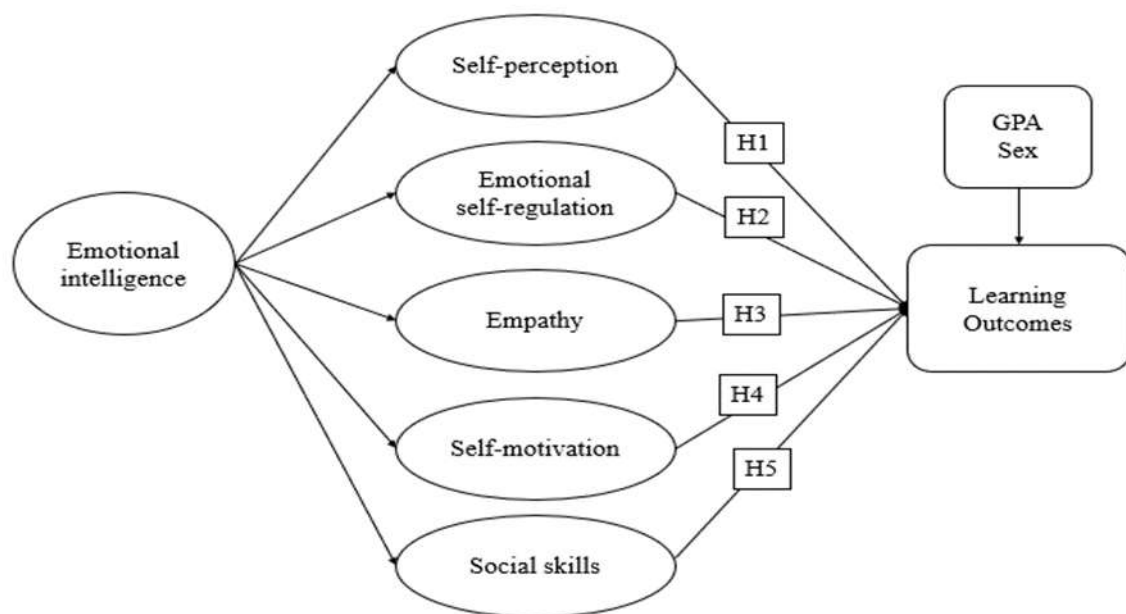


Figure 1: Proposed research model

Source: Michael Ewela Ebinagbome, Ismail Nizam (2016), Azizi Yahaya et al. (2012), Erum Shahzadi, Zahoor Ahmad (2011), Duong Thi My Dung (2019), Eleonora Gullone and John Taffe (2011), R. Nathan Spreng, Margaret C. McKinnon, Raymond A and Brian Levine (2009), Jerald C. Moneva, Jeanelyn S. Arnado, Ildebrando N. Buot (2020), Sana Hamid, Ayesha Jabeen, Zahid Mahmood (2019) and research team's proposal

And the established research hypotheses are:

Hypothesis 1 (H1): Self-perception has a positive influence on the learning outcomes of university students.

Hypothesis 2 (H2): Emotional self-regulation has a positive effect on the academic performance of university students.

Hypothesis 3 (H3): Empathy has a positive influence on the academic performance of university students.

Hypothesis 4 (H4): Self-motivation has a positive influence on the learning outcomes of university students.

Hypothesis 5 (H5): Social skills have a positive influence on the academic performance of university students.

4. Research Methodology

4.1. Qualitative research methods

The research team used expert interview method (05 lecturers and 05 university students). After collecting information, NNC conducts analysis and processing of the data. The results show the responses of the interviewed experts about the research variable that affects the effects of emotional intelligence on learning outcomes. For legacy indicators, the majority received 8/10 agreeing opinions. In addition, 8 out of 10 individual subjects wanted to adjust the observation variable “When I want to feel happier, I will think about good things” to “When I want to feel happier, I will think about positive things in life” (TDC1); 9/10 people suggested adding the observation variable “I think love is the most important thing parents can teach their children” (DC1) because it is consistent with characteristics of Vietnamese people; 10/10 people suggested adding the observed variable "I participate in the activities of the Ho Chi Minh Communist Youth Union" (KNXH1); 10/10 people suggested adding the observed variable " I always strive to improve my academic results" (KQHT1); “I find that my study results reflect my investment” (KQHT2) and “I find that besides the final score Learning results are also reflected in the ability to apply in practice” (KQHT3).

4.2. Preliminary quantitative research

Preliminary quantitative research was carried out to test the reliability of the scales, eliminate inappropriate variables, especially to check the reliability of newly developed scales. NNC investigated a questionnaire of 38 university students, the results obtained were 5 unsatisfactory votes, due to the lack of answers to many survey questions or identical answers. The research team decided to remove these votes and leave 33 votes to test the reliability of the scale. Calculation results of Cronbach's Alpha coefficient for each group of factors show that:

Empathy factor: This item has a good Cronbach's alpha value of 0,774, in which one observed variable is excluded (DC7) because the total correlation is less than 0,3. After removing the observed variable DC7, the research team re-analyzed the data and obtained a Cronbach alpha of 0,812; The remaining observed variables all have a total variable correlation greater than 0,3.

Social skills factor: This item has a satisfactory value of Cronbach's alpha of 0,666, of which three observed variables are excluded (KNXH6, KNXH7, KNXH8) because their total correlation is less than 0,3. After removing the observed variables social skills 6, social skills 7, social skills 8, the research team re-analyzed the data and the results Cronbach alpha was 0,748; The remaining observed variables all have a total variable correlation greater than 0,3.

Learning outcome factor: This item has a satisfactory value of Cronbach's alpha of 0,655, of which two observed variables are excluded (KQHT4, KQHT5) because their total correlation is less than 0,3. After removing the observed variables KQHT4, KQHT5, the research team re-analyzed the data and found that the Cronbach alpha was 0,759, the remaining observed variables all had a total variable correlation greater than 0,3.

Preliminary quantitative results are reduced to a list of 31 observed variables

4.3. Formal Quantitative Research

In this study, the authors used 31 scales in factor analysis, so the minimum sample size to be achieved is $31 * 5 = 155$ observations. The period takes place from September 2021 to December 2021. To meet the requirements of the survey sample, the authors distributed 271 votes (reaching 50 universities), after screening the answer sheets, 46 invalid votes were removed due to incomplete information. the remaining 225 valid votes (82%) were used for data entry and processing with a fairly uniform structure with the overall scale and therefore representative.

Table 2: Descriptive statistics of the survey sample

| Feature | | Numbered | Rate (%) |
|---------------------------|----------------------|------------|-------------|
| Sex | Male | 67 | 29,8 |
| | Femail | 155 | 68,9 |
| | Other sex | 3 | 1,3 |
| Total | | 225 | 100% |
| Academical | Freshman | 42 | 18,7 |
| | Sophomore | 134 | 59,6 |
| | Junior | 34 | 15,1 |
| | Senior | 13 | 5,8 |
| | fifth-year | 2 | 0,9 |
| | sixth-year | 0 | 0 |
| Total | | 225 | 100% |
| GPA 4- point scale | Below 1.0 | 1 | 0,4 |
| | From 1.0 to near 2.0 | 2 | 0,9 |
| | From 2.0 to near 2.5 | 14 | 6,2 |
| | From 2.5 to near 3.2 | 77 | 34,2 |
| | From 3.2 to near 3.6 | 101 | 44,9 |
| | From 3.6 to 4.0 | 30 | 13,3 |
| Total | | 225 | 100% |
| GPA 10- point scale | Below 4.0 | 1 | 0,4 |
| | From 4.0 to near 5.0 | 2 | 0,9 |
| | From 5.0 to near 7.0 | 19 | 8,4 |
| | From 7.0 to near 8.0 | 88 | 39,1 |
| | From 8.0 to near 9.0 | 107 | 47,6 |
| | From 9.0 to 10.0 | 8 | 3,6 |
| Total | | 225 | 100% |

Source: Analytical results from SPSS 26

Quantitative research method is carried out with the purpose of testing the given hypotheses. After cleaning, the survey questionnaires were analyzed using SPSS 26 and AMOS 24 software to create data for analysis, testing and evaluation by appropriate techniques, that is: Analytical techniques Descriptive statistics; Techniques to verify the reliability of the scale; CFA analysis techniques; Structural Equation Modeling (SEM), ANOVA test.

5. Research results

5.1. Overview of undergraduates in Vietnam

Over the years, Vietnamese universities have continuously invested in facilities and improved training quality. In addition, the state also established more public and non-public universities to expand the training environment for students. By 2020, the whole country will have 172 public universities and 65 non-public universities (MOET, 2021).

In recent years, the number of university students has not changed much, in which the number of full-time undergraduates fluctuated between 1.34 and 1.5 million students, of which female students usually accounted for about 50% - 60%. Over the years, the number of graduates has always been lower than the number of new students. The cause of this problem is that some students are forced to drop out, others choose to drop out, or for any other reason. The number of graduates did not fluctuate much. This is because the enrollment targets of the schools do not have much difference over the years.

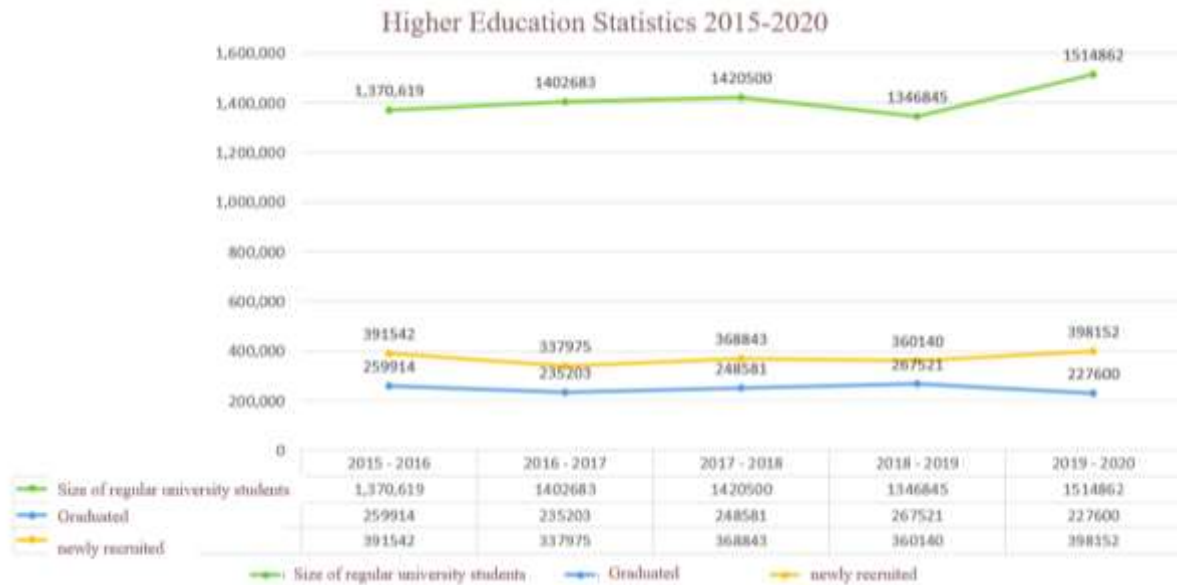


Figure 2: Higher Education Statistics 2015-2020

Source: MOET (2021)

5.2. Reliability analysis of the scale

Scale of independent variables: “Self-awareness”; “Emotional self-regulation”; “Empathy”; “Self-motivation”; “social skills” have Cronbach's Alpha coefficient of 0,873, respectively; 0,861; 0,853; 0,843; 0,778 are all $> 0,6$, which ensures high reliability. The lowest corrected item-total correlation coefficient reached 0,487, respectively; 0,584; 0,528; 0,574; 0,440 is higher than 0,3 and Cronbach's Alpha coefficient if these types of observed variables are all smaller than Cronbach's Alpha coefficient of the independent variable, it shows that all observed variables are used for EFA exploratory factor analysis.

Scale of dependent variable "Learning Outcomes": Cronbach's Alpha coefficient = 0,874 $> 0,6$, which ensures high reliability. The lowest corrected item-total correlation coefficient is 0,645, higher than 0,3 and if these types of observed variables, the Cronbach's Alpha coefficient are all lower than the Cronbach's Alpha coefficient of the variable "Learning outcomes" which shows that all observed variables are used for analyzing EFA exploratory factor.

5.3. EFA exploratory factor analysis

When analyzing the first EFA for the factors, the results show that the coefficient $KMO = 0,852 > 0,5$; The sig significance level of Bartlett's test = 0,000 $< 0,05$ satisfies the condition. However, the observed variables TNT5, TNT6, DC2, DC5, DC6, KNXH3, KNXH5, KQHT4 are not satisfied because these factors have a load factor of less than 0,5. Running EFA for the second time gives the following results: KMO coefficient = 0,853 $> 0,5$; significance level sig = 0,000 $< 0,05$. The data is suitable for EFA factor analysis, the significance level is sig $< 0,05$, so it can be concluded that the observed variables are correlated with each other. With 6 main components, the total explanatory rate is at 69,66% $> 50\%$ and Eigenvalues reach 2,828 > 1 , satisfying the requirements.

Table 3: Rotation Matrix

| | Factors | | | | | |
|-------|---------|-------|-------|-------|-------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 |
| TDC3 | 0,792 | | | | | |
| TDC1 | 0,776 | | | | | |
| TDC4 | 0,735 | | | | | |
| TDC2 | 0,724 | | | | | |
| TDC5 | 0,710 | | | | | |
| TTDL5 | | 0,801 | | | | |
| TTDL1 | | 0,734 | | | | |
| TTDL4 | | 0,698 | | | | |
| TTDL2 | | 0,662 | | | | |
| TTDL3 | | 0,609 | | | | |
| TNT1 | | | 0,868 | | | |
| TNT4 | | | 0,835 | | | |
| TNT2 | | | 0,811 | | | |
| TNT3 | | | 0,798 | | | |
| DC1 | | | | 0,831 | | |
| DC4 | | | | 0,830 | | |
| DC3 | | | | 0,820 | | |
| KQHT2 | | | | | 0,794 | |
| KQHT1 | | | | | 0,765 | |
| KQHT3 | | | | | 0,733 | |
| KNXH2 | | | | | | 0,783 |
| KNXH1 | | | | | | 0,750 |
| KNXH4 | | | | | | 0,594 |

Source: Analytical results from SPSS 26

Considering the Pattern Matrix component matrix table, it can be seen that the factor loading coefficient of the observed variables is higher than 0,5, so it reaches the standard. Running the regression obtained 6 factors, in which 5 factors are independent variables (TNT factor, TDC factor, DC factor, TTDL factor, KNXH factor) and a dependent variable is the KQHT (see Table 3): TDC factors include: TDC3, TDC1, TDC4, TDC2, TDC5; TTDL factor include: TTDL5, TTDL1, TTDL4, TTDL2, TTDL3; TNT factors include: TNT1, TNT4, TNT2, TNT3; DC factors include: DC1, DC4, DC3; KNXH factor include: KNXH2, KNXH1, KNXH4; KQHT factor include: KQHT2, KQHT1, KQHT3.

5.4. CFA confirmatory factor analysis

The results of the first CFA analysis show that the GFI, CFI, and RMSEA indexes satisfy the set conditions. However, the TLI= 0,895 does not satisfy to be higher than 0,9 and the PCLOSE= 0,001 does not

satisfy to be higher than or equal to 0,01. Therefore, we connect the e in the suggestion of Modification indices of the Covariances table including: e8 –e10, e7- e10, e13- e14.

The final CFA result modeled includes 212 degrees of freedom. The value of the Chi-squared index = 401,477 with value p=,000. Other indicators: Chi-squared/df = 1,894; TLI, CFI are higher than 0,9 (Bentler & Bonett, 1980), 0,9> GFI= 0,867>0,8 (Baumgartner and Homburg, 1995), RMSEA = 0,063< 0,08 (Steiger, 1998), PCLOSE = 0,012 > 0,01 (Hu & Bentler, 1999), this can infer that the model is considered to be suitable for the market data and this gives us the necessary and sufficient conditions for the observed variable to be achieved unidirectionality.

Evaluating composite reliability (PC), total variance (PVC) and Cronbach's Alpha coefficient. PC and PVC must be $\geq 0,5$, Cronbach's Alpha coefficient must be $\geq 0,6$ and the total variable correlation coefficient must be higher than 0,3.

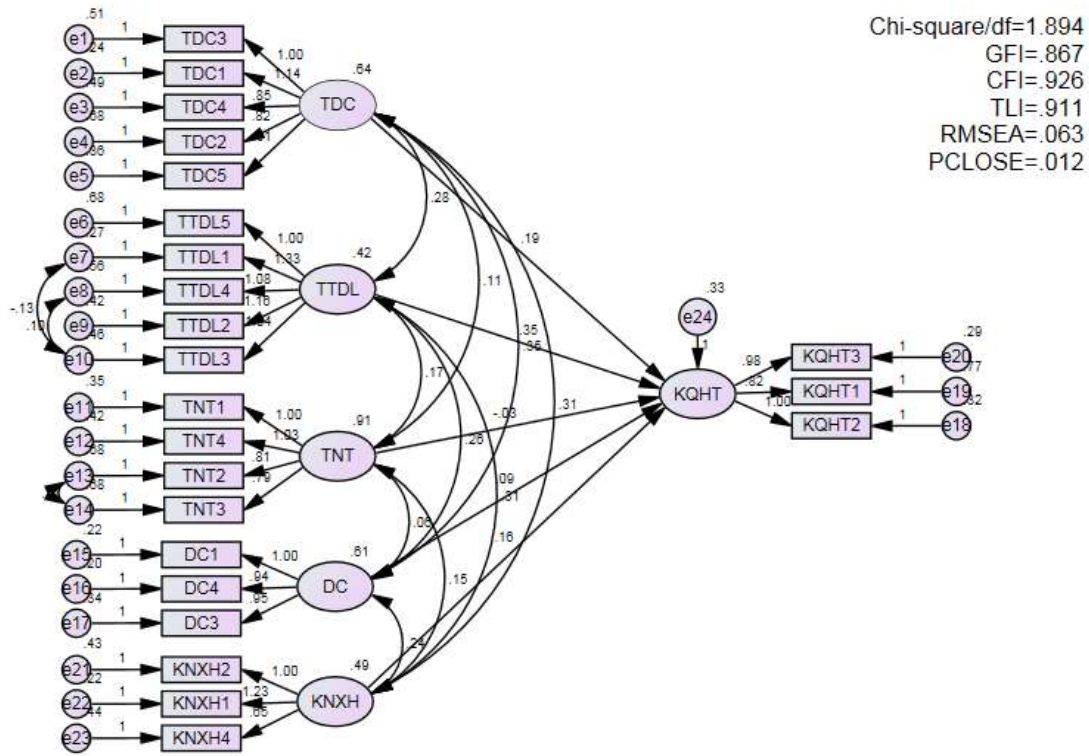


Figure 3: Analysis results of the modified SEM linear structure model

Source: Synthesizing from the analysis of SPSS 26 and AMOS 24

Unidirectionality/monad: The CFA analysis for this model has 212 degrees of freedom. Figure 4 shows the value of the Chi-squared index = 401,477 with p=000. Other indicators: Chi-squared/df = 1,894, TLI, CFI are all higher than 0,9 (Bentler & Bonett, 1980), 0,9>GFI= 0,867>0,8 (Baumgartner and Homburg, 1995), RMSEA = 0,063< 0,08 (Steiger, 1998), PCLOSE= 0,012 >0,01 (Hu & Bentler, 1999) → This gives us a necessary and sufficient condition for the set of observed variables to achieve unidirectionality. (Steenkamp & Van Trijp, 1991).

Convergence value: For the weights (normalized) all of them > 0,5, it proves that the scale of concepts all achieve convergent value (if there is any observed variable with weight < 0,5). then need to be eliminated in turn, but this model does not have it)

Discriminant value: All correlation coefficients between concepts which are studied in the model are positive and < 1 and different from 1 (based on the above table), all of P-value are very small and < 0.05, so the correlation coefficient of each pair of concepts is different from 1 at the 95% reliability. Therefore, the research concepts in this model have gained discriminant value.

5.5. Research hypothesis verification

The results of SEM analysis for this model have 212 degrees of freedom, the value of the Chi-squared index = 401,477 with p = 0,000. Other indicators: Chi-squared/df = 1,894, TLI, CFI are higher than 0,9 (Bentler & Bonett, 1980), 0,9>GFI= 0,867>0,8 (Baumgartner and Homburg, 1995), RMSEA = 0,063 < 0,08 (Steiger, 1998), PCLOSE = 0,012 > 0,01 (Hu & Bentler, 1999) this can infer that the model is considered to be consistent with market data.

The results of SEM model analysis on regression weights for the factors TNT, TDC, DC, TTDL, KNXH, and KQHT are statistically significant at 5% due to the P-value < 0,1. Thus, 5 factors in the model have an impact on learning outcomes: Self-perception; Self-motivation; Empathy; Social skills; Emotional self-regulation.

Table 4: Regression Weights

| | | | Estimate | Standard Error S.E. | Critical value | Alpha |
|------|------|------|----------|---------------------|----------------|-------|
| KQHT | <--- | TDC | 0,491 | 0,089 | 7,134 | *** |
| KQHT | <--- | TTDL | 0,350 | 0,133 | 6,635 | *** |
| KQHT | <--- | TNT | 0,202 | 0,105 | 5,664 | *** |
| KQHT | <--- | DC | 0,191 | 0,058 | 4,354 | *** |
| KQHT | <--- | KNXH | 0,137 | 0,031 | 2,183 | 0,008 |

Source: Synthesizing from the analysis of SPSS 26 and AMOS 24

Factors: Emotional self-regulation; Self-motivation; Self-awareness; Empathy, Social Skills explained 69,66% of the variation of the dependent variable. However, the degree of influence and role of each factor is not the same. Therefore, the equation representing emotional intelligence factors affecting learning outcomes:

$$\text{KQHT} = 0,491.\text{TDC} + 0,350.\text{TTDL} + 0,202.\text{TNT} + 0,191.\text{DC} + 0,137.\text{KNXH}$$

5.6. Verifying learning outcomes among groups of students of different genders

Test of Homogeneity of Variances results in Table 5 show the significance level Sig = 0,439 > 0,05, which means the hypothesis of homogeneity of variance between groups of qualitative variable values is not violated. The results of ANOVA analysis can be used.

Table 5: ANOVA inspection according to different genders

Learning outcomes

| Levene Statistic | df1 | df2 | Sig. |
|------------------|-----|-----|-------|
| 0,827 | 2 | 222 | 0,439 |

Source: Results from the analysis of SPSS 26

Table 6 shows that the test value Sig = 0,590 > 0,05. Therefore, it can be concluded that students with gender differences will not lead to the influence of emotional intelligence on student learning outcomes in Vietnam is different.

Table 6: Inspection results according to different genders

| | Variation | Df | Average Variation | F | Sig. |
|-------------|-----------|-----|-------------------|-------|-------|
| Among group | 0,665 | 2 | 0,333 | 0,528 | 0,590 |
| In group | 139,725 | 222 | 0,629 | | |
| Total | 140,391 | 224 | | | |

Source: Results from the analysis of SPSS 26

5.7. Learning outcomes verification among groups of students with different GPA

Verifying the learning outcomes results between groups of students with different GPA (4-point scale). Test of Homogeneity of Variances results in Table 7 show the significance level Sig = 0,128 > 0,05, that means the hypothesis of homogeneity of variance between groups of qualitative variable values is not violated. The results of ANOVA analysis can be used.

Table 7: ANOVA inspection according to different GPA (4-point scale)

Learning outcomes

| Levene Statistic | df1 | df2 | Sig. |
|------------------|-----|-----|-------|
| 1,810 | 4 | 219 | 0,128 |

Source: Results from the analysis of SPSS 26

Table 8 about the results of the GPA difference test shows that the Sig test value = 0,04 < 0,05. Therefore, it can be concluded that students with differences in GPA (According to a scale of 4) will lead to the influence of emotional intelligence on the learning outcomes of students in Vietnam.

Table 8: Inspecting difference results according to GPA (4-point scale)

Learning outcomes

| | Variation | Df | Average Variation | F | Sig. |
|-------------|-----------|-----|-------------------|-------|------|
| Among group | 6,593 | 5 | 1,319 | 2,158 | 0,04 |
| In group | 133,797 | 219 | 0,611 | | |
| Total | 140,391 | 224 | | | |

Source: Results from the analysis of SPSS 26

6. Discussion of research results and recommendations

6.1. Discussion of research results

Factors: "Self-awareness"; "Emotional self-regulation"; "Empathy"; "Self-motivation"; "Social skills" explained 69,66% of the variation of the dependent variable and had different degrees of influence on "learning outcomes", specifically: "Emotional self-regulation" had an impact. The strongest impact on student learning outcomes (weight is 0,491), followed by "Self-Motivation" with a normalized weight of 0,350 and "Self-awareness" with a normalized weight of 0,202, while the factor "Empathy" has a standardized weight of 0,191 and the factor "Social skills" has a normalized weight of 0,137. At the same time, determining the GPA between different students causes different emotional intelligence affecting learning results.

The test results show that the regression weights have positive signs with factors: TNT; TDC; DC; TTDL; KNXH allow to draw conclusions 05 research hypotheses from H1 to H5 are accepted. The results of this study are different from previous studies. While the legacy research of author Michael Ewela Ebinagbome, Ismail Nizam (2016) shows that only empathy and self-motivational factors have a strong influence on students' learning outcomes, while The three factors self-perception, emotional management, and social skills had not significantly affect on learning outcomes.

6.2. Background and recommendations

6.2.1. Learning context of university students in Vietnam to 2030

First, comprehensively renovating higher education and training: The general goal of Vietnamese education by 2030 is to comprehensively develop the Vietnamese people, to bring into full play the potential and creative ability of each person. individuals, as the foundation for the goal of a rich people, a strong country, democracy, justice, civilization, a prosperous and happy country. At the same time, build an open

education system, serving lifelong learning, fairness and equality, in the direction of standardization, modernization, democratization, socialization and international integration.

Second, university autonomy: University autonomy has begun to have positive changes. There have been 142/175 public higher education institutions consolidated by the School Council, of which 34/35 institutions under the Ministry of Education and Training have consolidated the School Council. Besides the achieved results, there are still some limitations and inadequacies; The implementation of university autonomy is still slow, and in some places, it is still awkward. Promoting autonomy, increasing creativity in all activities, and respecting the interests of learners is the determination of many higher education institutions now

Third, the Blended Learning form of learning has grown strongly associated with the achievements of the 4.0 revolution. The 4.0 revolution has created opportunities for learners to be exposed to new technologies and learn new skills. In Vietnam, the Blended learning model has begun to be researched and applied mainly at the university level. Blended learning model is “combining e-learning with traditional teaching and learning methods (in which instructors and learners must be together) to improve training efficiency and education quality.

Fourth, the change of college students generation Z: Generation Z is the term used to refer to the class of people born in the mid/late 1990s and early/mid-2010s. Under the influence of age factor, Generation Z shows many different personality traits when compared to previous generations. They are highly individualistic people, with independence in both thought and action. This is also the generation with creativity and ambition, reflected in their two important values: the spirit of social construction and the spirit of entrepreneurship. Thereby, Gen Z shows that they have more opportunities to change themselves, make a difference with new thinking than previous generations. Therefore, equipping era-appropriate skills for generation Z learners is necessary.

6.2.2. Recommendations

Based on the above research results, the research team proposes some recommendations to improve awareness and understanding of emotional intelligence; create conditions for students to improve their emotional intelligence to increase learning outcomes. Specifically:

(1) *About self-awareness*: Each student needs to focus when listening and communicating with people in order to recognize and understand their emotions in order to establish and maintain social relationships; In the relationship between friends, each student needs to promote teamwork, focus when listening and communicating with people, build a spirit of solidarity, respect, share with each other, increase community in the organization. Besides, journaling also helps students to recognize and rearrange their thoughts. It can be seen that the identification of students' own passions in Vietnam is still low. To solve this problem, learners need to determine what their forte is, what they like, what they need.

(2) *About emotional self-regulation*: Each student needs to practice their own emotional regulation skills, look directly at the problem in order to keep a balance between emotion and reason, and build a good relationship. beautiful, creating favorable conditions for the learning process. The majority of respondents agree that positive thoughts make them happier. So it can be based on directing your thoughts to the small positive things in life. In addition, learners can meditate or create an open learning space to exchange and learn from each other.

(3) *About empathy*: Listening is an important factor to help learners increase empathy. Family is a factor that greatly affects the development of children's thinking. Families need to take care of their children from a young age, learn to listen and share with their children a lot. To empathize with others, you must put yourself in their shoes. Learning to ignore the ego will help students gain empathy with the world around them, thereby asking for more new knowledge, absorbing different things.

(4) *About self-motivation*: Students need to clearly define their goals to create the necessary motivation. Goals should be clear, not ambiguous. Try to slow down, think openly, stay away from

unprofitable activities, participate in recreational activities, volunteer, travel... In a learning environment, students should find themselves a friend. together so that we can stay motivated together.

(5) *About social skills*: Students can join a club at school, the area will help students add many skills that cannot be taught in books. Participating in competitions organized by faculties, schools, or schools in the locality is also an opportunity for students to be more confident in themselves, dare to express themselves in front of the crowd, besides, participating in Competitions also help students learn more professional skills. Participating in activities of the Ho Chi Minh Communist Youth Union helps Vietnamese students improve many other social skills. However, students still need to balance between studying and participating in extracurricular activities to ensure good academic results combined with a healthy body and enthusiastic spirit.

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FACTORS AFFECTING THE EFFECTIVENESS OF E-LEARNING DURING THE COVID-19 PANDEMIC

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ABSTRACT

Due to the Covid-19 pandemic, people tend to adapt to new circumstances by studying online instead of the traditional way, so it is essential to conduct research about the result of learning online. By using the e-learning framework theory developed by Badrul Khan and his partner in 2005 (George Washington University, USA) and a survey of 420 students who have experienced e-learning in Hanoi, the research illustrates 08 main factors that impact the result of the study online, including: (1) Institution, (2) Pedagogical, (3) Technological, (4) Interface design, (5) Evaluation, (6) Management, (7) Resource Support and (8) Ethical. The figures have been performed by EFA (Exploratory Factor Analysis) and linear regression techniques to determine the level of each factor's impact during the pandemic.

Keywords: E-learning strategy, Regression analysis, EFA

1. Introduction

In recent years, the Ministry of Education and Training implemented lots of policies to maintain students' learning efficiency even after the complication of the Covid – 19 pandemic. Therefore, with the slogan “*Fight the pandemic is like fighting against foreign invaders*”, the Ministry had to both ensure safety against pandemic and complete the study plans. In the era of strong development of artificial intelligence and technology, e-learning can be considered as an opportunity to promote the smart school model in the 4.0 technology era. Therefore, the task of researching and thoroughly understanding the factors affecting the effectiveness of e-learning is very important, including online teaching and learning for students. The research topic aims to point out the factors affecting the effectiveness of e-learning and propose solutions to improve learning quality, helping to solve the problem of online learning effectiveness through the framework of Badrul Khan (2005).

2. Theoretical framework

2.1. The concept of e-learning methods

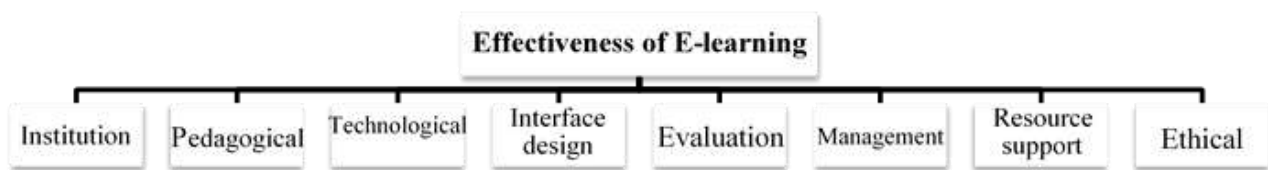
The principle of E-Learning is a new concept that is getting everyone's attention today. According to Bates (2007), E-learning is all activities that rely on computers and the Internet to support teaching and learning. Horton (2011) argues that E-learning is the use of technology and computers in learning. In the research process, finding a common definition of E-learning is difficult. The American Society for Training and Development (ATD) defines E-learning as a set of applications and processes which include web-based learning and computer-based learning. According to Cheng (2011), Engelbrecht (2005), Welsh & ctg (2003), E-learning is defined as a tool that uses computer-based technology such as the Internet, an intranet to provide learning guidance to users. In addition, E-learning is another form of self-study by students through free websites and application platforms. E-learning has now become simple and popular with many ages. Thus, through studying different concepts of E-learning, the authors believe that E-learning is a form in which each individual will use modern electronic tools such as computers, the Internet, etc. to conduct learning, exchange information or provide educational activities on online information platforms suitable for many ages.

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2.2. Theory about factors affecting the effectiveness of E-learning

It is important to understand the role of e-learning in formulating policies and developing plans at the national level as well as in each university. Due to the basis of analysis of experimental studies on each specific factor, synthetic models of success factors were proposed. According to Ghoreishi and co-authors (2017), as of 2016, there are 6 proposed e-learning analysis frameworks. In 2009, Andersson and Grönlund conducted an overview of the challenges in e-learning implementation. The results obtained by the group include four main aspects: Learner, Technology, Course, and Context. Empirical works generally confirm the factors proposed by Badrul Khan, with varying degrees of importance depending on the context, but prominently technology and learner factors. The importance of these factors is also found in empirical studies using other analytical methods and based on other frameworks compatible with Khan's analytical framework. Looking at the issues in detail, it can be seen that they can be reallocated according to the analytical framework proposed by Khan (2005), for example, the issue of teacher capacity development is classified as Pedagogy while according to Khan (2005) belongs to the aspect of Institutional; The issue of Social acceptance is classified in the group of Learners while this is an issue of Ethics in Khan's 8-factor analysis framework (2005). Comparing the above models, the authors show that the general analytical framework proposed by Khan (2005) is quite broad and includes the most relevant aspects, from personal, pedagogical, content to personal aspects. technical, institutional, and social aspects. According to Khan (2005), this analytical framework is the result of research during the period 1997-2005 to answer the question "What is needed to provide an adaptable learning environment for learners globally?". Through the research process, the author has identified many necessary factors to be able to establish a meaningful learning environment, in which there is a close relationship between these factors. The author has grouped these factors into 8 main aspects as follows:

Model 1: Research proposal model



Institutional: The author uses this term to focus on administrative and academic aspects and student services. More specific issues in terms of management can be listed as needs survey, change management, enrollment, scholarships, financial aid,...; academic aspects include issues such as accreditation, teaching quality, faculty support, class organization,...

Pedagogical: This aspect of E-learning includes teaching-related issues such as content analysis, learner analysis, goal analysis, teaching methods and strategies. Some of the methods and approaches that can be used include: presentation, instruction, storytelling, fieldwork, etc.

Technological: The technical aspect considers all issues related to system equipment including hardware, software and technology infrastructure of the E- learning environment such as data standards, plans on technology facilities. Technology was mentioned by many research models because it is one of the most important factors in the process of industrialization and modernization of the country.

Interface design: Including elements related to the interface of e-learning programs, this aspect includes page design, content design, how to navigate between pages, elements, ease of use and accessibility.

Evaluation: For an increasingly perfect learning environment in terms of quality and efficiency, the Evaluation element is an indispensable thing; each environment has different advantages and disadvantages, different learners and teachers, so it is important to evaluate which is the right environment.

Management: Unlike traditional learning, if there is an announcement or important event, the school can communicate directly to students under the direction of the superior, but E-learning is different, it is

necessary to inform the students through many different intermediary platforms, which can lead to a lack of information to students.

Resource support: Includes online support (e.g. academic counseling support, technical support, career counseling and other online support), resources (both online and offline) necessary to create a conducive learning environment. Online learning organizations should show learners that they are not really alone in the learning process (Khan, 2005).

Ethical: This aspect involves considering socio-political impacts, biases, cultural diversity, geographic diversity, learner diversity, etc.. and also legal issues.

3. Research model

3.1. Research hypothesis on factors affecting e-learning effectiveness and research model

3.1.1. Research hypothesis on factors affecting online learning effectiveness

According to the E-learning analytical framework proposed by author Khan (2005) - the analytical framework evaluated by Ghoreishi and co-authors as being the most comprehensive and covering the most relevant aspects, has been identified. Many factors are necessary to build a flexible and convenient learning environment, with close relationships between factors from personal, pedagogic, .. to technical and ethical aspects. and social. Based on that analysis, the author has grouped these factors into 8 main aspects as follows:

H1: *The institution focuses on building typical and necessary activities in schools to make a positive impact on the effectiveness of online learning.*

H2: *Pedagogy includes elements related to the teaching process aimed at student interaction with teachers, in order to create a positive online learning environment.*

H3: *Technical is to consider all the infrastructure issues that have a positive effect on e-learning effectiveness.*

H4: *The interface design includes aspects related to the design and display of the learning programs that have a positive impact on the effectiveness of online learning.*

H5: *Evaluation is one of the aspects of objectively assess the positive effect of the online learning process.*

H6: *Management includes all issues related to the learning environment and information dissemination that positively affect the effectiveness of online learning.*

H7: *Resource support includes online and offline support and resources have a positive effect on online learning effectiveness.*

H8: *Ethical consideration of the social-cultural - political impacts that positively affect online learning effectiveness.*

3.1.2. Research model

In this research, the authors use the model according to the general analytical framework proposed by Khan (2005). The authors have grouped these factors into 8 principal aspects as follows: Institutional, Management, Technological, Pedagogical, Ethical, Interface Design, Resource Support, and Evaluation. The research topic was conducted to build an initial Linear Regression Model with the dependent variable being online learning efficiency, and the independent variables including H1, H2, H3, H4, H5, H6, H7, H8. The independent variables all have the same effect on the dependent variable.

Research on factors affecting the effectiveness of online learning in the context of Covid-19 uses a 5-point Likert scale so that the assessment is carried out conveniently and uniformly. The following is a summary of the scales and concepts in the model used by previous studies:

Table 1. Scale of independent variables in the research model

| CODE | SCALE OF MEASUREMENT | LEVEL OF CONSENT | | | | |
|-------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---|---|---|---|
| INSTITUTIONAL | | | | | | |
| IN01 | I find it saves effort and money when I can use E-learning resources | 1 | 2 | 3 | 4 | 5 |
| IN02 | I find it suitable for the school's online learning organization plan | 1 | 2 | 3 | 4 | 5 |
| IN03 | I find it convenient to be able to be flexible between online work and other personal activities | 1 | 2 | 3 | 4 | 5 |
| PEDAGOGICAL | | | | | | |
| PE01 | I can easily grasp the knowledge of the lesson prepared and taught by the teacher during the online learning process | 1 | 2 | 3 | 4 | 5 |
| PE02 | I am interested in the content of the lecture that the lecturer gives both in theory and practice | 1 | 2 | 3 | 4 | 5 |
| PE03 | I am attracted by the teaching ability of the lecturer during online learning | 1 | 2 | 3 | 4 | 5 |
| TECHNOLOGICAL | | | | | | |
| TE01 | I have no connection problems during each scheduled online study session | 1 | 2 | 3 | 4 | 5 |
| TE02 | I can easily join online learning using available technology devices at home or anywhere | 1 | 2 | 3 | 4 | 5 |
| TE03 | The online learning software has many features that make it easy for me to interact with the teacher in each class (raise hands, clap hands,...) | 1 | 2 | 3 | 4 | 5 |
| INTERFACE DESIGN | | | | | | |
| ID01 | I find the interface of the online learning software modern, easy to see, and easy to use. | 1 | 2 | 3 | 4 | 5 |
| ID02 | I can understand the lesson better because the teacher uses many different browsers during lectures (excel, math worksheets, ...) | 1 | 2 | 3 | 4 | 5 |
| ID03 | Teaching slides are designed by teachers to be simple, easy to understand and attractive | 1 | 2 | 3 | 4 | 5 |
| EVALUATION | | | | | | |
| EV01 | I find the form of testing such as individual test or group work to help me in my online learning | 1 | 2 | 3 | 4 | 5 |
| EV02 | Online tests objectively assess my results and academic ability | 1 | 2 | 3 | 4 | 5 |
| EV03 | I find it convenient and useful to participate in online learning | 1 | 2 | 3 | 4 | 5 |
| MANAGEMENT | | | | | | |
| MA01 | I am satisfied when I study online because the learning environment is modern and convenient, giving me many interesting experiences | 1 | 2 | 3 | 4 | 5 |
| MA02 | I can still interact well with teachers and other students in a simple way when learning online | 1 | 2 | 3 | 4 | 5 |

| | | | | | | |
|-------------------------|----------------------------------------------------------------------------------------------------------------------------------------|---|---|---|---|---|
| MA03 | I receive full timetable and class schedule notifications during online learning | 1 | 2 | 3 | 4 | 5 |
| RESOURCE SUPPORT | | | | | | |
| RS01 | I give full instructions on how to use the software during the online learning process | 1 | 2 | 3 | 4 | 5 |
| RS02 | I have the maximum support from my family and school to be able to study online effectively | 1 | 2 | 3 | 4 | 5 |
| RS03 | I feel secure when teachers are trained to use online software effectively, positively affecting the online learning process | 1 | 2 | 3 | 4 | 5 |
| ETHICAL | | | | | | |
| ET01 | I am still enthusiastic about building lessons, self-study and take full notes during the online learning process | 1 | 2 | 3 | 4 | 5 |
| ET02 | During the online learning process, I did not have any actions to disturb or disrupt the classroom, affecting teachers and classmates. | 1 | 2 | 3 | 4 | 5 |
| ET03 | I strictly abide by the university's rules in the online classroom | 1 | 2 | 3 | 4 | 5 |

3.2. Scale of dependent variable

The scale used in this study has also been verified by previous studies to be reliable. The data table of the scale of satisfaction when participating in online learning is synthesized from previous studies as follows:

Table 2. Scale of dependent variable in the research model

| | |
|--------------------------------------|----------------------------------------------------------------------|
| EFFICIENCY OF ONLINE LEARNING | |
| EF01 | I am satisfied with the learning results that online learning brings |
| EF02 | Online learning helps me promote self-study ability |
| EF03 | Online learning has a positive impact on me |

3.3. Sample selection and data collection

According to Hair & co-authors (1998), in order to be able to do exploratory factor analysis (EFA), it is necessary to collect data sets with at least 5 samples on an observed variable. MacCallum and co-authors (1999) summarized previous researchers' views on the absolute minimum number of samples required for factor analysis. In it, Gorsuch (1983) and Kline (1979) suggested that the number be 100 and Guilford (1954) suggested that the number be 200. Comrey and Lee (1992) did not give a fixed number, but gave it different numbers with corresponding statements: 100 = bad, 200 = fair, 300 = good, 500 = very good, 1000 or more = excellent.

To ensure the reliability of the scale, the authors plan to conduct an online survey with a total of 250 samples and collect at least 205 samples that match the requirements. Actually received 420 student survey questionnaires, and completed the author's goal. All data are taken objectively and honestly to achieve the best results for the group's scientific research.

3.4. Testing and building regression models

With the number of samples and the data obtained through the survey application, the research team will proceed to build a two-variable regression model and perform scale testing and research hypothesis testing. From the obtained results, the research team discussed and analyzed the test cases and then made an assessment based on the calculated results and answered the questions posed around the relationship between variables.

3.5. Conclusion

The quantitative research method was carried out by surveying through a questionnaire with a size of 420 samples, which is completely objective and fully meets the requirements set forth by the scientific work. Each factor has its own impact on the online learning method, so to get the most out of this method, it is necessary to closely combine the factors together.

4. Model result

4.1. Elements description

The research was conducted by surveying in the form of collecting opinions through the form of a questionnaire and it was built by the author's team, the form received more than 420 responses and is considered to be quite good according to the theory of sample size by Comrey & Lee (1992). As a result, 420/420 valid answers were obtained, which were satisfactory for use in the analysis

Table 3: Sample description

| | Frequency | Percent | Cumulative Percent |
|----------------------------------------|-----------|---------|--------------------|
| Gender | | | |
| Male | 52 | 84,8 | 84,8 |
| Female | 356 | 12,4 | 97,2 |
| Others | 12 | 2,8 | 100 |
| Educational institution | | | |
| Academy of Finance | 397 | 94,52 | 94,52 |
| Others | 23 | 5,48 | 100 |
| Grade | | | |
| Freshman | 254 | 60,48 | 60,48 |
| Sophomore | 144 | 34,28 | 94,76 |
| Junior | 17 | 4,05 | 98,81 |
| Senior | 4 | 0,95 | 99,76 |
| Alumni | 1 | 0,24 | 100 |
| Internet's using level | | | |
| Everyday | 415 | 98,8 | 98,8 |
| A few days/week | 5 | 1,2 | 100 |
| Internet' times using (per day) | | | |
| Above 5 hours | 219 | 52,14 | 52,14 |
| 2-5 hour | 170 | 40,48 | 92,62 |
| 1-2 giờ hour | 27 | 6,43 | 99,05 |
| Under 1 hour | 4 | 0,95 | 100 |
| Method | | | |
| Laptop, Smartphone | 209 | 49,76 | 49,76 |
| Smartphone | 135 | 32,14 | 81,905 |
| Laptop | 25 | 5,952 | 87,857 |
| Laptop, Desktop, Smartphone | 19 | 4,524 | 92,381 |
| Desktop, Smartphone | 11 | 2,619 | 95 |

| | | | |
|--------------------------------------|------------|------------|------------|
| Laptop, Tablet, Smartphone | 9 | 2,143 | 97,143 |
| Laptop, Tablet, Desktop, Smart phone | 7 | 1,667 | 98,81 |
| Desktop | 4 | 0,952 | 99,762 |
| Tablet, Smartphone | 1 | 0,238 | 100 |
| Total | 420 | 100 | 100 |

4.2. Reliability and Item-total Statistics verification

Cronbach's alpha is a measure of scale reliability, that is, how closely related a set of items are as a group.

After analyzing Cronbach's alpha coefficient and removing variables that do not guarantee reliability, the scale of group work efficiency measured by 24 observed variables for eight factors affecting online learning effectiveness is higher than 0.6, including: Institution (IN), Pedagogical (PE), Technological (TE), Interface design (ID), Evaluation (EV), Management (MA), Resource Support (RS) and Ethical (ET). Therefore, the reliability reaches the permissible level and the scale meets the standards to be used for research. The results of testing Cronbach's Alpha scale of the components are presented in Table 4

Table 4: Verification of the reliability of independent variables

(Item -Total Statistics)

| Items | Scale Mean if Item deleted | Scale Variance if Items deleted | Corrected Item – Total Correlation | Cronbach 's Alpha if Items deleted |
|---------------------------------------------------|----------------------------|---------------------------------|------------------------------------|------------------------------------|
| Institutional: Cronbach's Alpha = 0.821 | | | | |
| IN1 | 7.407 | 2.476 | 0.690 | 0.740 |
| IN2 | 7.414 | 2.539 | 0.668 | 0.761 |
| IN3 | 7.226 | 2.237 | 0.673 | 0.760 |
| Pedagogical: Cronbach's Alpha = 0.865 | | | | |
| PE1 | 6.240 | 1.711 | 0.773 | 0.782 |
| PE2 | 6.112 | 1.780 | 0.732 | 0.819 |
| PE3 | 6.143 | 1.736 | 0.723 | 0.828 |
| Technological: Cronbach's Alpha = 0.898 | | | | |
| TE1 | 6.771 | 4.191 | 0.820 | 0.849 |
| TE2 | 6.719 | 5.086 | 0.829 | 0.833 |
| TE3 | 6.662 | 5.389 | 0.773 | 0.879 |
| Interface design: Cronbach's Alpha = 0.855 | | | | |
| ID1 | 7.157 | 2.620 | 0.738 | 0.789 |
| ID2 | 7.319 | 2.442 | 0.703 | 0.821 |
| ID3 | 7.319 | 2.456 | 0.743 | 0.781 |
| Evaluation: Cronbach's Alpha = 0.922 | | | | |
| EV1 | 6.990 | 3.117 | 0.855 | 0.876 |
| EV2 | 7.098 | 3.043 | 0.862 | 0.871 |
| EV3 | 6.993 | 3.138 | 0.808 | 0.915 |

| Management: Cronbach's Alpha = 0.869 | | | | |
|-----------------------------------------------------------|-------|-------|-------|-------|
| MA1 | 6.690 | 2.730 | 0.840 | 0.748 |
| MA2 | 6.674 | 2.955 | 0.716 | 0.849 |
| MA3 | 6.812 | 2.167 | 0.743 | 0.854 |
| Resource support: Cronbach's Alpha = 0.929 | | | | |
| RS1 | 7.598 | 2.451 | 0.868 | 0.885 |
| RS2 | 7.598 | 2.508 | 0.855 | 0.895 |
| RS3 | 7.643 | 2.517 | 0.838 | 0.909 |
| Ethical: Cronbach's Alpha = 0.897 | | | | |
| ET1 | 8.307 | 3.612 | 0.703 | 0.929 |
| ET2 | 7.821 | 2.906 | 0.836 | 0.818 |
| ET3 | 7.876 | 2.982 | 0.862 | 0.794 |
| Efficiency of e-learning: Cronbach's Alpha = 0.998 | | | | |
| EF1 | 6.583 | 3.744 | 0.998 | 0.996 |
| EF2 | 6.588 | 3.777 | 0.994 | 0.998 |
| EF3 | 6.585 | 3.743 | 0.995 | 0.997 |

4.3. Pearson correlation coefficient verification

The analysis results in Table 5 shows that the independent and dependent variables in the research model have a close relationship and a fairly high correlation with each other. All factors have a positive relationship with the correlation coefficient and have coefficients ranging from 0.428 to 0.542. The correlation between the independent variables and the correlation between the independent variable and the dependent variable is strong enough for establishing a linear regression model.

Table 5: Correlation coefficients

| | Correlations | | | | | | | | |
|--------------------------------------------------------------|---------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | IN | PE | TE | ID | EV | MA | RS | ET | EF |
| IN | 1 | | | | | | | | |
| PE | 0.493** | 1 | | | | | | | |
| TE | 0.422** | 0.397** | 1 | | | | | | |
| ID | 0.485** | 0.397** | 0.495** | 1 | | | | | |
| EV | 0.481** | 0.408** | 0.486** | 0.522** | 1 | | | | |
| MA | 0.485** | 0.376** | 0.410** | 0.443** | 0.545** | 1 | | | |
| RS | 0.447** | 0.351** | 0.412** | 0.535** | 0.491** | 0.420** | 1 | | |
| ET | 0.377** | 0.307** | 0.325** | 0.458** | 0.449** | 0.439** | 0.508** | 1 | |
| EF | 0.504** | 0.428** | 0.542** | 0.444** | 0.532** | 0.473** | 0.475** | 0.428** | 1 |
| N | 420 | | | | | | | | |
| **. Correlation is significant at the 0.01 level (2-tailed). | | | | | | | | | |

4.4. Multiple Linear Regression Analysis

After obtaining the results of a strong correlation between the variables through the test results as shown in Table 6, to avoid the phenomenon of multicollinearity (according to Carsten F. Dormann et al., 2013), the research team continued to conduct multivariable regression analysis with the dependent variable being Online learning effectiveness (EF) to determine factors affecting online learning effectiveness and obtained the following results:

Table 6: Result of model^a

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Collinearity Statistics | | |
|-------|-----------------------------|------------|---------------------------|--------|--------|-------------------------|-------|-------|
| | B | Std. Error | Beta | | | Tolerance | VIF | |
| 1 | Constant | -0.519 | 0.231 | | -2.245 | 0.025 | | |
| | IN | 0.198 | 0.061 | 0.153 | 3.237 | 0.001 | 0.579 | 1.727 |
| | PE | 0.136 | 0.066 | 0.090 | 2.066 | 0.039 | 0.686 | 1.458 |
| | TE | 0.233 | 0.040 | 0.260 | 5.800 | 0.000 | 0.642 | 1.558 |
| | ID | -0.030 | 0.062 | -0.023 | -.480 | 0.631 | 0.542 | 1.844 |
| | EV | 0.176 | 0.055 | 0.157 | 3.192 | 0.002 | 0.530 | 1.886 |
| | MA | 0.113 | 0.057 | 0.091 | 1.963 | 0.050 | 0.596 | 1.679 |
| | RS | 0.142 | 0.059 | 0.114 | 2.401 | 0.017 | 0.576 | 1.735 |
| | ET | 0.112 | 0.050 | 0.101 | 2.246 | 0.025 | 0.644 | 1.552 |

(a. Dependent Variable: EF)

At the 5% level of significance, through table 4, we see that there are 7 factors affecting the effectiveness of online learning of students and students, including Institution, Pedagogical, Technological, Evaluation, Management, and Support, Ethical is accepted by having sig value less than or equal to 0.05. However, the Interface design factor when considering the effectiveness of online learning is not accepted (sig > 0.05)

4.5. Goodness of fit verification

Table 7.1: Model Summary^b

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Durbin-Watson |
|-------|--------------------|----------|-------------------|----------------------------|---------------|
| 1 | 0.685 ^a | 0.470 | 0.460 | 0.71062 | 1.894 |

a. Predictors: (Constant)ID, ET, PE, TE, MA, RS, IN, EV

b. Dependent Variable: EF

Table 7.2: Model Summary^b (without Interface design factor)

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Durbin-Watson |
|-------|--------------------|----------|-------------------|----------------------------|---------------|
| 1 | 0.685 ^a | 0.470 | 0.461 | 0.70996 | 1.892 |

a. Predictors: (Constant), ET, PE, TE, MA, RS, IN, EV

b. Dependent Variable: EF

The analysis results in Tables 7.1 and 7.2 show that after removing the Interface variable from the model, the adjusted coefficient of determination is obtained by 0.461, an increase compared to the model without the variable. Thus, the model has better quality after removing the unaffected variable from the model and the removal of the variable is necessary. The F-test on the fit of the regression model shows that the regression model is suitable for all levels of significance (probability of significance, Sig. = 0.000).

4.6. Exploratory factor analysis

After testing the scale, the author conducts factor analysis (EFA) for the group of factors affecting the effectiveness of online learning, using the Principal Components extraction method with Varimax rotation. KMO coefficient = 0.912 > 0.5, Bartlett's test result is 7409,826 and with significance level < 0.05, shows that Factor Analysis is suitable with research data. The results of the factor rotation matrix are presented in Table 6

Table 8: EFA results for independent variables

| Rotated Component Matrix ^a | | | | | | | | |
|---------------------------------------|-----------|-------|-------|-------|-------|-------|---|---|
| | Component | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| RS1 | 0.866 | | | | | | | |
| RS2 | 0.850 | | | | | | | |
| RS3 | 0.794 | | | | | | | |
| TE2 | | 0.857 | | | | | | |
| TE1 | | 0.855 | | | | | | |
| TE3 | | 0.806 | | | | | | |
| MA1 | | | 0.835 | | | | | |
| MA3 | | | 0.817 | | | | | |
| MA2 | | | 0.785 | | | | | |
| ET2 | | | | 0.904 | | | | |
| ET3 | | | | 0.884 | | | | |
| ET1 | | | | 0.700 | | | | |
| PE2 | | | | | 0.834 | | | |
| PE1 | | | | | 0.832 | | | |
| PE3 | | | | | 0.814 | | | |
| EV2 | | | | | | 0.864 | | |
| EV1 | | | | | | 0.846 | | |

| | | | | | | | | |
|-----------------------|--------|--------|--------|--------|--------|--------|--------|--------|
| EV3 | | | | | | 0.702 | | |
| ID1 | | | | | | | 0.796 | |
| ID3 | | | | | | | 0.785 | |
| ID2 | | | | | | | 0.743 | |
| IN1 | | | | | | | | 0.804 |
| IN3 | | | | | | | | 0.765 |
| IN2 | | | | | | | | 0.730 |
| Eigenvalues | 10.082 | 1.980 | 1.605 | 1.541 | 1.262 | 1.171 | 1.104 | 1.015 |
| Cumulative percentage | 42.007 | 50.258 | 56.945 | 63.364 | 68.622 | 73.500 | 78.100 | 82.331 |

5. Model conclusion

After analyzing the factors by regression and testing models, the authors have come to the following conclusion after determining the degree of influence of these factors on the effectiveness of online learning. Accordingly, the results show that the Technical aspect has the strongest impact on the effectiveness of online learning of learners ($\beta=0.229$). This is a relatively special aspect compared with other aspects in other works. Research in developed and developing countries in 2009, Technology has little effect on learning efficiency, so it could be seen that the circumstances of each time also play an equally important role.

The next significant factor that has a positive impact on students' e-learning effectiveness is the Institution ($\beta=0.194$) and the Evaluation factor ($\beta=0.175$), when students see flexibility in their learning. The organization of online learning as well as seeing the responses that are met and changed quickly after each assessment will have a positive impact on the effectiveness of online learning. Next are other factors that have a decreasing impact on the effectiveness of online learning, including Supporting factors ($\beta=0.135$), Pedagogical ($\beta=0.134$), Management ($\beta=0.111$) and the other one have the lowest influence is Ethical ($\beta=0.109$). In addition, the factor that did not affect the effectiveness of students' online learning was the Interface design factor ($\beta=-0.030$, $\text{sig}=0.631>0.05$).

6. Conclusion and Recommendations

Based on the theoretical framework and research models, the results show that there are 7 factors that have signs of positive impact on the effectiveness of online learning in order from high to low: Technical, Institution, Evaluation, Support, Pedagogical, Management and Ethical. And there is one factor that does not affect e-learning effectiveness, which is Interface, this does not mean that the Interface design factor does not positively affect the effectiveness of the online learning method, it also because this data is not enough to prove a linear correlation between the variables need to be considered.

From the collected data, the author makes discussions and then proposes some recommendations for activities in the field of online training to increase the positive impact on the learning efficiency of each participant:

Institutional: Training institutions need to focus on developing a training plan to foster the management team and remote training instructors and diversify sources of digital materials provided by training institutions. Also the training unit needs to survey and listen to feedback from learners about the quality of the lesson.

Pedagogical: educational units should ensure fairness, objectivity, strong screening in the teaching process and avoid negative behaviors, which not only degrade the quality of training but also lead to unnecessary prejudices against potential learning models.

Interface design: the learning interface should be prioritized in a simple, easy-to-use but equally attractive design. Using integrated interfaces such as Kahoot!, Quiz. vn, .. can both meet and arouse students' interest and help teachers control the learning efficiency of each student.

Evaluation: Training organizations are responsible for providing criteria and models to evaluate the quality and effectiveness of online learning so that it is fair and equitable, while the tasks of individuals and organizations is to make perfect efforts, to meet those criteria without having negative behaviors.

Technological: Schools need to choose online learning software suitable for each school's conditions such as financial capacity, ability to train user skills, etc. Therefore, when choosing software for teaching, it is necessary to listen to feedback from lecturers and students to take timely remedial measures.

Management: Groups can be created for classes and administrators add everyone to the group; Integrate attendance every time someone enters the online learning application; Participating users can answer some questions.

Resource support: encouraging, caring students will be more motivated to succeed, spend more quality time, and persevere through challenges. The whole family can try to organize the home environment to best support the needs of the online learner.

Ethical: A healthy learning environment has enough civilized, polite, and modern elements, each individual in the class is aware of their responsibility to not create negative impacts on everyone. people around. It is necessary to increase their understanding of cultural and political differences to maximize the benefits of a civilized learning environment.

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THE INFLUENCE OF USER-GENERATED CONTENT (UGC) ON THE PURCHASE INTENTION OF GENERATION Z CUSTOMERS CASE OF HO CHI MINH CITY

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ABSTRACT

Communication is increasing with the explosion of social networks along with increasingly diverse consumer needs so the research topic was carried out with the aim of determining and analyzing the impact of user-generated content on the purchase intention of consumers. The research collects data from about 450 Generation Z users aged 10 to 25 in Ho Chi Minh City. The main analytical method used in this study is Confirmatory factor analysis and PLS-SEM. The research results show that the factor "Purchase intention" is influenced by "UGC's information, social interaction, and tendency", mediating by "Attitude towards UGC", and 2 factors "Perceived usefulness" and "Perceived credibility". In that, Tendency of UGC has a positive effect on both the "Perceived usefulness" and "Perceived credibility" of UGC. At the same time, the research results are the basis for the research team to propose some recommendations to help businesses take reasonable measures to improve the efficiency of the management of user-generated content related to commerce brands and consumers.

Keywords: user-generated content (UGC), generation Z, purchase intention, Technology Acceptance Model.

1. Introduction

Thanks to the development of the Internet, trade is almost borderless. We can stay at home, with a few clicks on a computer or smartphone, we can buy goods anywhere as well as in any country. However, there are so many brands in the same product that consumers become confused about which brand's products to choose. At this time, consumers tend to watch the posts, reviews, and comments of previous customers on online platforms to consider whether to choose and decide to buy a product (Thilina et al. , 2019). Previous customers' posts, reviews, and comments are User-generated content (UGC).

Consumers are getting increasingly sophisticated, and they carefully choose and evaluate information before making a buying decision. "Potential consumers will seek for UGC before making a purchasing choice, and they find that UGC is a convenient source to obtain as much information connected to products and services," Ivana and Robert said in 2020. In terms of academic research, several studies from various nations have proven that UGC has an impact on customer purchasing intent, such as Thomas et al. (2020), Maria et al. (2020), and others (2017). However, because the research subjects of past studies were still fairly diverse, our research team concentrated on Generation Z, who will be the economy's primary client group in the next ten years. Furthermore, they are technologically sensitive and enjoy innovation and originality. The research team extracts two features of UGC from the above research subject that can alter customers' views and attitudes, and so affect their purchase intention, that prior studies have not yet uncovered. The level of product involvement, for starters (which is the level of consumer interest in purchasing a certain product). Second, the up-to-dateness of UGC (tendency), because the study subject is particularly sensitive to new trends, the research team evaluates whether catching up with new trends drives the target group's buy intention or not. Furthermore, previous studies were only conducted in the United States, the United Kingdom, Italy, Germany, and other countries with different economic characteristics and consumer behaviors than Vietnam, and there are very few studies in Vietnam that investigate the relationship between

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UGC and purchase intention. The study team decided on the topic "**THE INFLUENCE OF USER-GENERATED CONTENT (UGC) ON THE PURCHASE INTENTION OF GENERATION Z CUSTOMERS - CASE OF HO CHI MINH CITY**" based on the information provided. The study's goals are to determine which UGC elements influence the researched subject's buy intention, to better understand the relationship between UGC and purchase intention, and to provide a variety of solutions for brands to attract and promote customers' shopping intentions.

2. Literature review

"User-Generated Content" is a term used to describe content that is created by people outside of professional media organizations. These contents help people access publicly and often unpaid by companies. User-generated content can include text, photos, images, graphics, audio or video, and other forms. Olenski (2017) and Merckel (2017) claim that user-generated content is a highly beneficial secret marketing tool for companies, as it is combined with social media content. Saleh et al. (2016) show that consumers are influenced by UGC and they perceive customer articles, reviews, and shares to be more trustworthy than companies' articles. Regarding some more specific studies, Firda and Tina (2019) have shown that UGC has an influence on consumers' intention to buy cosmetics, in terms of user-generated content, the more attractive it is, the more people want to refer to and use it to fill the information that consumers need.

Furthermore, there is much academic literature that addresses the relationship between attitudes and purchase intention. According to Smriti Mathur et al. (2021), consumer attitude toward UGC influences online purchase intention. When customers start to think positively about online content created by other users, they are ready to purchase and experience new products. The higher consumers' positive attitude towards UGC, the more their online purchasing intentions towards products (Utami and Rahyuda, 2019). In addition to the attitude factor, there are also many research papers that make the point that the perceived factor associated with UGC directly affects the intention to buy online. Ventre and Kolbe (2020) have come to the conclusion that being aware of the usefulness of UGC impacts purchasing intent. Modern consumers often seek the comments, views, and suggestions of others through social networks to reinforce their purchasing intentions when they think the information will be useful. The clearer, more detailed, and appropriate information about the product or service will give consumers a sense of initiative and prestige from the brand (Ruoshi Geng and Jun Chen, 2021).

In addition, awareness of credibility is a factor that is frequently mentioned. Today's online consumers believe that UGCs are more reliable than seller-provided content, and brands are unable to manage these UGCs (Mazzini and Noor, 2020). The higher frequency of user interaction, the more detailed and authentic the information, and the greater the consumer will have belief in the product, thus improving their purchasing intentions. Ruoshi Geng and Jun Chen (2021) concluded that the quality of UGC's social interactions will affect consumers' purchasing intentions, this relationship is mediated by the perception of UGC's "usefulness" and "credibility," which play a role in the formation of purchasing intent. Luu Thi Minh Nghia and Nguyen Minh Duong (2021) study the impact of the information provided in UGC that positively impacts perception with UGC if users are oriented and facilitate specific information, contributing to their content. In a recent study, Nusairat et al. (2021) found that customers' online purchasing intention would be influenced by UGC's tendency through customers' awareness.

Theoretical framework

The theory of planned behavior (Icek Ajzen, 1991), extended from the theory of rational behavior - TRA, adds a cognitive element of behavioral control, which means the perception of how easy or difficult it is to perform a particular behavior. According to this theory, the more positive the attitude towards the behavior, the more the subjective norm favors performing the behavior, and the less hindrance perceived behavioral control is, the stronger the intention to perform the behavior. Luu Thi Minh Nghia and Nguyen Minh Duong (2021) have shown that subjective norm has a significant impact on the reference of the user's B-UGC, while perceived behavioral control does not. Specifically, the results indicate that the social network

users of an online community have a positive attitude towards B-UGC created by members, and their intentions to read B-UGC content also increase, while users' perceived behavior control does not affect their intentions.

The Technology Acceptance Model - TAM indicates that the two main factors determining consumer attitudes are perceived usefulness and perceived ease of use. When consumers find the information provided by the source useful, they will have a positive attitude towards it and believe that the use of information from this system helps to improve the intention to perform the behavior of the customer. In addition, if consumers think that systems make it easier to perform their behavior, their attitudes towards these tools will be more positive, and their perceived usefulness about them will be higher. According to Bahtar et al.(2020), using social networks such as Instagram to advertise businesses is really effective. Consumers have a positive attitude when using this platform and their intentions are significantly affected. They find this information useful and find it very easily thanks to the "highlight story" of Instagram. Therefore, consumers tend to search for information on Instagram when they intend to buy.

The team decided to combine the two theories above for research: the theory of planned behavior (TPB) and the technology acceptance model (TAM) - people's attitude towards an event is one of the two main factors affecting the behavioral intentions (TPB) and is partly influenced by people's perception of technology (TAM).

3. Hypotheses development

3.1. UGC's information (INF) and Perceived usefulness (PU), Perceived credibility (PC) of UGC

"Information" includes information quality, source quality, and relevance of the information provided in UGC (Luu Thi Minh Nghia, Nguyen Minh Duong, 2021). According to Hua and Wang (2014), information quality refers to the extent to which a message is persuasive to an audience, and is considered to be measured in terms of reliability, comprehensibility, usefulness, and relevance (Cheung et al., 2008). It has an impact on consumers' attitudes through perceived usefulness and perceived credibility, this is because they need information for the pre-purchase stage, before comparing with other alternative brands, and ultimately making a purchasing decision (Mazzini Muda and Noor Rita Mohamed Khan, 2020).

Previous studies have also shown that perceived trustworthy message sources positively impact consumers' attitudes towards brands (Ohanian, 1990; Muda et al., 2020) because of the perceived usefulness and perceived credibility of UGC. The more reliable the information sources, the more successful they are in enhancing the positive attitudes of users (Chu et al., 2008). As UGC is considered more trustworthy than Brand-generated content due to the user's perspective, it provides honest reviews of both the good and the bad of a product or service (Park et al. author, 2007). Therefore, this study proposes the hypothesis:

H1a: UGC's information has a positive effect on perceived usefulness of UGC

H1b: UGC's information has a positive effect on perceived credibility of UGC

3.2. UGC's social interaction (INT) and Perceived usefulness (PU), Perceived credibility (PC) of UGC

"Social Interaction" is the level of interaction between users with various types of advertising, described as a means for individuals to effectively communicate with each other, and at the same time it is also a feature of the environment that allows the user to engage in creativity and recreation. This factor affects every stage of the decision-making process, including consumer awareness and attitudes, as well as affects the way purchase intention is formed (Azizul Yaakop, 2013). According to Geng Ruoshi and Jun Chen (2021), UGC's quality of social interaction, such as users sharing their buying experience, has a positive impact on consumer perception and improves purchase intention. In addition, Luu Thi Minh Nghia and Nguyen Minh Duong (2021) further note that the perception and attitude of B-UGC and UGC readers may be affected by other people's opinions and increasing conditions. Thereby, it can be seen that UGC's "interaction quality" is related to purchase intention and this relationship is mediated by "perceived usefulness" and "perceived credibility". Therefore, this study proposes the hypothesis:

H2a: UGC's social interaction has a positive effect on perceived usefulness of UGC

H2b: UGC's social interaction has a positive effect on perceived credibility of UGC

3.3. UGC's tendency (TEN) and Perceived usefulness (PU), Perceived credibility (PC) of UGC

“Tendency”, also known as UGC's up-to-dateness, is the fact that UGC aims to present the latest topics so that viewers can follow the latest news. Then they will make discussions and comments on that content. The tendency of UGC will likely relate to new product or marketer developments regarding the latest models, brands, features and experiences (Owusu et al., 2016). Also according to the authors, UGC's tendency and updating properties help consumers easily classify information flows, new and old products, thereby forming purchase intentions mediated by perceived usefulness that UGC brings.

More recently, the study by Nusairat et al. (2021) also mentioned the propensity of UGC. UGC with fully up-to-date content is more persuasive, which will increase consumer belief in that UGC. The study shows that this factor has a positive impact on purchase intention through the intermediary of customers' perception of UGC.

There is still a gap as to whether there is a positive relationship between UGC's tendency and purchase intention. This factor directly affects purchase intention or will affect indirectly through intermediaries according to the analyzed theories. From the above ideas, this research proposes the following hypothesis:

H3a: UGC's tendency has a positive effect on perceived usefulness of UGC

H3b: UGC's tendency has a positive effect on perceived credibility of UGC

3.4. Perceived usefulness and perceived credibility of UGC

3.4.1. Perceived usefulness of UGC (PU) and Consumer attitudes towards UGC (AT)

Perceived usefulness is defined as the degree to which a person believes that using a particular system would improve one's job performance (Davis, 1989; Karahanna and Straub, 1999; Amin et al., 2014). Pavlou and Fygenson (2006) also suggested perceived usefulness of information from websites is indicative of the belief that such information will enhance efficiency in collecting product information.

According to the Technology Acceptance Model (TAM), perceived usefulness affects consumer attitudes (Mir and Rehman, 2013). Hsu et al. (2013) also found that the usefulness of blog recommendations has a direct influence on attitudes and an indirect influence on purchase intention. In a study on web service acceptance, Yang et al. (2010) showed that perceived usefulness has both a direct influence on usage intention and also an indirect effect through attitude. In addition, according to a study by Prabha Kiran and Abhishek Srivastava (2020) on the Instagram platform, when users realize that UGC can provide timely available information relevant to what they are looking for, they will have positive attitudes towards UGC because of their usefulness help users make more favorable purchasing decisions.

In the current study, perceived usefulness of UGC is defined as the perception of consumers that accessing and interacting with UGC would enhance their performance and purchase intention. It is hypothesized that:

H4a: Perceived usefulness of UGC has a positive effect on consumer attitudes towards UGC

3.4.2. Perceived credibility of UGC (PC) and Consumer attitudes towards UGC (AT)

In general, credibility of a source can be defined as the positive features of the source that influence the receiver to accept the message (Ohanian, 1990). Perceived credibility is the trust dimension that affects the adoption of a message in a positive or negative way and it can bring changes in consumer attitudes (Bouhleb et al., 2010).

For user-generated content, perceived credibility is a consumer's willingness to be influenced by integrity (honesty and commitment), kindness (care, thinking for others), and skills (responsibility) in product recommendation based on UGC publishers (Ruoshi Geng and Jun Chen, 2021). UGC is perceived as more trustworthy than branded content (seller-generated content) because from a user's perspective it states honest evaluations with both positive and negative sides (Park et al., 2007). At the same time, according to a

study by Li et al. (2020), consumers obtain information through UGC to reduce the risk of making decisions and improve their perception of usefulness. If consumers see many product reviews and more members participate in sharing information, they will have a positive attitude towards the product or service (Ye et al., 2011). Besides that, as consumers regularly participate in UGC, they will continue to increase their understanding of UGC and reduce perceived risks, which increases customers' belief in the utility of UGC in their purchases (Dawes and Nencyz-Thiel, 2014). Therefore, this study proposes the hypothesis:

H4b: Perceived credibility of UGC has a positive effect on consumer attitudes towards UGC

3.5. Consumer attitudes towards UGC (AT) and Purchase intention (PI)

Attitude is said to be the primary factor affecting the intention and behavior of consumers (Icek Ajzen, 1991), Attitude is one of the criteria that affect people's intentions and is often used to make purchasing decisions (Malhotra and Birks, 1996).

Putu and Rahyuda (2019) have shown that consumer attitudes toward UGC has a positive and significant influence on online purchase intention. In addition, user attitudes toward UGC on the Youtube platform has a positive relationship with their cosmetic purchase intention (Wang, 2015). Thereby, it shows that if consumers have a more positive attitude about UGC, their future purchase intention will increase and vice versa. From there, our team hypothesizes the following:

H5: Attitude towards UGC has a positive effect on the purchase intention of consumers.

Based on the above analysis, we propose a moderated mediation model as below:

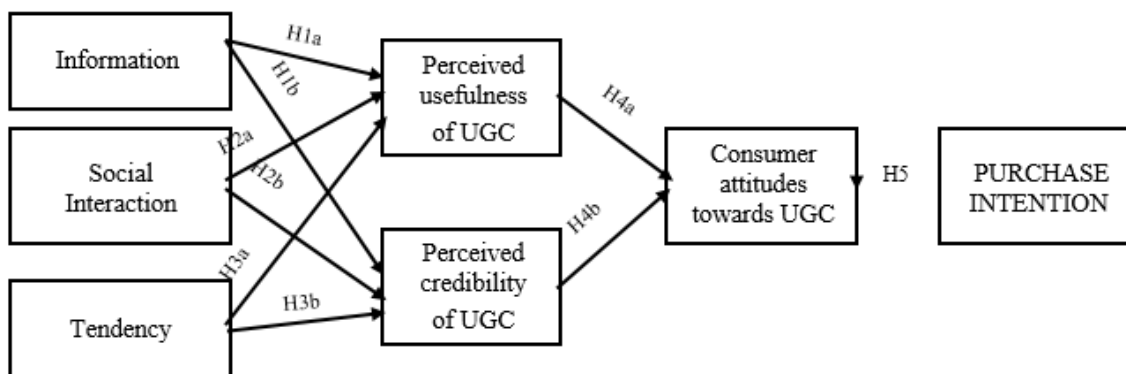


Figure 1. Proposed Model

4. Methodology

As an internet-related subject, the most appropriate and convenient place to recruit participants is the internet. Therefore an online questionnaire survey was distributed to a convenient and snowball sample of students and people in Ho Chi Minh City from the age group of Generation Z in January 2022. The team sent out 450 surveys and got back 389 valid samples considered for data analysis. This meets the minimum sample size of 190, 5 times the number of observed variables, based on Hair et al. (1998).

The online form survey was divided into three parts. In the first part, demographic characteristics such as age group, gender, occupation, monthly income, amount and frequency of purchases were formed to discover differences in the respondents' socio-demographic backgrounds. The second part measured (1) consumers' perceptions of user-generated content; (2) consumers' experience searching for product information through UGC before making a purchase. The last part assessed the extent to which factors of UGC affect purchase intention. UGC was particularly investigated in terms of three dimensions including UGC's information (six-items), UGC's social interaction (six-items) and UGC's tendency (five-items) is adapted from the instrument developed by Putu and Rahyuda (2019), Lin et al. (2013), Saleh et al. (2016) and Nguyen et al. (2013). The factors related to TAM model include Perceived Usefulness (five-items) and Perceived Credibility (five-items) measurement that is adopted from Mir and Rehman (2013), Kolomiets et al. (2016), Mazzini and Noor (2020) Ruoshi and Jun (2021). Measurements related to Attitude (five-items) and Intention to Purchase (six-items) are borrowed from Fishbein and Ajzen (1975), Shirley and Peter

(1995); David (2006); Taylor et al. (2011). These measurements are rated by a five-point Likert scale, ranging from 1 = strongly disagree and 5 = strongly agree.

The data are obtained with a gender ratio that is not too different (approximately 40% male – 60% female) with the age from 10 to 25 years old, in which the age group from 15 to 22 accounts for the majority (approximately 80% of the population). First, to ensure the validity and reliability of all items in the questionnaire, the scale is preliminarily assessed via Cronbach's Alpha reliability test with IBM SPSS Statistics 26 software. Next, observed variables were included in Confirmatory Factor Analysis (CFA) by Principal Axis Factoring and Promax rotation. The CFA method reduces the set of interdependent variables into a smaller set but still ensures the model significance to evaluate the relationship between the variables in the model after adjusting for measurement errors. Finally, to examine the relationships between the proposed research model factors, we applied the structural equation modeling method based on the Partial Least Squares (PLS) technique with SmartPLS 3.0. PLS-SEM is applied to maximize the dependent variable's prediction level (Hair et al., 2019). Moreover, its advantages are testing all proposed hypotheses simultaneously for a complex model. Discriminant validity using Fornell-Larcker Criteria, Path Analysis and one-way ANOVA test were used to test the results and draw conclusions.

5. Results and discussion

5.1. Results

Table 1. Measurement Model Results

| Question Items | Cronbach's Alpha | SD | Loading | Discriminant Validity | AVE |
|--------------------------------------------------------------------------------------------------------------------------------------------|------------------|------|---------|-----------------------|-------|
| 1. Information – INF | | | | | |
| INF1. UGC providing product/brand information help your shopping easier. | 0.810 | 0.65 | 0.775 | 0.739 | 0.547 |
| INF2. UGC providing product/brand information help your shopping more efficient. | | 0.68 | 0.800 | | |
| INF3. UGC provides useful product/brand information for your shopping. | | 0.64 | 0.795 | | |
| INF5. Information from UGC accurately reflects product quality/brand. | | 0.71 | 0.602 | | |
| INF6. You believe the product/brand information provided by UGC is more truthful than that of the manufacturer. | | 0.74 | 0.707 | | |
| 2. Social Interaction – INT | | | | | |
| INT1. The more interactions and comments from UGC viewers, the more credible the source of UGC information. | 0.739 | 0.84 | 0.374 | 0.735 | 0.541 |
| INT2. The higher the number of interactions and reviews about UGC, the more clearly the quality of UGC's information sources is reflected. | | 0.77 | 0.970 | | |
| 3. Tendency – TEN | | | | | |

| | | | | | |
|------------------------------------------------------------------------------------------------------------------------------------|-------|------|-------|-------|-------|
| TEN2. UGCs provide timely product/brand information. | 0.874 | 0.75 | 0.831 | 0.852 | 0.726 |
| TEN3. You believe that UGC's constant updating of trends is directly proportional to the product/brand reputation that UGC offers. | | 0.82 | 0.884 | | |
| TEN4. The contents in UGC help in choosing your products/brands suitable for each context, stage (COVID-19, etc.). | | 0.78 | 0.827 | | |
| TEN5. UGC constantly displays the latest topics to help you know what's trending. | | 0.79 | 0.864 | | |
| 4. Perceived Usefulness of UGC – PU | | | | | |
| PU1. The UGC of the product you need to refer is easily searchable and accessible. | 0.823 | 0.75 | 0.967 | 0.863 | 0.744 |
| PU2. UGC can be used as an effective reference when making purchasing decisions. | | 0.77 | 0.965 | | |
| PU4. You can use UGC to increase access to good and relevant products. | | 0.71 | 0.605 | | |
| 5. Perceived Credibility of UGC – PC | | | | | |
| PC1. You think UGC's content is right. | 0.923 | 0.71 | 0.952 | 0.932 | 0.869 |
| PC2. You think UGC's content is trustworthy. | | 0.76 | 0.907 | | |
| PC5. You think UGC is more credible than brand advertising. | | 0.77 | 0.937 | | |
| 6. Consumer Attitudes toward UGC – AT | | | | | |
| AT1. You like the values UGC brings. | 0.962 | 0.72 | 0.916 | 0.933 | 0.870 |
| AT2. You are very willing to access UGC. | | 0.73 | 0.972 | | |
| AT3. You are interested in UGC. | | 0.71 | 0.927 | | |
| AT4. Using UGC for shopping is a great idea. | | 0.73 | 0.952 | | |
| AT5. Your attitude towards UGC is positive. | | 0.73 | 0.895 | | |
| 7. Purchase Intention – PI | | | | | |
| PI1. You would consider purchasing products recommended by UGC in the future. | 0.772 | 1.01 | 0.587 | 0.732 | 0.536 |

| | | | | | |
|----------------------------------------------------------------------------------------------------------|--|------|-------|--|--|
| PI2. You are willing to purchase products recommended in UGC. | | 0.96 | 0.704 | | |
| PI3. You think the better the product is recommended by UGC, the higher your purchase intention will be. | | 0.99 | 0.757 | | |
| PI5. You will use UGC as a reference when making future purchases. | | 0.79 | 0.781 | | |
| PI6. You will recommend to others the products mentioned in the UGC. | | 0.78 | 0.812 | | |
| *Some items are deleted due to low outer loading | | | | | |

Source: Synthesis of the research team

First, the results of Cronbach's Alpha test removed the variables TEN1_factor group Tendency, variable PU3_ group Perceived Usefulness (PU), variable PC3, PC4_ group Perceived Credibility, and variable PI4_group Purchase Intention because the variables have Alpha < 0.6 and the total correlation coefficient is less than 0.3. After that, CFA confirmatory factor analysis continued to remove the variables INF4_group Information (INF), observed variables INT3, INT4, INT5, INT6_group Social Interaction (INT), and variable PU5_ group Perceived Usefulness (PU) when the KMO value < 0.5. Finally, the data set is analyzed according to PLS-SEM (Partial Least Squares - Structural Equation Modeling) linear structural model, Path Analysis (PA) model, and Anova test shows the relationship between variables. The independent and dependent variables meet the measurement conditions as well as the problem of multicollinearity is not significant in the model.

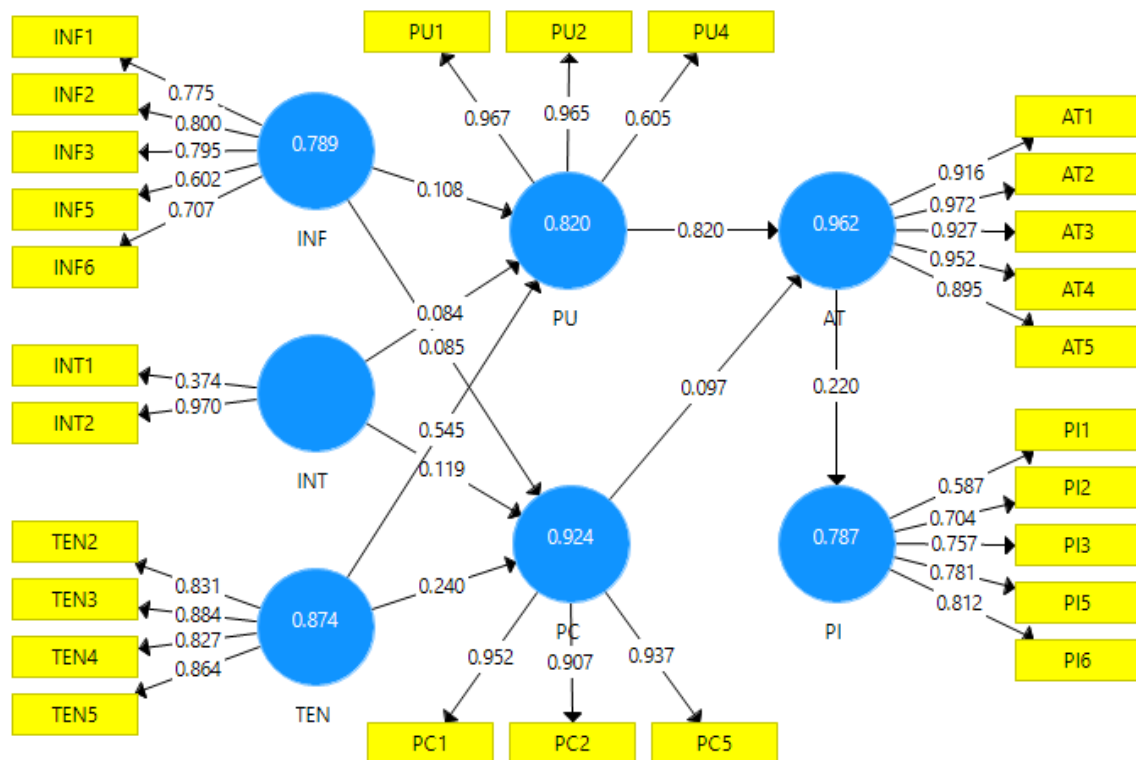


Figure 2. Structural Model and Path Coefficients

Source: Synthesis of the research team

The results of PLS-SEM show that the Cronbach's Alpha values range from 0.758 to 0.962 and the combined reliability and external load coefficients are all over 0.7. AVE values > 0.5 mean that the latent

variable will explain at least 50% of the variation of each sub-observed variable. Based on Fornell-Larcker, convergent and discriminant validity were approved for the measurement model. Thus, the factors of UGC including “Information”, and “Tendency” positively affect “Perceived Usefulness” and “Social Interaction”. In which, "Tendency" has a positive effect on "Perceived Credibility", then affects "Attitude" and has a positive impact on "Purchase Intention" of Generation Z consumers. The group's results coincide with many previous studies such as the study by Geng et al. (2021) and the study by Mazzini Muda and co-author (2020).

Table 2. Hypothesis test results

| Hypothesis | Results |
|-------------------------------------------------------------------------------------------|----------------|
| H1a: UGC's information has a positive effect on perceived usefulness of UGC | Supported |
| H1b: UGC's information has a positive effect on perceived credibility of UGC | Not supported |
| H2a: UGC's social interaction has a positive effect on perceived usefulness of UGC | Not supported |
| H2b: UGC's social interaction has a positive effect on perceived credibility of UGC | Supported |
| H3a: UGC's tendency has a positive effect on perceived usefulness of UGC | Supported |
| H3b: UGC's tendency has a positive effect on perceived credibility of UGC | Supported |
| H4a: Perceived usefulness of UGC has a positive effect on consumer attitudes towards UGC | Supported |
| H4b: Perceived credibility of UGC has a positive effect on consumer attitudes towards UGC | Supported |
| H5: Attitude towards UGC has a positive effect on the purchase intention of consumers. | Supported |

Source: Synthesis of the research team

5.2. Discussion

Social media has profoundly affected our purchase intentions. Today's consumers believe UGC is more trustworthy than seller-provided content. Therefore, this study proposes a research model for the impact of UGC's on consumers' purchase intention. The research results show that the factors of UGC including “Information” and “Tendency” have a positive influence on “Perceived usefulness”, “Social interaction” and “Tendency” have a positive effect on “Perceived credibility”, then positively affect “Attitude towards UGC” and “Purchase Intention” of Generation Z consumers. This conforms to the findings of previous empirical studies reported in the literature such as the study by Geng et al. (2021) and the study of Mazzini Muda et al. (2020). These studies have confirmed that there was a positive relationship between “Information”, “Social interaction” of user-generated content and “Perception” factors, which positively affect “Attitude” toward UGC thereby forming intentions to purchase. Therefore, nowadays UGC must be informative, giving correct and detailed figures and connective among users to have significant influence on consumers. This study determines that "UGC's Tendency" positively affects both "Perceived usefulness" and "Perceived credibility" of UGC, thereby leading to a positive relationship with "Attitude towards UGC" and “Purchase intention” of Generation Z consumers. This result also coincides with the research of Nusairat et

al. (2021), and is said to be consistent with the state of affairs. The context of the COVID-19 period encourages people to form the habit of regularly updating the latest information and status every day. Therefore, tendency, as known as up-to-dateness, has gradually become a strong influential factor. On that account, to increase purchase, brands can rely on UGC trends from which to improve products and contents. Moreover, perceived usefulness, perceived credibility and attitude towards UGC mediate the relationship between aspects of UGC and purchase intention. Hence, brands and marketers might take advantage of social interaction and current trends in parallel with tracking, managing, and navigating brand-related UGCs, thereby changing consumers' perceptions and attitudes.

6. Conclusion

Due to the exploration of the Internet, customers' behavior has become more likely to rely on brands or products recommendation and information from other consumers who share their real experiences on online platforms than product promotion from companies. The results of this research show the importance of UGC as a strong construct in forming Generation Z customers' perceptions and driving their intentions toward utilizing such contents to support their purchasing. Theoretically, the research findings boost the existing literature on the influence of UGC on customer buying intentions in a defined age group - Generation Z. The study provides a comprehensive understanding about the area of UGC in general. In addition, the shopping intention through the influence of UGC of Generation Z consumers in Ho Chi Minh city is also different among the demographic groups. This research suffered from some limitations, especially sampling producers. The method of approaching the sample is not diverse and effective. The scope of the study is still relatively small, only in the population of Generation Z living, studying and working in Ho Chi Minh City. This leads to the lack of generalizability of the topic. Such limitations could be avoided in the future by applying probability sampling techniques and expanding the scope of the study not only in the Z generation or in Ho Chi Minh city. Researchers propose that further studies should delve into other factors such as subjective standards, biases, risk perception, product involvement, consumer satisfaction, etc. In addition, it is necessary to consider in detail the relationship of factors, and the regulatory role of demographic factors based on characteristics such as age, gender, education level, and income, etc., to find out. How consumers respond to UGC and influence shopping intention, thereby, have the correct direction in making judgments and recommendations suitable for different customer segments.

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FACTORS AFFECTING SUSTAINABLE CONSUMPTION BEHAVIOR OF GEN Z IN VIETNAM

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ABSTRACT

The study aims to explore specific factors that drive sustainable consumption behavior of Gen Z in Vietnam. Based on Theory of Planned Behavior, the study testifies 6 factors, including attitude towards sustainable consumption, subjective norms, perceived behavioral control, expectation of better life for future generation, personal ethic standards, and the emergence of sustainable marketing program on the behavioral intention of sustainable consumption among gen Z consumers. Using a convenience sampling, our data sample consists of 353 consumers of Gen Z segmentation across Vietnam. The findings suggest that the strongest influences on the intention of sustainable consumption behavior are the expectation of a better life for future generations, perceived behavioral control, subjective norms, and personal ethic standards. Our study contributes to the emerging literature of sustainable consumption in developing countries. Implications and recommendations for further research are also discussed.

Keywords: Sustainable consumption, Generation Z, Consumer behaviors, Sustainability

1. Introduction

Due to increasing environmental damages and care for quality of life, the concept of sustainable consumption has caught significant attention from scholars, researchers, and policy makers (Dang, Nguyen, & Pervan, 2020; Quoquab & Mohammad, 2020). Sustainable Consumption is also seen as one of the most important pillars to achieve the Sustainability Development Goal 12 as it takes into consideration the needs of both current and future generations (UNDP, 2010). Nevertheless, research in this area is still in its infancy, and many aspects have not been extensively examined (Quoquab & Mohammad, 2020). It then asserts a call for more studies on sustainable consumption in term of both conceptual and empirical research.

Today, there are about 2.6 billion people of Gen Z *who were born in 1997-2013*, accounting for about a quarter of the world's population. In Vietnam, there are about 15 million people of this generation, constituting 25% of the country's labor force (McKinsey, 2018). Not only becoming the largest proportion in the future work forces, this generation is also considered as the biggest spending power in the coming years. Therefore, many companies have targeted this segmentation, and developed Marketing strategies which matches with their needs and wants. For Gen Z, consumption is seen as a matter of ethical concern (McKinsey, 2018). Coupled with environmental and social issues, it is clear that the Sustainable Consumption Behavior of Gen Z is an interesting topic to explore.

It is obvious that several attempts have been made within this area. For example, the study by Le (2018) on using economic tools such as taxes, environmental protection fees, land fees, etc to promote sustainable consumption in Vietnam; or the research by Dang et al., (2019) with the topic "Raising awareness about sustainable consumption of high school students in Ho Chi Minh City" after launching a communicational campaign on sustainable consumption at 6 high schools in Ho Chi Minh City. Based on the theory of social dilemma, Ho (2020) studied sustainable consumption behavior among different groups of Vietnamese consumers . The result indicates that there is significant difference in sustainable consumption behaviors among four consumer groups, namely: Short-Term - Personal, Short-Term - Social, Long-term - Personal, and Long-term - Social. However, such studies just focus on a single aspect of sustainable consumption such as environmental concern, green purchasing or better for health whereas sustainable

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consumption could be a multidimension subject. In addition, most previous studies on sustainable consumption have used behavioral intentions as an outcome rather than actual behavior ((Nguyen, Nguyen, & Hoang, 2018; Truong, Lang, & Conroy, 2021). This could be problematic because positive attitudes do not necessarily translate to actual behavior (LaPiere, 1934; White, Habib & Hardisty, 2019; Fischer & De Vries, 2008; Vermeir & Verbeke, 2006). Moreover, little attention has been paid to consumers of gen Z while this segmentation would present the most significant spending power in the foreseeable future.

This study aims to address the above-mentioned research gaps by conceptually and empirically examining the specific factors that drive sustainable consumption among Gen Z in Vietnam. To this end, we employ the Theory of Planned Behavior (TPB) developed by Ajzen (1991) with some revisions. The primary data is then collected through interviews and survey. A questionnaire is constructed with both demographic information, and attitude, purchase intention and actual behavior factors. After that, the data is analyzed by a number of statistical tests, including descriptive statistics, Exploratory Factor Analysis (EFA), Confirmation Factor Analysis (CFA) and Structural Equation Modeling (SEM).

Our contributions to the latent literature of sustainable consumption are threefold. First, by using actual behavior rather than purchase intention as the ultimate indicator of sustainable consumption, this study helps to explain the attitude-behavior gap in sustainable consumption behavior: why many consumers express their support to sustainable products, they might act differently in reality. Second, the current research is among the first studies specifically exploring behavioral patterns of Gen Z consumers with regards to sustainable consumption. Third, with a focus on Vietnam market, the research contributes to the emerging literature of sustainable consumption in developing countries.

The rest of this paper is structured as follows. The next sections present the background and literature review of the study. Data and Methodology are introduced later on, followed by empirical results. The last section displays the summary findings and policy implication.

2. Theoretical framework

2.1. Definition of Sustainable Consumption

Evidence of sustainable consumption dates back to the second or third century BC in the form of "criticisms of resource overconsumption" (Jackson, 2014). In 1994, at the Oslo Symposium, "Sustainable Consumption" (SC) was defined as *"the use of goods and services that respond to basic needs and bring a better quality of life, while minimising the use of natural resources, toxic materials and emissions of waste and pollutants over the life cycle, so as not to jeopardise the needs of future generations"* (UNEP, 2010). Until now, the concept of sustainable consumption (SC) has been developed more complete.

In this study, we base on the definition of SC by (Quoquab & Mohammad, 2020) to explore different dimensions of the concept. The reason to use this construct is that it provides a more holistic approach as the authors did comprehensively systematic reviews of more than 336 articles on the subjects of sustainable consumption to develop the conceptualization. Accordingly, Sustainable Consumption is defined as follows: *"Sustainable consumption refers to the continued act of controlling desire by avoiding extravagant purchases and rationalized use of goods and services that satisfy the basic needs. It concerns the quality of life over material standards of living, suggests satisfying basic human needs (not the desire for "wants" and luxuries), demonstrates care for protecting and preserving the natural resources (e.g. minimizing resource use, waste and pollution) and keeping the natural resources useful for future generations."* (Quoquab & Mohammad, 2020; p.7).

2.2. Literature review on factors affecting sustainable consumption behavior

Consumer behavior is the interaction between environmental stimuli and human perception and behavior through which people change their lives. In other words, consumer behavior includes the thoughts and feelings people have and the actions they take in the process of consumption. Factors such as opinions of other consumers, advertising, prices, packages, product appearance, etc all have an impact on customers' feelings, thoughts, and behaviors (American Marketing Association).

Previous studies have used a variety of theoretical perspectives to explore the concept of sustainable consumption behavior. Based on the author's assessment, the most frequently used theory is the Theory of Planned Behavior (Chekima et al., 2016; Geng et al., 2017; Rezvani et al., 2018; Yarimoglu & Binboga, 2019), followed by cultural theory (Dolan, 2002; Seyfang, 2004). Other theories under consideration are spillovers of innovation theory (Kapoor & Dwivedi, 2020), stimulus-response theory (Piligrimiene et al., 2020), self-determination theory (Abdulrazak & Quoquab, 2018), action theory (Minton et al., 2018), social cognitive theory (Lee, 2014), economic theory (Seyfang, 2007), emotion regulation theory (Kadic-Magljalic et al., 2018). et al., 2019), value-belief-norm theory (Kadic- Magljalic et al., 2018), signaling theory (Brach et al., 2018), social network theory (Chabowski et al., 2018). 2011), modern economic theory (Reisch, 2001), worldview theory (Kemper et al., 2019) and structural theory (Spaargaren, 2003).

In addition to theories, many studies have applied models/frameworks to explain the phenomenon, such as the SCB cube model (Fischer et al., 2017), the lifespan value model (Balderjahn et al., 2017), purchase intention gap (Park & Lin, 2020), attitude-behavior gap (Quoquab et al., 2019), change model planned society (Sheth et al., 2011), capacity approach (Comim et al., 2007), SC policy model (Seyfang, 2006), Consumer behavior model (Vermeir & et al., 2006) and global governance frameworks (Fuchs & Lorek, 2005).

After an extensive literature review, the authors chose the Theory of Planned Behavior (TPB) as the theoretical framework of this research due to its high relevance and validity in consumption behavior study. Under TPB, sustainable consumption behavior can be explained by the behavioral intention which is then determined by the attitudes, subjective norms and perceived behavioral control (Ajzen, 1991). Perceived behavioral control refers to an individual's ability to perform a certain behavior, which can also have a direct influence on behavior (Figure 1).

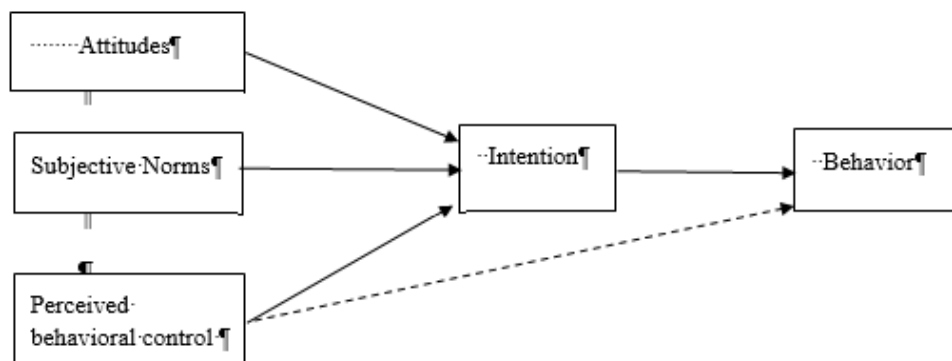


Figure 1: Theory of Planned Behavior

Source: Ajzen, 1991

2.3. Hypothesis development and proposed research model

Firstly, Ajzen (1991) shows that attitude toward the behavior is one of the factors affecting behavior. Attitude refers to the degree to which a person has a favorable or unfavorable evaluation of the behavior of interest. It entails a consideration of the outcomes of performing the behavior. Thus, attitude has direct effect on an individual's response to objects or situation to which he/she is exposed. Attitude is the factor that has the strongest influence on intention and thereby indirectly affects behavior (Fishbein & Ajzen, 1975). In addition, it also acts as a mediator in the relationship between environmental concerns, ethical beliefs and intentions. Therefore, we propose the hypothesis as follows:

H1: Attitude towards sustainable consumption behavior affects sustainable consumption intention .

Second, the Subjective Norm is the perceived social pressure to engage or not to engage in a behavior (Ajzen (1991). Various studies have shown that subjective norms or social pressures are important in an individual's behavioral intention and behavior (Minton et al., 2018; Vermeir and Verbeke, 2006). Hence, we develop the hypothesis as follows:

H2: Subjective norms have a positive influence on sustainable consumption intentions.

Third, to perform a certain behavior, consumers depend on available resources and opportunities, or in other words, the ease or difficulty of performing that behavior. According to Ajzen (1991), perceived behavioral control affects intention and action. Therefore, we propose the hypothesis as follows:

H3: Perceived behavioral control positively affects the sustainable consumption intention of Gen Z

Fourth, Ethical standards are socially recognized ethical rules that people see as a measure to regulate their behavior. Personal ethical standards affect the formation of moral attitudes. Therefore, we propose the hypothesis as follows:

H4: Personal ethical standards positively affect the sustainable consumption intention of Gen Z

Fifth, Social influences are generally assumed to capture individuals' perceptions of others, important in their environment, and expect them to behave in a certain way. Social influence through expectations influences consumer intentions. Therefore, we propose the hypothesis as follows:

H5: Expectations of a good life for future generations positively affect the sustainable consumption intention of Gen Z

Sixth, The emergence of sustainable consumer products combined with green or environmental marketing programs includes all activities aimed at meeting human needs and causing little adverse impact on the environment. natural field. The emergence of consumer products and sustainable marketing programs is an independent and influential variable in explaining consumption intention. Therefore, we propose the hypothesis as follows:

H6: The emergence of sustainable consumer products and marketing programs positively affects the sustainable consumption intention of Gen Z

Seventh, intention is considered to include motivational factors that influence an individual's behavior. According to the TPB model, intention is seen as the precursor and best predictor of behavior. Therefore, we propose the hypothesis as follows:

H7: Sustainable consumption intention positively affects the sustainable consumption behavior of Gen Z

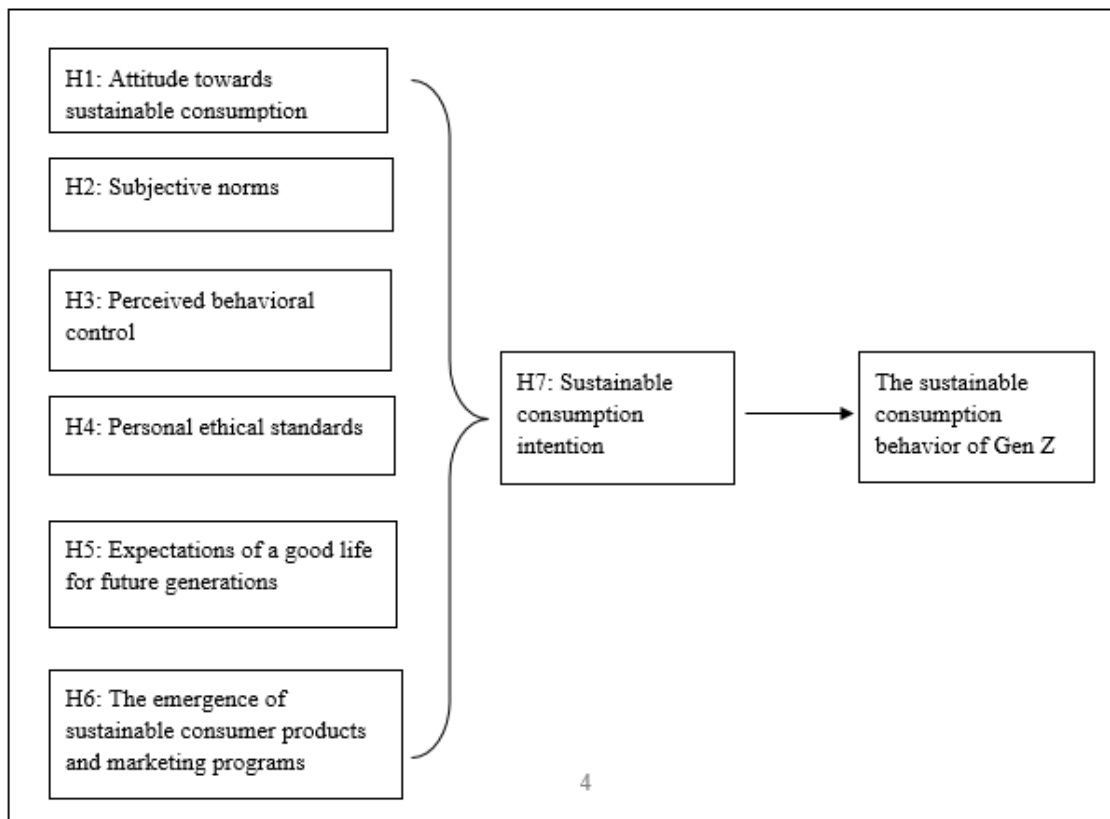


Figure 2: Proposed research mode

Source: Compiled by the author

3. Research Methods

3.1. Data Collection

This is survey-based research, and we conducted a convenient sampling survey in which the data was collected through both online and offline. First, the survey was distributed to a circle of friends and students of Academy of Finance where the authors is studying. As we focus on studying Gen Z behavior, targeting students was highly relevant with the research's objectives.

To get more diverse responses, the survey was also distributed online through social media community in Vietnam. We targeted younger participants, especially groups of sustainable purchases on Facebook as they are consumers that already display some forms of actual sustainable consumption behavior. However, we did not make any selection of the participants.

The survey questionnaire include three parts. The first part consists of demographic questions, such as their age, gender, educational background, professional situation, Internet usage. The second part focuses on the factors affecting sustainable consumption behavior, and the last part covers questions on consumers' intentions and actual purchase of sustainable products. The respondents were also asked about barriers that inhibits them towards sustainable consumption.

3.2. Measures

The measures used in this research are all modified from previous studies (Table 1) in order to enhance the reliability and validity of the measurement models of the constructs. Specifically, 29 variables were developed to measure 7 factors. The researchers used 5-point Likert scales for each measure, anchored on 'Strongly disagree' and 'Strongly agree.'

Table 1: Measures

| Measures | Symbol | Measurement criteria | Source |
|-----------------------------------------------------------|--------|-----------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|
| Attitudes towards sustainable consumption behavior | TD1 | You focus on life satisfaction rather than just material enjoyment. | Ajzen (1991); Ho et al (2020) |
| | TD2 | Sustainable consumption is a practical idea | |
| | TD3 | Sustainable consumption behavior is imperative | |
| | TD4 | You support sustainable consumption in Vietnam and accept it. | |
| Subjective norms | TC1 | No one feels I'm eccentric or inconvenient when it comes to everyday sustainable consumption. | Ajzen (1991); Ho et al (2020) |
| | TC2 | My sustainable consumption decisions are mainly influenced by my family members. | |
| | TC3 | Most of the people around me (friends, idols, teachers, etc.) encourage me to have sustainable consumption behavior. | |
| | TC4 | The mass media (newspapers, TV, social networks,...) have encouraged me to orient myself towards sustainable consumption behavior. | |
| | TC5 | The current government encourages Gen Z to have sustainable consumption behavior and I see many people choosing this consumption style. | |
| Perceived behavioral control | KS1 | Current concerns (natural environment, epidemics, etc.) bad impacts on health/personal life and loved ones, so I want to consume sustainably. | Ajzen (1991); Ho et al (2020) |
| | KS2 | Sustainable consumption today is an investment/opportunity for Generation Z and the next generation to live in a healthier environment | |
| | KS3 | I take the time to find out information and choose products for sustainable consumption | |

| | | | |
|------------------------------------------------------------------------------|------|----------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| | KS4 | Now I no longer hesitate to buy products for sustainable consumption even though the price is a bit higher. | |
| | KS5 | I am not too shy or have trouble finding information, choosing products, pursuing a sustainable lifestyle. | |
| Personal ethical standards | DD1 | I feel guilty if I don't practice sustainable consumption behavior in my daily life | Ajzen (1991); Ho et al (2020) |
| | DD2 | I believe I have an obligation to practice sustainable consumption behavior to protect life | |
| | DD3 | Increasing the implementation of sustainable consumption behaviors is one of my orientations in later life. | |
| Expectations for a good life for future generations | KV1 | I want Generation Z to live in a healthier environment | Ajzen (1991); Ho et al (2020) |
| | KV2 | I hope future generations do not have to bear the heavy consequences of the natural and social environment... Due to irresponsible consumption behavior. | |
| | KV3 | I wish future generations have the opportunity to develop in a more balanced natural, social,... | |
| The emergence of sustainable consumer products and marketing programs | MAR1 | There are many products and services that serve the essential needs of Gen Z's sustainable consumer lifestyle (safety-convenience-sustainable). | Ajzen (1991) Recommended by the author |
| | MAR2 | The price of sustainable consumer products is no longer so expensive | |
| | MAR3 | I can easily find and buy sustainable consumer products at stores, supermarkets, e-commerce sites,... | |
| | MAR4 | Communication programs of the State and of enterprises help me understand and see sustainable consumption easier to apply. | |
| | MAR5 | Influencer Marketing reviews and opinions are a source of reference and influence for me when choosing sustainable consumption | |
| Sustainable consumption intention | HV1 | I will practice the practice of sustainable consumption behavior every day | Ajzen (1991); Ho et al (2020) |
| | HV2 | I am willing to learn and share knowledge about sustainable consumption for everyone | |
| | HV3 | I will make efforts to implement sustainable consumption behavior in my life even though I am young now | |
| | HV4 | I will encourage relatives and friends to form sustainable consumption habits | |

Source: Compiled by the author

To ensure the face validity of the measures, a back translation method was used. In particular, the first translator made the translation of all the original items into Vietnamese. A second independent translator made the translation of the Vietnamese version back into English. Two English versions, the original and the translated one, were compared and resolved for any differences. Moreover, to ensure that respondents understand the concept of sustainable consumption in the same way, the definition was presented to them before questions.

3.3. The sample

After distributing survey questionnaires to young people of Gen Z in Vietnam, the author obtained 369 responses of which 353 responses were valid . According to Hair et al. (2014), the number of observations

must be at least 5 times or 10 times larger than the number of variables to ensure the quality of statistical results. As our study has 29 variables in total, the sample size of 353 response is good enough to run empirical analysis.

Table 2: Summary of research samples

| Criteria | | Quantity | Proportion |
|--------------------------------------------|----------------------|----------|------------|
| Living area | North | 308 | 87.30% |
| | Central | 34 | 9.60% |
| | South | 11 | 3.10% |
| Gender | Male | 96 | 64.90% |
| | Female | 252 | 34.40% |
| | LGBT | 5 | 0.60% |
| Age | 25 | 8 | 2.30% |
| | 20- 24 | 264 | 74.80% |
| | 15 - 19 | 81 | 23.00% |
| | Under 15 | 0 | 0 |
| Academic level | Post graduate | 9 | 2.55% |
| | College graduate | 309 | 87.54% |
| | High school or below | 35 | 9.92% |
| Occupation | Student | 288 | 81.59% |
| | Business | 12 | 3.40% |
| | Manage | 3 | 0.85% |
| | State employees | 2 | 0.57% |
| | Pupil | 35 | 9.92% |
| | Freelance | 5 | 1.42% |
| | Other | 8 | 2.27% |
| Average income/month (million VND) | Less than 3 | 193 | 54.50% |
| | From 3- under 10 | 82 | 23.23% |
| | From 10- under 20 | 9 | 2.55% |
| | From 20 to under 30 | 5 | 1.42% |
| | From 30 and above | 0 | 0% |
| | Unstable income | 43 | 18.13% |
| Marital status | Not married | 350 | 99.15% |
| | Married | 3 | 0.85% |
| | Other | 0 | 0% |
| Average internet usage time/day (hours) | Less than 2 | 13 | 3.68% |
| | From 2-6 | 124 | 35.13% |
| | From 6-8 | 114 | 32.29% |
| | From 8-12 | 70 | 19.83% |
| | Over 12 | 32 | 9% |
| Understanding of "Sustainable Consumption" | Don't know yet | 131 | 37.11% |
| | Already known | 205 | 58.07% |
| | Clearly understand | 8 | 2.27% |
| | In application | 9 | 2.55% |

Source: Author calculated from survey data

Regarding gender of respondents, the percentage of female to male is 64:34. The main age group participating in the survey is 20-24 years old (74.8%). Around 87.5% of the respondents have a education background of university level and higher. They are currently mainly students from Universities or Colleges across the country. Over 50% of the sample is still financially dependent or has low income (less than 3

million VND/month), and the remaining earn 3 million VND/month or more. Most of the respondents are single, and spending 6 hours/day or more on the Internet. Significantly, up to 58.07% know about sustainable consumption.

4. Results and Discussion

4.1. Analysis Results

4.1.1. Measure reliability and validity

To evaluate reliabilities and validities of the measures, exploratory factor analysis (EFA) was carried out and Cronbach alpha (α) were determined. According to the proposed research model, there are 6 scales on the factors affecting Sustainable Consumption Intent and 1 scale on Intent to decide on sustainable consumption behavior measured by a total of 29 observed variables. Reliability should be evaluated by the variable-total correlation coefficients and Cronbach's Alpha.

Table 3: Descriptive statistics of variables

| Analytical variables | Factors | Indicators | Mean | SD | |
|---------------------------------------------|-----------------------------------------------------------------------|--------------------------|------|------|------|
| Sustainable consumption intentions of GEN Z | Attitudes towards sustainable consumption | Td1 | 3.63 | 0.80 | |
| | | Td2 | 3.54 | 0.81 | |
| | | Td3 | 3.66 | 0.82 | |
| | | Td4 | 3.54 | 0.73 | |
| | Subjective norms | Ccq1 | 3.66 | 0.65 | |
| | | Ccq2 | 3.68 | 0.80 | |
| | | Ccq3 | 3.53 | 0.77 | |
| | | Ccq4 | 3.76 | 0.82 | |
| | | Ccq5 | 3.57 | 0.72 | |
| | Perceived behavioral control | Nt1 | 3.50 | 0.76 | |
| | | Nt2 | 3.21 | 0.77 | |
| | | Nt3 | 3.48 | 0.81 | |
| | | Nt4 | 3.33 | 0.72 | |
| | | Nt5 | 3.36 | 0.77 | |
| | Personal ethical standards | Dd1 | 3.22 | 0.88 | |
| | | Dd2 | 3.32 | 0.80 | |
| | | Dd3 | 3.19 | 0.83 | |
| | Expectation of a good life for future generations | Kv1 | 3.16 | 0.78 | |
| | | Kv2 | 3.29 | 0.77 | |
| | | Kv3 | 3.18 | 0.78 | |
| | The emergence of consumer products and sustainable marketing programs | Mar1 | 3.47 | 0.75 | |
| | | Mar2 | 3.23 | 0.74 | |
| | | Mar3 | 3.27 | 0.80 | |
| | | Mar4 | 3.27 | 0.79 | |
| | | Mar5 | 3.23 | 0.78 | |
| | Sustainable | Intention to sustainable | Yd1 | 3.40 | 0.80 |

| | | | | |
|--------------------------------------|-----------------------------|-----|------|------|
| consumption behavior of Gen Z | consumption behavior | Yd2 | 3.25 | 0.78 |
| | | Yd3 | 3.33 | 0.83 |
| | | Yd4 | 3.41 | 0.91 |

Source: Author calculated from survey data

Table 4: Measurement reliability

| | Coefficient of correlation of total variables | α if the variable is excluded | | Coefficient of correlation of total variables | α if the variable is excluded |
|----------|------------------------------------------------------|--------------------------------------|----------|------------------------------------------------------|--------------------------------------|
| α: 0.819 | | | α: 0.813 | | |
| Td1 | 0.606 | 0.788 | Ccq1 | 0.565 | 0.788 |
| Td2 | 0.675 | 0.756 | Ccq2 | 0.587 | 0.781 |
| Td3 | 0.619 | 0.783 | Ccq3 | 0.644 | 0.763 |
| Td4 | 0.666 | 0.762 | Ccq4 | 0.640 | 0.764 |
| | | | Ccq5 | 0.577 | 0.783 |
| α: 0.873 | | | α: 0.743 | | |
| Nt1 | 0.690 | 0.849 | Dd1 | 0.559 | 0.648 |
| Nt2 | 0.710 | 0.845 | Dd2 | 0.568 | 0.637 |
| Nt3 | 0.722 | 0.842 | Dd3 | 0.547 | 0.659 |
| Nt4 | 0.675 | 0.853 | | | |
| Nt5 | 0.710 | 0.844 | | | |
| α: 0.831 | | | α: 0.885 | | |
| Kv1 | 0.711 | 0.746 | Mar1 | 0.761 | 0.852 |
| Kv2 | 0.636 | 0.819 | Mar2 | 0.708 | 0.864 |
| Kv3 | 0.727 | 0.731 | Mar3 | 0.666 | 0.874 |
| | | | Mar4 | 0.789 | 0.845 |
| | | | Mar5 | 0.696 | 0.867 |
| α: 0.851 | | | | | |
| Yd1 | 0.719 | 0.799 | | | |
| Yd2 | 0.618 | 0.840 | | | |
| Yd3 | 0.727 | 0.795 | | | |
| Yd4 | 0.706 | 0.806 | | | |

Note: α: Cronbach alpha's Coefficient

Source: Author's complication

All measures have Cronbach's alpha coefficient > 0.6. The correlation coefficients of the variable-total (Corrected Item-total Correlation) are all greater than 0.3 and are consistent with these scales. Thus, it can be assessed that the above are good and suitable measurement scales to conduct EFA analysis with 29 indicators.

The "Subjective norms" has the highest average of 3.64 , which indicates that Gen Z youth in Vietnam are influenced by the people around them or by social pressure to form their thoughts. The indicator with the highest average is Ccq4 (3.76), which shows that communication through mass media highly affects GenZ's orientation towards sustainable consumption. Other factors such as: "Attitude towards behavior sustainable consumption" (M=3.59); "Perceived behavioral control" (M=3.37); "Personal ethical standards" (M=3.24) all have above-average mean score. This group of factors is also classified as an intrinsic factor, which shows that when Gen Z in Vietnam have a good attitude, high awareness and personal morality towards the

community. These are three strong influencing factors positively towards their sustainable Consumption Intention.

“The emergence of consumer products and sustainable marketing programs” with an average of 3.29 indicates that this is a completely external factor that affects Sustainable Consumption Intent. Mar1 (average 3.47) and Mar3, Mar4 (average 3.27) are two indicators showing the influence of Popularity, including: There are many products and services to serve essential needs; The website helps Gen Z easily find and buy sustainable consumer products at stores, supermarkets, e-commerce sites,... and "Influential reviews and opinions expressed by influencers." Marketing is a reference source and helps to give orientation on sustainable consumption intentions of Gen Z consumers. The other factor is “Expectations for a good life for future generations” which also has an average score of 3,21 is quite similar to the remaining factors.

Regarding “Intention to sustainable consumption behavior of Gen Z in Vietnam”, said the average appropriate score, about 3.34. In particular, the Yd4 indicator has an average score of up to 3.41, which proves that Vietnamese Gen Z are in a state of readiness to learn about sustainable consumption, applications for personal life and more to spread the word, sharing for everyone, creating a sustainable consumer community. Most of the Gen Z participants in the survey knew the concept of "sustainable consumption", but not many people understood and applied this lifestyle. It indicates that Gen Z in Vietnam nowadays have high sustainable consumption intention, thus it is the golden time to promote sustainable consumption behavior.

4.1.2. Exploratory factor analysis (EFA)

The purpose of this step is to reduce the number of observed variables, remove unnecessary variables, and keep only those variables that are really meaningful to the model.

a) EFA for independent variables

Table 4: KMO & Bartlett test and total variance results

| | | | | |
|-----------------------------------------------------------------------|------------|-------------------|-------------------|----------------------|
| KMO . coefficient | | 0.811 | | |
| Bartlett's test | Chi-Square | 3806.225 | | |
| | DF | 300 | | |
| | Sig. | 0.000 | | |
| Factor | | Eigenvalue | | |
| | | Total | % Variance | % accumulated |
| Attitudes towards sustainable consumption | | 6.956 | 27.824 | 27.824 |
| Subjective norms | | 2,870 | 11,478 | 39,302 |
| Perceived behavioral control | | 2.297 | 9,189 | 48,491 |
| Personal ethical standards | | 1,941 | 7,762 | 56,253 |
| Expectation of a good life for future generations | | 1,744 | 6.976 | 63,229 |
| The emergence of consumer products and sustainable marketing programs | | 1,200 | 4,800 | 68.029 |

(Source: Calculation results using SPSS software)

Analysis by SPSS shows that the KMO test results = 0.811 > 0.5 satisfy the requirements for performing EFA, factor analysis is suitable with the research data. Bartlett test results: Sig = 0.000 < 0.05, showing that the variables are correlated with each other on the overall scale, so EFA can be performed. (Table 4)

The EFA results show that there are 6 groups of factors with 29 observed variables. The total cumulative variance of these 6 groups reached 68.029%, showing that the factor explained 68.029% of the variability of the data (*Table 4*). We have the following rotation factor matrix table:

Table 5: Rotation Matrix

| | Factor | | | | | |
|------|--------|-------|-------|-------|-------|-------|
| | first | 2 | 3 | 4 | 5 | 6 |
| Mar4 | 0.884 | | | | | |
| Mar2 | 0.802 | | | | | |
| Mar1 | 0.791 | | | | | |
| Mar5 | 0.760 | | | | | |
| Mar3 | 0.741 | | | | | |
| Nt1 | | 0.824 | | | | |
| Nt3 | | 0.813 | | | | |
| Nt2 | | 0.780 | | | | |
| Nt5 | | 0.737 | | | | |
| Nt4 | | 0.694 | | | | |
| Ccq3 | | | 0.755 | | | |
| Ccq4 | | | 0.751 | | | |
| Ccq1 | | | 0.726 | | | |
| Ccq5 | | | 0.718 | | | |
| Ccq2 | | | 0.715 | | | |
| Td2 | | | | 0.821 | | |
| Td1 | | | | 0.761 | | |
| Td4 | | | | 0.759 | | |
| Td3 | | | | 0.720 | | |
| Kv3 | | | | | 0.857 | |
| Kv1 | | | | | 0.812 | |
| Kv2 | | | | | 0.753 | |
| Dd3 | | | | | | 0.784 |
| Dd2 | | | | | | 0.729 |
| Dd1 | | | | | | 0.611 |

(Source: Calculation results using SPSS software)

According to the results in *Table 5*, all variables have Factor loading coefficient > 0.5, which means it has practical significance, so it is suitable for the scale. After the analysis, we can re-affirm 6 groups of factors affecting the formation of sustainable consumption intention as follows:

Factor 1 is Attitude towards sustainable consumption behavior, including the following 6 variables:

Td1: Focus on life satisfaction rather than just material enjoyment.

Td2: Sustainable consumption is a practical idea

Td3: Sustainable consumption behavior is imperative

Td4 : You support sustainable consumption in Vietnam and accept it.

Factor 2 is Subjective standards including the following 5 variables:

Ccq1: No one feels that I'm eccentric or inconvenient when it comes to daily sustainable consumption

Ccq2: My sustainable consumption decisions are mainly influenced by my family members

Ccq3: Most of the people around (friends, teachers, etc.) encourage me to have sustainable consumption behavior.

Ccq4: The mass media (radio, TV, social networks, etc.) have encouraged me to orient myself towards sustainable consumption behavior.

Ccq5: The current government encourages Gen Z to have sustainable consumption behavior and I see many people choosing this consumption style.

Factor 3 is the perception of self-control, including the following 4 variables:

Nt1: Current concerns (natural environment, epidemics, etc.) have a negative impact on health/personal life and loved ones, so I want to consume sustainably.

Nt2: Sustainable consumption now is an investment/opportunity for Generation Z and the next generation to live in a healthier environment

Nt3: Do I take the time to find out information and choose products for sustainable consumption ?

Nt4: Now I no longer hesitate to buy products for sustainable consumption even though the price is a bit higher.

Nt5: I am not too shy or have trouble finding information, choosing products, pursuing a sustainable lifestyle.

Factor 4 is the Personal Ethical Standard, including the following 3 variables:

Dd1: I feel guilty if I don't practice sustainable consumption behavior in my daily life

Dd2: I believe I have an obligation to practice sustainable consumption behavior to protect life

Dd3: Increasing implementation of sustainable consumption behaviors is one of my orientations in later life.

Factor 5 is the expectation of a good life for future generations, including the following 3 variables:

Kv1: I want Generation Z to live in a healthier environment

Kv2: I hope future generations do not have to bear the heavy consequences of the natural and social environment... Due to irresponsible consumption behavior

Kv3: I wish future generations have the opportunity to develop in a more balanced natural, social,...

Factor 6 is the appearance of sustainable marketing products and programs including the following 5 variables:

Mar1: There are many products and services to serve the essential needs of Gen Z's sustainable consumer lifestyle (safety-convenience-sustainable)

Mar2: The price of sustainable consumer products is no longer so expensive

Mar3: I can easily find sustainable consumer products at stores, supermarkets, e-commerce sites,...

Mar4: Communication programs of the State and of enterprises help me understand and see sustainable consumption easier to apply.

Mar5: Influencer Marketing reviews and opinions are a source of reference and influence for me when choosing sustainable consumption.

b) EFA for the dependent variable

Table 6: KMO and Bartlett test

| | | |
|-------------------|------------|---------|
| KMO . coefficient | | 0.820 |
| Bartlett's test | Chi-Square | 487,186 |
| | DF | 6,000 |
| | Sig. | 0.000 |

(Source: Calculation results using SPSS software)

The results of EFA showed that there was 1 group multiplied by 4 observed variables. We have the component matrix table as follows:

Table 7: Component matrix table

| | Ingredient |
|-----|------------|
| | first |
| Yd3 | 0.856 |
| Yd4 | 0.851 |
| Yd1 | 0.843 |
| Yd2 | 0.777 |

As can be seen from table 6, the KMO test results = 0.820 > 0.5, satisfying the requirements for performing EFA, factor analysis was appropriate with research data. Bartlett test results: Sig = 0.000 < 0.05, for variables that are correlated with each other on the overall scale, EFA can be performed. One main component reflects the Intent factor affecting the sustainable consumption behavior of Gen Z youth today as follows:

Yd1: I will practice the practice of sustainable consumption behavior every day

Yd2: I am willing to learn and share knowledge about sustainable consumption for everyone

Yd3: I will make efforts to implement sustainable consumption behavior in my life even though I am young now

Yd4 : I will encourage relatives and friends to form sustainable consumption habits

Common criteria used to evaluate the fit of the model to market data include: χ^2 (Chi-square), χ^2 - adjusted for degrees of freedom (Chi-square/df), GFI, CFI and RMSEA is considered:

+ The value χ^2 has a corresponding P-value of 0.000 < 0.05, Chi-square/df = 2.726 < 3 is good.

+ GFI = 0.814, CFI = 0.817 all > 0.8 is acceptable

+ RMSEA = 0.076 < 0.08 shows that the model's fit with market data is good.

4.1.3. Confirmatory factor analysis (CFA)

The purpose of this step is to test the fit of the model through different criteria.

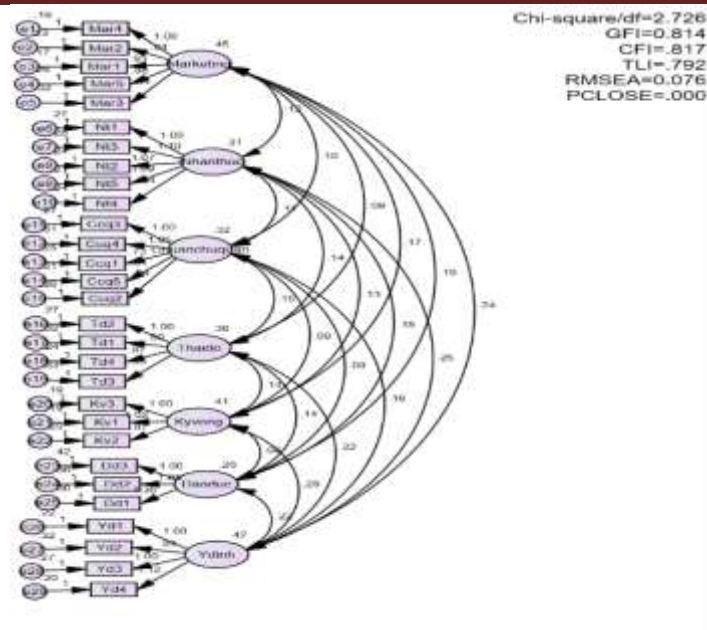


Figure 2: CFA . Diagram

Building a linear structural model SEM

The research model is built based on 6 factors affecting the dynamics with the following results:

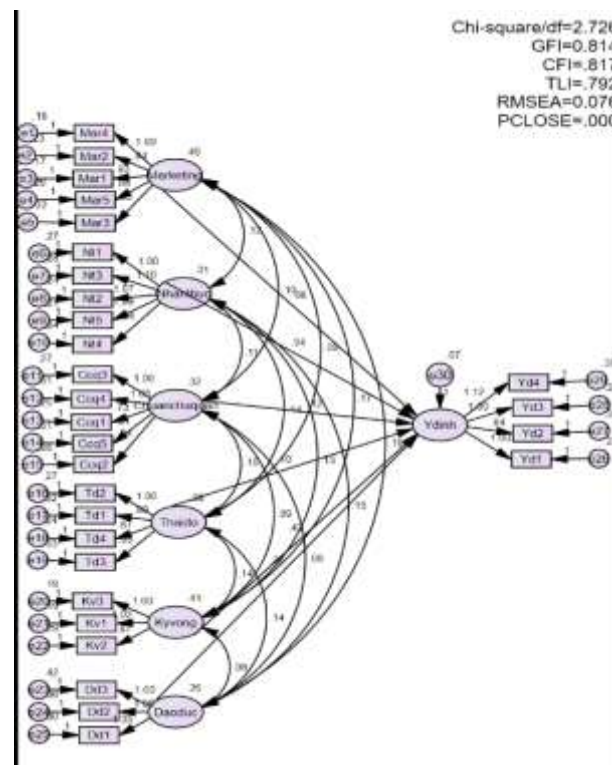


Figure 3: SEM linear structure model

Evaluate the overall fit of the model:

Common criteria used to assess the fit of the model with market data include: χ^2 (Chi-square), χ^2 - adjusted for degrees of freedom (Chi-square/df), GFI, CFI, TLI and RMSEA are considered:

- + The value 2 has a corresponding P-value of $0.000 < 0.05$, Chi-square/df = $2.726 < 3$ is good
- + GFI = 0.814, CFI = 0.817 all > 0.8 is acceptable
- + RMSEA = $0.076 < 0.08$ shows that the model's fit with market data is good.

These indicators are at acceptable levels, so the above model is suitable.

Table 8 : Regression weights – SEM

| | | | Weight | P-value |
|-------|------|--------------|--------|---------|
| Ydinh | <--- | Mar | 0.079 | 0.168 |
| Ydinh | <--- | Nhanthuc | 0.344 | *** |
| Ydinh | <--- | Chuanchuquan | 0.116 | 0.043 |
| Ydinh | <--- | Thaido | 0.1 | 0.094 |
| Ydinh | <--- | Kyvong | 0.429 | *** |
| Ydinh | <--- | Morality | 0.37 | *** |

Table 9: Normalized Regression Weights - SEM

| | | | Weight |
|-------|------|--------------|--------|
| Ydinh | <--- | Nhanthuc | *** |
| Ydinh | <--- | Chuanchuquan | 0.043 |
| Ydinh | <--- | Kyvong | *** |
| Ydinh | <--- | Morality | *** |

(Source: Summary results from Normalized Regression Weighted Results)

Table 10: Factor of determination - SEM

| | Weight |
|-------|--------|
| Ydinh | .839 |

(Source: Summary results from the Coefficient of Determination Results)

Monadity:

This measurement model is consistent with market data and there is no correlation between the measurement errors of the indicators, so it achieves monadism. (Figure 5)

Distinguishing value:

The correlation coefficients of the components of the variables are all smaller than the unit value (the largest correlation coefficient is between "Perception" and "Intention" with a value of 0.703, the lowest is between "Appearance of products and services". sustainable marketing products/programs” with “Attitudes” having a value of 0.224), so the scale achieves discriminant value (Steenkamp & Van Trijp, 1991). (Table 8)

In table 9, with 95% confidence, the P-value of the factors "Appearance of sustainable marketing products/programs" and "Attitudes towards sustainable consumption behavior" is 0.168; 0.094 are all > 0.05. Therefore, this factor does not really affect the Sustainable Consumption Intent and Behavior of Gen Z. The remaining factors of Perception, Expectations, Subjective Standards and Personal Ethical Standards really affect the Sustainable Consumption Intent because all four have P-value < 0.05 (0.000; 0.000; 0.043; 0.000). In addition, the unnormalized weights of all 6 factors are > 0 or have positive signs, which shows that these factors have a positive influence on the intention and sustainable consumption behavior of Gen Z.

After reviewing the results of the Regression Weighted Table - SEM, with 95% confidence, the factor "Appearance of sustainable marketing products/programs" and "Attitude towards behavior" sustainable consumption” does not really affect the Sustainable Consumption Intent and Behavior of Vietnamese Gen Z.

Thus, we will not consider the standardized regression coefficient of these variables. The variables that significantly affect the Sustainable consumption intention are 4 variables belonging to internal motivation (Perception; Expectations; Ethics) and extrinsic motivation (Standard norms) (*Table 9*). It can be seen that the normalized regression coefficients of all four are positive, so these variables have a direct positive influence on Intention and indirectly on the decision to perform sustainable consumption behavior. Subjective norms have the highest influence on the intention to decide on sustainable consumption behavior by having the largest standardized weight of 0.043. The remaining three factors have the same normalized weights.

The coefficient R^2 of the intention to determine sustainable consumption behavior is 0.839 or four variables, namely: Perceived behavioral control, Expectation of a good life for future generations, Personal ethical standards and Standards Norms explains 83.9% variation of the intention to choose sustainable consumption behavior of Gen Z in Vietnam. (*Table 10*)

4.2. Discussion

The author conducts data analysis after collecting a sample size of 353, with 6 independent variables, 1 dependent variable and 29 observed variables. The data analysis process is as follows: The variable-total correlation coefficient and Cronbach's Alpha coefficient were used to test the reliability of the scale. The test results show that the scale proposed by the author is good and the variables are suitable for the scale. The EFA is then used to identify the factors that affect the Intention to decide on sustainable consumption behavior. The results considering the correlation between variables are very good. After analyzing EFA, the results show that there are 6 groups of factors of the independent variable and 1 factor of the dependent variable with a total of 29 observed variables and all variables are assessed as being in accordance with the scale. The CFA is conducted to evaluate the validity (convergence and discrimination) of the scale. The results show that this measurement model is consistent with market data and there is no correlation between measurement errors, so it achieves monadism. The scale achieves discriminant value and meets reliability requirements. The author continues to test the research model by SEM linear structure model. The results show that there are 4 factors, namely: Perceived behavioral control, Expectation of a better life for future generations, Personal ethical standards, and Subjective norms have a direct and positive influence on the intention to decide on sustainable consumption behavior, in which the Subjective norms is the most influential factor. This result can be explained by the fact that Vietnam follows collectivism culture in which the cohesiveness among individuals and prioritization of the group over the individual are highly accepted. In such culture, individual behavior is directed by social norms and what others think of.

5. Conclusion and Implication

This study sought to understand the specific factors that drive the intention to consume sustainable products, focusing on gen Z behavior. Using the TPB, we investigated how attitude towards sustainable consumption, subjective norms and perceived behavioral control influence sustainable consumption of Gen Z in Vietnam. Adding to the existing literature on the TPB, we include three more factors, namely: personal ethic standards, expectation of good life for future generations, the emergence of consumer products and sustainable marketing programs. We found that the four factors that have the strongest influence on the intention to decide on sustainable consumption behavior are the expectation of a better life for future generations, perceived behavioral control, subjective norms, and personal ethic standards. These four factors explain 83.9% of the variation of the data when analyzing the coefficient of determination SEM.

This study is among the pioneering studies on sustainable consumption in developing countries, with the focus on gen Z segmentation. The findings help recommend strategies for triadic parties (the Seller, the Buyer and the Regulator) to promote sustainable consumption among young generation.

For the consumers: First, it is vital to maintain the correct perception of sustainable consumption. Every young Gen Z needs to understand that Sustainable consumption is not about cutting demand but about controlling consumption, not spending lavishly and wastefully to meet current needs, not affecting resources and living environment of future generations. Another solution is to practice mindful consumption. Mindful

consumption is the application of mindfulness by consumers to make consumption choices. Practicing mindful consumption will help Gen Z youth gradually transform their behavior into calming self-defeating attitudes related to engaging, repetitive, and rewarding consumption

For firms: First, companies should employ social responsibility and sustainable production orientation. Businesses with a commitment to social responsibility and sustainable consumption orientation will have a place in the priority list of Gen Z customers. Businesses need to increase the credibility of their commitments through actual actions. These commitments should be made public for consumers to know and also become a driving force for businesses. Additionally, firms need to communicate actual images/information in the process of making those commitments to create trust in customers. *Second, the production application follows the circular economy model.* All "waste" of a consumer production process should be treated as raw material for other consumer production processes. Some typical models towards circular economy in the field of efficient use of energy have been actively deployed by the Ministry of Industry and Trade in recent years. For instance: pilot use model of alternative energy forms and energy-saving household model; applying the energy management model in industrial facilities, etc. *Third, research and develop more sustainable products and marketing programs and work closely with governmental and non-governmental organizations.* Businesses need to closely coordinate with governmental, non-governmental and local organizations in their business activities because these are agencies that are very interested in sustainable development and ready to support for businesses that want to follow this path. Enterprises can also proactively propose support options suitable to their actual situation and needs, such as support for capital, human resources, or brand, for procedures. administration, etc., so that the business's sustainable marketing strategies achieve the desired spillover results.

For regulators: First, the government should focus on educational activities on sustainable consumption issues to raise awareness on the matters. While more than 50% of Gen Z are still students, the combination of awareness education programs and the integration of sustainable consumption behavior orientation is especially necessary at all levels of education. *Second, amend, supplement or add policies to promote sustainable consumption behavior with all groups of subjects and all areas of society.* Specifically, the State needs to build and develop the legal framework and policies on sustainable consumption so that it is synchronous and consistent. A number of policies to encourage sustainable consumption need to be developed, such as: Green labeling program; Green procurement in the public sector; Program to limit products harmful to the environment and recycle. *Third, continue propaganda and communication campaign about the need of sustainable consumption.* Propaganda from the government not only raises awareness of Gen Z but also general public about the meaning and importance of sustainable consumption for the living environment and human health.

The current research is not without limitations. While it sheds light on sustainable consumption behavior of gen Z, the research results may not be generalized to whole population since other generations also present significantly different behavior. Therefore, for future research, it is worthy to explore consumption behaviour of other generations such as millennials, anpha, etc.

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FACTORS AFFECTING HANOIAN CONSUMERS' ATTITUDE AND BEHAVIOR TOWARDS ECO-FRIENDLY BAGS: A PLS – SEM APPROACH

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ABSTRACT

Plastic waste is becoming an increasingly critical problem in Vietnam, particularly in major cities. As a result, this study was done to clarify the factors affecting Hanoians' consumer attitudes and behavior toward eco-friendly shopping bags through a survey of 206 persons residing in Hanoi and qualitative interviews. The results of the partial least squares linear structural model (PLS-SEM) and confirmatory factor analysis (CFA) revealed the influence of groups of factors including Personal factors, Environmental factors, and Factors related to bag-characteristics on the Attitude and Behavior of using eco-friendly bags, as well as affirming the positive impact of attitude on the behavior of using eco-friendly shopping bags. Since then, a number of alternatives for the municipal administration, supermarkets, businesses, and manufacturers to stimulate consumption of these products have been offered.

Keywords: Attitudes, Behavior, Eco-friendly shopping bags, PLS-SEM.

1. Introduction

According to statistics from the Ministry of Natural Resources and Environment in 2020, a Vietnamese household on average used up to 1kg of plastic bags every month. The total amount of plastic waste, including plastic bags, exceeded 5.1 million tons nationwide in 2018 (UNEP, 2018). In regard to the report of the Ministry of Natural Resources and Environment in 2019, Vietnam was in the top four Asian countries generating the most plastic waste (after China, Indonesia, and the Philippines), using 30 to 40 kg of plastic per person per year. In Hanoi, the daily amount of domestic waste is from 5,500 to 6,000 tons, of which about 50 to 60 tons are plastic waste, accounting for nearly 10% (Department of Natural Resources and Environment, 2019). However, only about 10% of the amount of plastic waste has been treated, which is still a low rate. This fact has already posed a burden to the environment of the capital city and the nation as well. Therefore, it is necessary to do research on Hanoi people's environmentally friendly consumption, from which to propose recommendations for switching from the habit of using plastic bags to other eco-friendly products.

In acknowledgment of the importance of encouraging Hanoi consumers to use eco-friendly bags instead of disposable plastic bags, the authors decided to carry out the research "Factors affecting Hanoi consumers' attitude and behavior towards eco-friendly bags: A PLS-SEM approach". This study systematized the theoretical basis related to the consumers' attitude and behavior toward eco-friendly bags, as well as building a research framework on the factors affecting the attitude and behavior of Hanoi consumers. The PLS-SEM method was applied to determine the influence level of each of these factors, and thereby solutions were proposed to promote the use of environmentally friendly shopping bags.

2. Theoretical framework and literature review on consumer attitudes and behavior towards eco-friendly shopping bags

2.1. Eco-friendly shopping bags

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In Vietnam, Decree No. 19/2015/ND-CP dated February 14, 2015, stating in detail the implementation of a number of articles of the Law on Environmental Protection 2014, provides the definition of environmentally friendly products in Article 3, Clause 9. Accordingly, environmentally friendly products are those that meet the criteria of eco-labels and are certified with eco-labels". The criterion "meeting eco-label criteria" is a necessary condition and the criterion "certified ecolabel" is a sufficient condition for a product to be deemed an eco-friendly product.

There are 04 types of eco-friendly shopping bags that are popular in Vietnam. The first type is self-destructing plastic bags. It is an eco-friendly bag derived from plants and is considered one of the most effective ways to improve the living environment while still meeting the demand for shopping bags. Self-destructing plastic bags consist of 2 main ingredients: plant-based powders such as tapioca, cornstarch, cornstarch... and biodegradable plastic. The second type is paper bags made from 100% natural wood, which governments in developed countries have especially encouraged people to use over the past decades. The third type is non-woven bags made from materials such as jute, sackcloth, hemp, etc., without the use of dyes or bleach and can be reused many times because their durability can last up to 5 years. When burned, they are tasteless, non-toxic and 100% biodegradable. Non-woven bags are internationally recognized as eco-friendly products. The last type is plastic shopping bags, usually made of plastic film, plastic, flexible plastic or non-woven fabric. Most plastic bags are heat sealed at the seams, while some are bonded with adhesives or sewn securely. The benefits of plastic shopping bags completely outweigh those of traditional plastic bags.

2.2. Attitudes towards eco-friendly shopping bags consumption

In The Theory of Planned Behavior (TPB), Ajzen defined attitude towards behavior as an individual's evaluation of the results obtained from performing a particular behavior. Thus, the attitude towards the use of eco-friendly products is a factor that directly affects sustainable consumption behavior (Ajzen, 1991).

To measure the attitude towards the consumption of sustainable products, the authors can make statements such as: "Using environmentally friendly products makes me feel comfortable/satisfied/trusted/different". By using a Likert scale from 1 to 5 or from 1 to 7 for the level of agreement with the above statement, the author can measure consumers' attitudes towards using eco-friendly products as alternatives to plastic products (Su Ngoc Diep et al., 2021; Cai Trinh Minh Quoc et al., 2020; Ho Huy Tuu et al., 2018).

2.3. Behavior of eco-friendly shopping bag consumption

Consumption behavior of eco-friendly shopping bag products can be listed in the group of green consumption behaviors (or sustainable consumption behaviors). Green consumption behavior is environmentally responsible consumption, in which consumers consider the environmental impacts of purchasing, using and disposing of normal products in comparison with those of using environmentally friendly products and services (Moisander, 2007). Green consumption can also be deemed as the behavior of consuming environmentally friendly products, avoiding products that are harmful to the environment (Chan, 2001). Environmentally friendly products are energy-saving products, organic products, biodegradable products or those that do not do any harm to the environment (Grinstein et al., 1997).

Previous studies in Vietnam approached the consumer behavior of eco-friendly products in general and eco-friendly shopping bags in particular from the perspective of planned behavior. That is, the behavior of using a type of product is measured through statements related to the use such as: "I am completely satisfied with the use of eco-friendly products", "I am encouraged to use eco-friendly products"; "I always speak well of eco-friendly products"; "I recommend buying/using environmentally friendly products to my friends and relatives" (Cai Trinh Minh Quoc et al., 2020).

2.4. Factors affecting the consumer attitudes and behavior towards eco-friendly shopping bags

2.4.1. Factors affecting attitudes towards eco-friendly shopping bags consumption

Personal Factors. Research by Su Ngoc Diep et al (2020) proved that the factors Environmental awareness, Green lifestyle, and Self-assessment of environmental friendliness had a direct and positive

influence on the Attitudes towards the consumption of environmentally friendly products. Kai & Haokai (2016), Mostafa (2006), Yadav & Pathak (2016) and Abdullah et al (2018) proved the positive impact of the factor Concern about environmental issues on Attitudes towards the purchase and use of eco-friendly products.

External environmental factors. Most studies have not delved into the relationship between the external environment and attitudes towards the use of environmentally friendly products. However, through qualitative interviews, the authors found that a number of external factors could affect the Attitude towards shopping using eco-friendly bags, including Subjective Norms and Advertising strategies of supermarkets and brands.

Factors related to the characteristics of the bag. Qualitative interviews revealed that consumers were concerned about characteristics such as Foldability, Water Resistance, Versatility, Material, Certified Eco-Friendly Bags. In addition, the interviewed consumers also acknowledged the impact of the availability of eco-friendly bags on Attitudes towards the consumption of eco-friendly bags.

2.4.2. Factors affecting behavior of eco-friendly shopping bags consumption

Personal factors. In the study of Su Ngoc Diep et al (2020), all personal factors directly affecting Attitude have either direct or indirect influence on Behavior of using eco-friendly products. In particular, while Environmental Awareness and Self-assessment of environmental friendliness have an indirect impact, Green lifestyle were shown to have a direct influence on Behavior using eco-friendly products. Environmental literacy was shown to have a positive influence on attitudes and behaviors of Hungarian high school and university students (Zsóka et al., 2013) and of American consumers (Polonsky, 2012). Kai & Haokai (2016), Mostafa (2006), Yadav & Pathak (2016), Abdullah et al (2018) demonstrated that Environmental concern has a positive influence on eco-friendly consumer behavior. According to Cai Trinh Minh Quoc et al (2020), Concern about future generations had an indirect influence on behavior of using eco-friendly bags through behavioral intentions.

External environmental factors. According to Ajzen's Theory of Planned Behavior (1991), Subjective norms proved to directly influence sustainable consumption behavior. Subjective norms are known as an individual's perceptions of a particular behavior and greatly influenced by the perception and behavior of people around (family, friends, colleagues, etc.). The closer the people around them are, the greater their impact on the individual's behavior (Ari & Yilmaz, 2015). However, research by Arifani & Haryanto (2018) and Cai Trinh Minh Quoc et al. (2020) showed that Subjective norms have almost no significant impact on consumers' intention to use eco-friendly bags. Appropriate supermarket and brand advertising campaigns were also shown to increase positive attitudes and encourage eco-friendly consumption behavior (K. Peattie & S. Peattie, 2009; Muralidharan & K. Sheehan, 2016).

Factors related to the characteristics of eco-friendly bags. Research by Chen et al (2021) showed that consumers cared about the characteristics of environmentally friendly products and preferred convenient features of products when making decisions. Purchase. Qualitative interview process showed that consumers were interested in specific characteristics such as Foldability, Water Resistance, Versatility, Material, Certified Eco-Friendly Bag. Besides, the Availability of eco-friendly bags and the Personal imprint on the products were also major concerns, which had a certain influence on consumer behavior (Lea & Worsley, 2008); I. Vermeir & W. Verbeke, 2008; Young et al., 2010).

2.5. Research Overview

In order to approach and explain green consumption behavior, previous studies focused on analyzing attitudes and behavioral intentions towards environmentally friendly products. These include the studies of Myriam Ertz et al (2017), Joshua O'Brien & Gladman Thondhlana (2019), Yatish Yoshi & Zillur Rahman (2015) ... Most studies use the Theory of Reasoned Action by Ajzen and Fishberg and the Theory of Planned Behavior (TPB) developed by Ajzen. According to the Theory of Reasoned Action, an individual's behavior is determined by two main factors: Attitude and Subjective norm. Meanwhile, the Theory of Planned Behavior has added one more factor affecting behavior, which is Perceived behavioral control.

Many studies followed the Theory of Planned Behavior to analyze consumer attitudes, intentions and behaviors related to environmentally friendly products. Cai Trinh Minh Quoc et al (2020) pointed out that 04 factors include: "Attitude towards environmentally friendly bag products", "Personal ethical standards", "Expectations for a good life for future generations" and "Green Marketing Programs at Supermarkets" directly affect the intention to use eco-friendly bags and indirectly affect the people's behavior of using eco-friendly bags in Hue city. Ho Huy Tuu et al (2018) showed that Attitude, Social Influence, Behavior Control, Risk, and Trust have a positive influence on green consumption behavior of Nha Trang people. In 2018, the study of Abdullah Al Mamun et al added the elements Ecological understanding and Environmental concern that directly and positively affect Attitudes towards environmentally friendly products. At the same time, 3 factors in TPB theory which are Attitude, Subjective standards and Perceived behavioral control, have a positive influence on the willingness to pay for environmentally friendly products, thereby indirectly affecting the buying behavior of environmentally friendly products. Myriam Ertz et al (2017) improved the Theory of Planned Behavior by adding the Perspectives of Contextual Facilitation and Motivation to the model. Accordingly, the consumer's perception of the convenience of the context has a direct and positive influence on the factors of Motivation, Attitude, Perception of behavioral control; and Motivation also has a direct impact on intention to use reusable boxes.

In recent years, a number of studies on sustainable consumption behavior have expanded the research model and approached external factors. The research model of Su Ngoc Diep et al (2020) divided the factors affecting shopping attitudes and behaviors using environmentally friendly products into 2 main groups: Internal factors and External factors. In which, the group of internal factors includes Environmental Knowledge, Green Lifestyle, Self-assessment of the level of environmental friendliness. The group of external factors includes Promotion for environmentally friendly products, Advertising for environmentally friendly products, Environmental reputation.

In addition, there are also studies on green consumption approaching companies, businesses, and stores. Do Huong Giang (2020) has shown that green procurement activities of enterprises are influenced by the size of enterprises, the type of businesses, the field of operation and the market of enterprises. In 2018, research by Roger Spranz, Achim Schlüter & Björn Vollan showed that 03 factors including Social Norms, Indirect cash flow promotion and Government permission all affect stores' environmental behavior.

3. Research model and hypotheses

Based on the synthesis and analysis of previous research results along with customer interviews in Hanoi, the research team proposes a new research framework on the factors affecting Hanoi consumers' attitudes and behavior when going to supermarkets and/or convenience stores, which includes three main groups of factors: (1) Personal factors; (2) External factors; and (3) Eco-friendly bag characteristics.

The following research hypotheses are proposed:

H1a: Environmental understanding related to eco-friendly bags has a direct and positive impact on attitudes towards shopping using eco-friendly bags.

H1b: Environmental understanding related to eco-friendly bags has a direct and positive impact on shopping behavior using eco-friendly bags.

H2a: Environmental concerns have a direct and positive impact on attitudes towards shopping using eco-friendly bags.

H2b: Environmental concerns have a direct and positive impact on shopping behavior using eco-friendly bags.

H3a: Green lifestyle has a direct and positive impact on attitudes towards shopping using eco-friendly bags.

H3b: Green lifestyle has a direct and positive impact on shopping behavior using eco-friendly bags.

H4a: Concern for future generations has a direct and positive impact on attitudes towards shopping using eco-friendly bags.

H4b: Concern for future generations has a direct and positive impact on shopping behavior using eco-friendly bags.

H5a: Subjective Norms have a direct and positive impact on attitudes towards purchasing eco-friendly bags.

H5b: Subjective Norms have an indirect and positive impact on eco-friendly bag purchasing behavior.

H6a: Marketing campaigns from stores and distributors for eco-friendly bags have a direct and positive impact on attitudes towards shopping using eco-friendly bags.

H6b: Marketing campaigns from stores and distributors for eco-friendly bags have a direct and positive impact on shopping behavior using eco-friendly bags.

H7a: If consumers are concerned about the characteristics of eco-friendly bags, they will have positive attitudes towards using eco-friendly bags.

H7b: If consumers are concerned about the characteristics of eco-friendly bags, they will have the behavior of using eco-friendly bags.

H8a: Personal impression has a direct and positive impact on attitudes towards shopping using eco-friendly bags.

H8b: Personal imprint has an indirect and positive impact on shopping behavior using eco-friendly bags.

H9a: Availability of eco-friendly bag products has a direct, positive impact on attitudes towards shopping using eco-friendly bags.

H9b: Availability of eco-friendly bag products has a direct, positive impact on shopping behavior using eco-friendly bags.

H10: Attitude towards shopping using eco-friendly bags has a direct and positive impact on shopping behavior using eco-friendly bags.

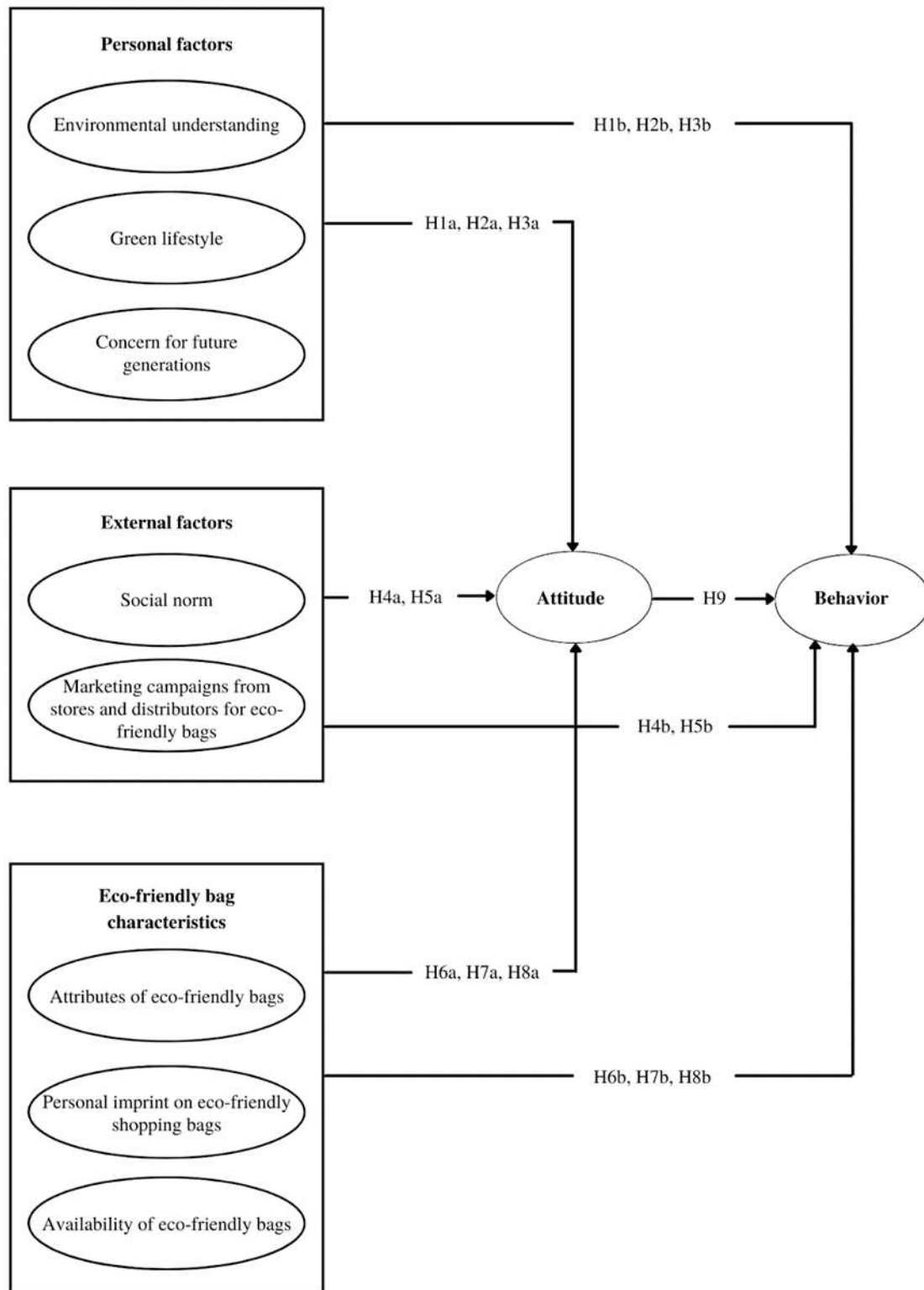


Figure 1. Proposed research model

Source: Suggested by the authors

4. Research Methods

4.1. Questionnaire design and scale development

The research model provides 8 factors affecting Attitudes towards using eco-friendly bags and Behaviors on using eco-friendly bags, including: (1) Environmental understanding regarding eco-friendly bags, (2) Green lifestyle, (3) Concern for the environment and future generations, (4) Subjective Norms, (5) Marketing campaigns of supermarkets and brands, (6) Characteristics of eco-friendly bags, (7) Personal

imprint on eco-friendly bags, (8) Availability of eco-friendly bag products. These factors are latent constructs and are measured through related (measurable) statements. Group of personal factors includes (1), (2), (3); group of external factors including (4) and (5); group of factors related to bag products includes (6), (7) and (8).

Table 1. Factors and observed variables in the model

| Question | Code | References |
|------------------------------------------------------------------------------------------|--------------|-----------------------------------------------------|
| Environmental understanding regarding eco-friendly bags | | |
| Using eco-friendly bags is good for the environment. | hieubietmt1 | |
| Using eco-friendly bags is good for human health. | hieubietmt2 | |
| Using eco-friendly bags helps to reduce the impact of climate change. | hieubietmt3 | hieubietmt1 → hieubietmt5: Duan & Sheng (2018) |
| Using eco-friendly bags helps to reduce the waste of natural resources. | hieubietmt4 | |
| Using eco-friendly bags will reduce the burden on solid waste disposal. | hieubietmt5 | |
| Green lifestyle | | |
| I have a habit of updating news on environmental issues. | loisongxanh1 | loisongxanh1,2: Newton & Meyer (2013) |
| I have a habit of discussing environmental issues with others. | loisongxanh2 | |
| I always choose products that are biodegradable and/or made from eco-friendly materials. | loisongxanh3 | loisongxanh3 → loisongxanh6: Duan & Sheng (2018) |
| I often think about recycling bags, boxes, ... when possible. | loisongxanh4 | |
| I frequently participate in environmental volunteer projects. | loisongxanh5 | |
| I regularly implement energy saving in my house to protect the environment. | loisongxanh6 | |
| Concern for the environment and future generations | | |
| I consider environmental protection a priority in every thought and action. | quantammt1 | quantammt1: Self-developed by author team |
| I avoid using bags, plastic/nylon packaging. | quantammt2 | quantammt2: Duan & Sheng (2018) |
| I want future generations to be able to live in a healthy environment. | quantammt3 | quantammt3,4: Newton & Mayor (2013) |
| I want future generations to have good health. | quantammt4 | |
| Subjective Norms for using eco-friendly bags | | |

| Question | Code | References |
|--------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------------------------------------------|
| My shopping decisions are influenced by the people around me. | chuanchuquan1 | |
| My relatives and friends often talk and encourage the use of eco-friendly bags. | chuanchuquan2 | |
| My agency/organization/school regularly informs and promotes the use of eco-friendly bags. | chuanchuquan3 | chuanchuquan1 → chuanchuquan5: Ajzen (1991) |
| Mass media regularly informs and encourages the use of eco-friendly bags. | chuanchuquan4 | |
| The government regularly informs and encourages consumers to use eco-friendly bags. | chuanchuquan5 | |
| Marketing campaigns of supermarkets and brands | | |
| There are many communication campaigns (banners, slogans) to encourage the use of eco-friendly bags at supermarkets/stores. | sthiqcao1 | sthiqcao1: Self-developed by author team |
| There are many communication campaigns promoting the use of eco-friendly bags on websites and social networks (Facebook) of supermarkets/stores. | sthiqcao2 | sthiqcao2: Su Ngoc Diep et al. (2020) |
| I receive incentives (discounts, gift vouchers, vouchers, reward points...) if I bring my bag when I go shopping. | sthiqcao3 | sthiqcao3: Su Ngoc Diep et al. (2020) |
| My favorite brand encourages the use of eco-friendly bags by giving away bags to customers. | nhanhang1 | nhanhang1,2: Self-developed by author team |
| My favorite brand encourages the use of eco-friendly bags with advertising and communication campaigns. | nhanhang2 | |
| Characteristics of eco-friendly bags | | |
| Durability (reusable, washable). | tui1 | |
| Fashion (beautiful, eye-catching, color ...). | tui2 | |
| Can be folded compactly. | tui3 | |
| Big size. | tui4 | |
| Water resistance. | tui5 | tui1→tui9: Self-developed by author team |
| Price. | tui6 | |
| Versatility. | tui7 | |
| Material. | tui8 | |
| The bag has an eco-friendly certificate. | tui9 | |

| Question | Code | References |
|-------------------------------------------------------------------------------------------|---------|----------------------------------------------------------------------|
| Personal imprint on eco-friendly bags | | |
| Eco-friendly bag with my name on it. | canhan1 | canhan1 → canhan3: Self-developed by author team based on interviews |
| Eco-friendly bags printed with slogans related to environmental protection. | canhan2 | |
| Eco-friendly bag has my favorite slogans printed on it. | canhan3 | |
| Availability of eco-friendly bag products | | |
| Supermarkets/stores provide free eco-friendly bags to customers. | sanco1 | sanco1,2: Self-developed by author team based on interviews |
| Supermarkets/stores have many stalls selling eco-friendly bags. | sanco2 | |
| Attitude towards the use of eco-friendly bags | | |
| Using eco-friendly bags when shopping makes me feel comfortable. | thaido1 | thaido1,4: Morschett et al. (2005) |
| Using eco-friendly bags when shopping makes me feel convenient. | thaido2 | thaido2,3: Self-developed by author team based on interviews |
| Using eco-friendly bags when shopping makes me feel different. | thaido3 | |
| Using eco-friendly bags when shopping makes me feel responsible for the environment. | thaido4 | |
| Behavior of using eco-friendly shopping bags | | |
| I often carry eco-friendly bags with me when I go shopping. | hanhvi1 | hanhvi1: Sharp et al. (2010) |
| I am encouraged to use eco-friendly bags every time I go shopping. | hanhvi2 | hanhvi2 → hanhvi4: Arnold & Reynolds (2009) |
| I always speak well about using eco-friendly bags with family and friends. | hanhvi3 | |
| I recommend eco-friendly bags to family, friends, acquaintances to encourage them to use. | hanhvi4 | |
| | | |

Source: Authors' Compilation

Participants in the survey were asked to rate the degree of agreement on each measurement item using a 7-point Likert scale with 1 being “Strongly Disagree” and 7 being “Strongly Agree”.

To determine the scale proposed above is appropriate, the research team conducted a pilot test before collecting official data. The results of exploratory factor analysis for new latent variables such as concern for future generations are highly correlated with environmental concerns, so these two groups of factors are grouped together into “Concern for the environment and future generations”. The statements about factors

such as characteristics, availability and personal imprint on bags all represent good scales for these latent variables.

4.2. Research samples and Data collection method

The study was conducted on consumers in Hanoi city who shop at supermarkets and/or convenience stores. Because the PLS-SEM analysis method has the advantage of not being limited to the number of research samples, the authors collected data by surveying online and offline in April 2021.

The survey was designed into 3 main parts. The first part introduced the purpose of the survey; the second part of the survey focused on collecting information and opinions of the sample related to measured variables; and the last part was the basic demographic information of the sample. After collecting, sifting, and cleaning data, the authors had collected a sample including 206 answer sheets in Hanoi.

4.3. Analytical methods

The above 206 samples were analyzed by the PLS-SEM method on SmartPLS 3.0 and STATA 15 softwares. Analysis by the PLS-SEM model was used to test the research hypotheses. Test standards were taken as usual at the 10% significance level. To test the hypotheses, the p-values of the regression weights were directly compared with 0.1. To assess the robustness of the model, the authors used the bootstrap test with a returned sample size of 500. The model fit criterion in the analysis of the linear least squares structural model was the factor R^2 .

The study used Confirmatory Factor Analysis (CFA) with orthogonal rotation (varimax) to obtain the smallest number of factors and to test the robustness of the scale for latent variables (Hair et al., 2006). Confirmatory factor analysis with a critical model was used to evaluate the model's compatibility with actual data, convergent value and discriminant value of the concepts in the model. The estimation method used was Principal Component Factor analysis.

5. Research Results

5.1. Results of the scale evaluation

The results of the CFA test show that the observed variables Environmental understanding and Environmental concerns quantamnt3 and quantamnt4 tend to explain the same latent variable, Environmental understanding. In addition, the EFA analysis also showed that quantamnt1 and quantamnt2 factors have the same trend with factors in observed variables Green lifestyle. Therefore, these two factors of the variable Environmental awareness and Environmental concerns are combined to become an observed variable, which is Green Lifestyle.

The group of external factors and the characteristics of the bag also changed after performing a scale assessment with the number of samples collected. Specifically, the Availability of bags tends to explain together with the group of marketing campaign factors of supermarkets and brands. After considering the general characteristics of the remaining factors after EFA analysis, the authors found that the factors sanc01, sthiquao1, sthiquao2, quickang1, quickang2 all reflect the availability of eco-friendly bags coming from supermarkets or supermarkets. brand name. Therefore, this group of factors is combined into a latent variable, the availability of the eco-friendly bag. Subjective Norms are evaluated through 4 factors (chuanchuquan2 – chuanchuquan5) instead of 5 factors as originally proposed.

Using CFA analysis once again confirms the stability of the scale for two latent variables Attitude and Behavior of using environmentally friendly shopping bags. All groups of factors proposed in Table 1 satisfy the condition that the load factor is greater than 0.5.

5.2. Results of the measurement model evaluation

From the analysis results confirming the above scale, the authors continue to perform PLS-SEM analysis to verify and evaluate the measurement model. The measurement model is used to evaluate the convergence value and reliability of the measured factors, thereby confirming the reliability of using these factors as the scale for the latent variable.

Table 2. The measurement model evaluation

| Construct | Outer loading | Cronbach's alpha | CR | AVE |
|-------------------------------------------------------------------------|----------------------|-------------------------|-----------|------------|
| <i>Environmental understanding (hieubietmt)</i> | | 0.935 | 0.947 | 0.72 |
| hieubietmt1 | 0.797 | | | |
| hieubietmt2 | 0.876 | | | |
| hieubietmt3 | 0.909 | | | |
| hieubietmt4 | 0.903 | | | |
| hieubietmt5 | 0.879 | | | |
| quantammt3 | 0.772 | | | |
| quantammt4 | 0.794 | | | |
| <i>Availability of eco-friendly bags (sanco)</i> | | 0.898 | 0.92 | 0.66 |
| sanco1 | 0.666 | | | |
| sthiqcao1 | 0.864 | | | |
| sthiqcao2 | 0.867 | | | |
| sthiqcao3 | 0.788 | | | |
| nhanhang1 | 0.823 | | | |
| nhanhang2 | 0.85 | | | |
| <i>Subjective Norms towards eco-friendly bags (chuanchuquan)</i> | | 0.871 | 0.911 | 0.719 |
| chuanchuquan2 | 0.816 | | | |
| chuanchuquan3 | 0.836 | | | |
| chuanchuquan4 | 0.847 | | | |
| chuanchuquan5 | 0.89 | | | |
| <i>Green Lifestyle(lsx)</i> | | 0.889 | 0.911 | 0.562 |
| quantammt1 | 0.681 | | | |
| quantammt2 | 0.75 | | | |
| loisongxanh1 | 0.75 | | | |
| loisongxanh2 | 0.734 | | | |
| loisongxanh3 | 0.78 | | | |
| loisongxanh4 | 0.757 | | | |
| loisongxanh5 | 0.821 | | | |
| loisongxanh6 | 0.719 | | | |
| <i>Attributes of eco-friendly bags (dacdiemtui)</i> | | 0.875 | 0.907 | 0.662 |
| tui3 | 0.741 | | | |
| tui5 | 0.821 | | | |

| Construct | Outer loading | Cronbach's alpha | CR | AVE |
|------------------------------------------------------------------------|---------------|------------------|-------|-------|
| tui7 | 0.822 | | | |
| tui8 | 0.863 | | | |
| tui9 | 0.815 | | | |
| Personal imprint on eco-friendly shopping bags (dauancanhan) | | 0.732 | 0.88 | 0.785 |
| canhan1 | 0.849 | | | |
| canhan3 | 0.922 | | | |
| Attitude towards the use of eco-friendly shopping bags (thaido) | | 0.846 | 0.897 | 0.687 |
| thaido1 | 0.888 | | | |
| thaido2 | 0.872 | | | |
| thaido3 | 0.711 | | | |
| thaido4 | 0.833 | | | |
| Behavior of using eco-friendly bags (hanhvi) | | 0.833 | 0.89 | 0.671 |
| hanhvi1 | 0.831 | | | |
| hanhvi2 | 0.682 | | | |
| hanhvi3 | 0.84 | | | |
| hanhvi4 | 0.906 | | | |

Source: The author's data analysis results

Cronbach's Alpha coefficient and combined reliability (CR) of all 8 observed variables in the final model are above 0.7, which indicates that the measurement model has good reliability. Two criteria are used to evaluate the concentration value including the factor loading factor and the mean of variance. In addition, the AVE values of all observed variables are higher than 0.5. Thus, the values of the factor loading coefficients of the remaining measurement variables and the AVE values of the observed variables are satisfactory, showing that the measurement model has a high convergence value.

5.3. Evaluation of direct effects

Figure 2 indicated the analysis results of the PLS-SEM model for direct effects on Attitude towards using eco-friendly shopping bags and Behavior of using eco-friendly shopping bags. The direct effects were evaluated based on the significance of the path coefficients (β) values, which was obtained using the Bootstrap procedure with 500 resamples.

The results shown in Figure 2 suggested that 8 out of 10 hypotheses (corresponding to direct effects) were supported at a significant level of 10% in this study. In particular, Attitude and Green lifestyle has the greatest effects on shopping behavior, much higher than that of Availability and Personal imprint, with the coefficient values of $\beta_{lsx \rightarrow hanhvi}$ (0,4) and $\beta_{thaido \rightarrow hanhvi}$ (0,342) respectively, and at the same statistical significance level of 1%. Although Personal imprint has a direct impact on Behavior with a significance level of 10%, this factor only has an indirect impact with significance on Attitude towards using eco-friendly shopping bags of consumers.

Based on the results of PLS-SEM analysis and the evaluation of direct effects, the author concluded that the accepted research hypotheses proposed in part 3 were: H1a, H3a, H3b, H5a, H5b, H9a, H9b and H10.

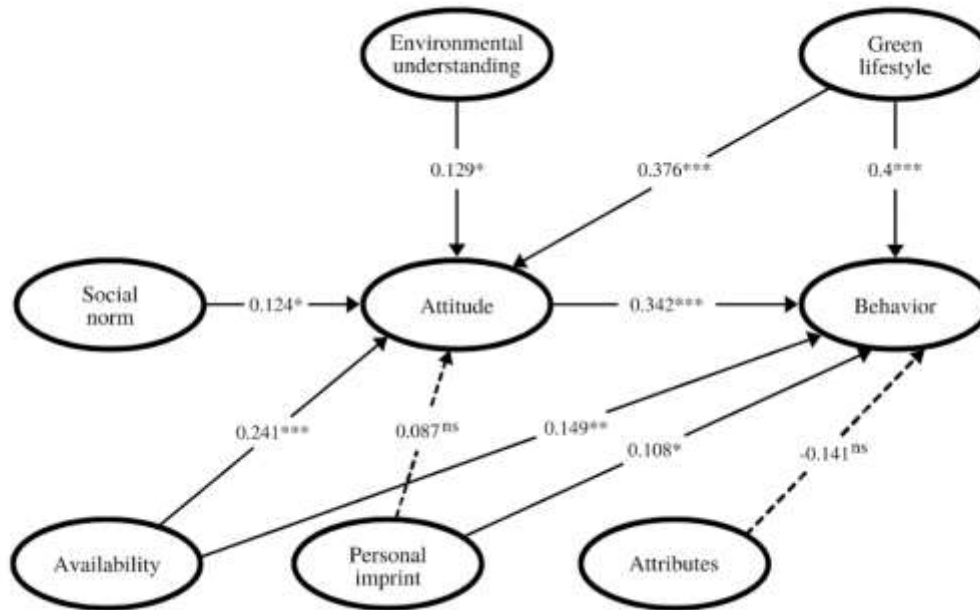


Figure 2. Results of direct effects evaluation

Source: The author's PLS-SEM analysis results

Note: ^{ns} not significant, * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

5.4. Evaluation of indirect effects

The results of the PLS-SEM analysis indicated two accepted indirect effects, which are (1) Environmental understanding has an indirect effect on Behavior of using eco-friendly shopping bags through Attitude towards using eco-friendly shopping bags and (2) Subjective norm has an indirect effect on Behavior of using eco-friendly shopping bags through Attitude towards shopping using eco-friendly shopping bags.

Table 3. Results of indirect effects evaluation

| Indirect path | Path coefficient | t-value | p-value | Evaluation |
|-----------------------------------------------------|------------------|---------|---------|------------|
| Environmental understanding -> Attitude -> Behavior | 0,051 | 2,834 | 0,005 | Accept |
| Subjective Norms -> Attitude -> Behavior | 0,079 | 2,745 | 0,004 | Accept |

Source: The author's data analysis results

5.5. Evaluation of predictive capability

The R^2 coefficients for Attitude and Behavior are 0.503 and 0.526, respectively. These figures indicated that 50.3% variation of Attitude towards using eco-friendly shopping bags was predicted by the following variables: Environmental understanding, Green lifestyle, Subjective norm, Personal imprint on eco-friendly bag products and Availability of eco-friendly bags. Meanwhile, Green lifestyle, Availability of eco-friendly bags, Attributes of eco-friendly bags, Personal imprint on eco-friendly bags. At the same time, Attitude towards using eco-friendly shopping bags predicted 52.6% variation of the Behavior of using eco-friendly shopping bags. Both figures indicated that the proposed model achieved the predictive capability.

6. Conclusion and recommendations to promote the use of eco-friendly bags

6.1. Conclusion

Consumers' attitudes and behavior towards using eco-friendly bags are influenced by Group of individual subjective factors (Environmental knowledge and concern, Concern for future generations, Green lifestyle); Group of environmental factors (Subjective Norms, Advertising Campaign for eco-friendly bag products) and Group of factors related to eco-friendly bag products (Characteristics, Availability, Personal imprint). Besides, the authors once again proved the direct and positive effect of Attitudes towards the Behavior of using environmentally friendly bags.

In general, the study has made new discoveries and approaches on groups of subjective and objective factors affecting the attitudes and behavior of using environmentally friendly bags of Hanoi consumers. As mentioned, the results of the data analysis indicated that two new factors, namely the interest in environmental issues & future generations and the availability of eco-friendly bag products, directly affect the Attitude towards using environmentally friendly bags, thereby affecting the Behavior of using environmentally friendly bags. Even the availability of eco-friendly bag products has a direct impact on the shopping behavior of using eco-friendly bags. These results support the original hypothesis that the authors put forward.

In addition, the study showed that the Green Lifestyle factor has a significant positive impact on the Attitude and Behavior of consumers to use eco-friendly bags in Hanoi. This means that consumers themselves will increase their tendency to use eco-friendly bags and other sustainable products when they adopt eco-friendly lifestyles and habits. From here, supermarkets, stores and brands can completely launch marketing campaigns and advertising programs for green products by reaching a group of customers with a green lifestyle through social media. However, currently, environmental awareness is still a limitation for Hanoi consumers. Therefore, it is necessary to have appropriate educational and propaganda plans and policies to raise awareness of environmental issues as well as the sense of responsibility of each citizen in the city. This is also one of four important roadmaps that the Hanoi People's Committee has set out.

6.2. Recommendations

6.2.1. For the Hanoi government and management agencies

Firstly, the propaganda, education and raising awareness of the people about the harmful effects of plastic bags as well as the issue of environmental protection is a particularly important solution. Currently, according to Plan No. 232 in 2020, Hanoi City will develop guidelines for garbage classification, organize contests to learn about plastic waste, and introduce waste collection models in urban areas, markets, supermarkets, schools, commercial centers, tourist areas, scenic areas, historical sites... These actions are expected to contribute to raising people's awareness of environmental protection in general and the reduction of plastic waste in particular.

Secondly, there should be management mechanisms and policies related to prices of plastic bags as well as environmentally friendly products. Specifically, it is necessary to have stricter mechanisms and regulations to tax plastic bags, contributing to reducing and limiting the number of plastic bags produced as well as the consumption of people. In addition, there should be subsidy programs to support and encourage organizations, businesses and individuals to use environmentally friendly products.

Thirdly, there should be regulations and management sanctions related to the production and consumption of plastic bags. Currently, Hanoi is conducting a survey to survey the production facilities of consumer packaging from plastic operating in the city (including quantity, scale, production technology...), to research and develop regulations to ban units and establishments producing single-use plastic consumer packaging. In addition, the City also requires all administrative agencies, non-business units, and state-owned enterprises in the city to reduce the use of plastic bags and single-use plastic products, with the actions specified in Plan 232.

Fourthly, it is necessary to increase and promote investment and development of infrastructure to serve the collection and recycling of plastic waste, plastic bags and production of alternative environmentally friendly products, supporting many businesses, production establishments facing difficulties in capital, technology... in the process of converting to production and consumption of environment-friendly products. It is necessary to come up with specific and transparent tax mechanisms and policies, preferential loan policies and incentive programs to support enterprises investing in modern technology to convert to producing sustainable products.

6.2.2. For supermarkets, shops and retail stores

Firstly, it is necessary to carry out solutions to reduce plastic bags and switch to environmentally friendly bags in a synchronous and unified manner among businesses, supermarkets, and retail systems. At the consultation meeting held on March 31, 2021, the initiative to establish a Retailers Alliance was proposed, under a pilot project coordinated by the Institute for Strategy, Policy on Natural Resources and Environment (ISPONRE) and Hanoi's Department of Industry and Trade.

Secondly, as mentioned, the availability of environmentally friendly products is an important factor in improving buyers' tendency to consume sustainably. Therefore, supermarkets and retail stores need to actively invest, increase supply and expand booths for environmentally friendly products. This requires a step-by-step transition from single-use plastic bags to eco-friendly products.

Thirdly, there should be attractive and unique programs and initiatives related to advertising and promotions to attract consumers' attention to environmentally friendly bag products. According to the Institute of Strategy, Policy on Natural Resources and Environment, the idea of establishing an Alliance between retail stores includes synchronously deploying communication activities, changing consumers' perceptions, and implementing marketing campaigns, discounts, reward points... if consumers do not use plastic bags. In addition, it is necessary to have an effective communication and marketing strategy, targeting potential customers who have environmentally friendly lifestyles and habits.

6.2.3. For manufacturers and businesses

Research results have shown the general characteristics of eco-friendly bags that are of interest to consumers: Foldability, Water resistance, Versatility, Material and Eco-friendly certification. Manufacturers based on the above characteristics can grasp the needs of potential customers to research, develop and produce eco-friendly bags that meet the desires and tastes of consumers, thereby can encourage consumers to switch from plastic bags to eco-friendly bags. Besides, the production and distribution of eco-friendly bags is also a potential business opportunity for startups with a large domestic market.

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DO THE CHARACTERISTICS OF SME OWNERS AFFECT THE DECISION TO PERFORM TECHNOLOGICAL INNOVATIONS? AN EMPIRICAL RESEARCH IN VIETNAM

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ABSTRACT

Enterprise owners play a key role in pushing the business to technologically innovate, hence creating a more productive environment, bringing to the table benefits both tangible and intangible. This research aims to analyze various characteristics of SME owners that can affect their decisions to perform technological innovations, based on datasets in Vietnamese SMEs surveyed in 2013 and 2015. The model's regression results show that (1) the SME owner being a member of the Communist Party, (2) having an education level of technical level without certificate, unskilled or (3) only basic vocational training, (4) the business collaborating with the technology supplier as well as (5) training its employees have a positive effect on the decision and the money spent on technological innovations. In contrast, (6) the SME owner's length of management and (7) age have a negative effect. Based on these findings, the research proposes several recommendations to increase the firm's ability to innovate.

Keywords: SME owners, technological innovations, technology, Vietnamese SMEs.

1. Introduction

The world is entering the Fourth Industrial Revolution, associated with unprecedented breakthroughs in technology. This will have a strong impact on every country, government, business and person worldwide, fundamentally changing the way we live, work, and produce. Research on the Asia Pacific region, in 2017, the impact of technological innovation on GDP is about 6%, 25% in 2019 and projected to be 60% in 2021 (Microsoft, 2018). McKinsey's research results in 2005 also predicted that, in 2025, the impact of technological innovation on the GDP of the United States will grow to 25%, Brazil at 35%, and up to 36% for European countries. From here, it can be seen that technological innovation has a tangible impact on GDP growth. Nguyen Van Binh, former Governor of the State Bank of Vietnam, in 2017 had opined: "As the 4th Industrial Revolution is happening rapidly worldwide and directly impacts enterprises in Vietnam, it will open up huge opportunities for Vietnamese enterprises by improving their science and technology level, thereby improving production, business capacity, and competitiveness in the global value chain".

However, for the time being, the foundation of science and technology applied in Vietnamese enterprises is still at a weak level, lacking research capabilities and technological innovation. Science-technology and innovation infrastructure remain weak, as a survey by the Ministry of Planning and Investment in 2021 showed that, Vietnamese enterprises only spend 1.6% of their annual revenue on research and development activities, lower than many other countries in the region such as: Laos (14.5%), Philippines (3.6%), Malaysia (2.6%). About 80% of enterprises said that they have not cooperated with other organizations to carry out innovation activities. Most industrial enterprises are still using technology that is 2-3 generations behind the world average, of which up to 76% of equipment, machinery and technological lines imported from abroad belong to the 1960-1970 generation, 75% of equipment has been depreciated, 50% of equipment has been refurbished (Ministry of Industry and Trade, 2021). In the structure, the proportion of industrial production value in the processing, manufacturing, low and medium-tech industries

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accounts for more than 60%. The investment rate in technological innovation of Vietnamese enterprises is less than 0.5% of turnover (while India is 5%, Korea 10%). The annual rate of renewal of machinery and equipment has only reached about 10% in the past 5 years, whereas the corresponding rate is 15-20% for other countries in the region (Ministry of Industry and Trade, 2021). With such a state of technology and technological innovation activities, according to the Ministry of Industry and Trade, our country's enterprises are not yet capable of producing products with added value and high competitiveness.

One of the main reasons why so few enterprises are interested in investing in technological innovation is due to the characteristics of SME owners. David McKenzie and Christopher Woodruff in a 2009 study asserted: "The owner's capability, personality traits, and ethnicity have a significant impact on a firm's ability to innovate", affirming the importance of SME owners in the innovation process, especially for SMEs. There have been many empirical studies showing the influence of some SME owner characteristics on technological innovation activities, such as the studies by Nguyen Thi Anh Van and Nguyen Khac Hieu (2020), Ngoc, Nahm and Dobbie (2021) and Nguyen Ha Lien Chi (2020). Despite the vital role of SME owner characteristics, most studies only use them as intermediate variables, instead focusing their research on drawing conclusions about the enterprise's factors, such as scale, product innovation, technical support from the government,.. The reality is that research and discussion on this subject is still limited in quantity and debatable in quality, with many studies only revolving around statements from experts and lacking quantitative research. Not knowing which exact characteristics of the SME owner can affect the management and technological innovation of the enterprise will pose a challenge to both central government agencies and the enterprise itself. Therefore, a study is needed to point out the exact characteristics of SME owners that directly affects SMEs' decision to perform technological innovation.

2. Theoretical framework

2.1. Related definitions

2.1.1. Small and medium-sized enterprises (SMEs)

In many regions of Europe, an SME is defined according to the User Guide to the SME definition (European Commission, 2020). The main factors determining whether an enterprise is an SME are staff headcount and either turnover or balance sheet total. Similarly, the World Bank also uses three quantitative criteria to define an SME consisting of the number of employees, total assets, and total annual revenue in million U.S. dollars (IEG, 2008). An enterprise is required to satisfy the quantitative criterion of the number of employees and at least one of the two financial criteria to be classified as an SME.

In Vietnam, on 26 August 2021, the Vietnamese government passed Decree 80/2021/ND-CP, effective 15 October 2021, replacing Decree 39/2018/ND-CP. The Decree details a number of articles on the SME Law, including three quantitative criteria defining an SME, consisting of the average number of employees contributing to social insurance, total annual revenue, and total annual investment capital in billion VND.

In general, an SME is most commonly defined using three region-based quantitative criteria, consisting of staff headcount and financial ceilings. For this research paper, an SME is defined as per the World Bank (IEG, 2008), with criteria detailed in Appendix A.

2.1.2. Technological innovation

One of the first definitions of technological innovation was introduced by Schumpeter (1983), defined as the introduction of a new product or an improvement of an existing product, as an internal innovation process, discovery of a new market, development of new material sources or changes within the enterprise.

The currently prevailing definition lies in the Frascati Manual (OECD, 2015). The Organisation for Economic Co-operation and Development considers technological innovation to consist of new products, processes and significant technological changes of products and processes. Innovation and considerable improvement is understood as relative to the enterprise itself, not necessarily as new or better within an industry, country or the entire world. Technological innovation includes many activities such as science,

technology, organization, finance, or research and development (R&D). An innovation has been implemented if it has been introduced on the market (product innovation).

Regardless of the definition, by improving the use of technological innovation, an SME can greatly increase its potential to survive and develop, therefore allowing for the business to grow and flourish (Rahman et al., 2016). Additionally, technological innovation has a potential positive impact on an enterprise's economic growth, organizational performance and competitive advantage. However, these benefits can only be realized if the innovation is appropriately and creatively used, with its potential opportunities well managed and exploited within a corporate culture that nurtures corporate entrepreneurship (Yunis et al., 2018).

In this research, technological innovation is defined as per the Frascati Manual (OECD, 2015), which involves new products, processes and significant technological changes of products and processes.

2.2. Literature review

There is much research worldwide related to the field of technological innovation, mainly leaning toward two aspects: the factors motivating the innovation of technology and the effects of technological innovation on business efficiency. In which some common factors, within the scope of this research, are the education level of the SME owner and the decision to cooperate externally.

Internationally, Makate et al. (2019) identified several factors relating to an SME owner's characteristics that affect innovation decisions in Zimbabwe. More specifically: socio-economic status (i.e. gender and experience), years in business, cooperation with professional organizations such as academies and vocational training centers will have positive effects on the recognition and utilization of modern processes and products into business. A study in an Indonesian city by Purwati et al. (2021) has drawn the following conclusions. First, enterprises that want to innovate need to cooperate with local partners. Innovation significantly depends on the transference of knowledge, especially regarding advanced technology. Second, SMEs in Pekanbaru under the leadership of young and highly educated entrepreneurs can quickly devise and apply business plans through the innovation of technology.

Domestically, studies by Phan Dinh Khoi et al. (2008), Truong Dong Loc and Nguyen Duc Trong (2010), Mai Van Nam and Nguyen Quoc Nghi (2011) and Nguyen Minh Tan et al. (2015) all show that the education level of the SME owner has a positive impact on technological innovation, which in turn significantly increase business efficiency. The higher the owner's education level, the more likely they are to acquire new information and modern management method; from which they can establish concrete plans to help the enterprise develop. Nguyen Thi Anh Van and Nguyen Khac Hieu (2020) further supported the aforementioned results, concluding that if the SME owner has a high education level, and is willing to take risks, the enterprise's ability to technologically innovate increases and vice versa. Meanwhile, Mai Le Thuy Van et al. (2018), when researching in-depth about the reality of factors determining technological innovation of Vietnamese enterprises, deemed that cooperation between the enterprises and external partners, such as universities and research institutions, play an important role in the decision to innovate technology.

3. Research method and data sample

3.1. Research method

The study uses analytical and comparative methods to synthesize theoretical information about entrepreneurial characteristics and technological innovation, creating a premise to propose and explain the results of the logit and regression models of the topic, at the same time giving the recommendations based on the results of the logit and regression models. To achieve this goal, the study has measured the dependent variable according to 2 models: logit and fixed-effect regression.

The general form of the logit model is as follows:

$$\text{Logit}(P(Y=1 | x_1, \dots, x_k)) = \beta_0 + \beta_3 X_{ijt}$$

The general form of the fixed effect model is as follows:

$$TI_{it} = \beta_0 + \beta_1 TRN_{it} + \beta_2 CLB_{it} + \beta_3 YR_{it} + \beta_4 LNSIZE_{it} + \beta_5 GENDER_{it} + \beta_6 AGE_{it} + \beta_7 PRT_{it} + \beta_8 MS_{it} + \beta_9 KLA_{it} + \beta_{10} PRO_{it} + \mu_{it}$$

Where: $\mu_{it} = v_i + \varepsilon_{it}$

With variables mentioned in detail in Appendix B.

3.2. Data sample

This study uses the SME datasets from 2013 and 2015, constructed by the United Nations University World Institute for Development Economics Research (UNU-WIDER) as the mediator of collaboration between the Institute of Labour Science and Social Affairs (ILSSA) belonging to the Ministry of Labour, War Invalids and Social Affairs (MOLISA), the Central Institute for Economic Management of Vietnam (CIEM) and the Department of Economics (DoE) of University of Copenhagen. Surveyed enterprises are sampled from 10 provinces/cities based on the selection methods of previous surveys, from 2500 to 2800 enterprises. Stratified sampling is applied to ensure the appropriate number of different legal forms of enterprises is accrued. When an enterprise is confirmed to no longer exist, that sample will be replaced by another, similar enterprise, predetermined through the process of on-field surveying. The survey is conducted in limited areas in each province/city to ensure the feasibility of the survey. Survey samples will be stratified based on forms of ownership to ensure the datasets will include all legal forms of an enterprise: business households, private enterprises, cooperatives, limited liability companies (LLC), joint-stock companies.

4. Results and discussion

4.1. Results

The study has run tests relevant to the model and controlled related issues (Appendix C). The regression results in Table 1 show the impact of each variable on the decision as well as the money spent on technological innovation. In terms of significance, *the SME owner being a member of the Communist Party* (5% significance level) has a positive effect on the decision as well as the money spent on technological innovation. According to the former Deputy Head of the Central Organization Department, Le Quang Thuong (2019), SME owners who meet the criteria for party membership are those with capital, ability, vision and patriotism. Enterprises run by party members can build a good reputation with partners on the market, helping the business grow. This can explain why SME owners who have party memberships tend to technologically innovate more as well as spend more money on doing so. This result is different from Nguyen Ha Linh Chi (2016)'s study.

Table 1. Regression results of variables affecting the decision and the money spent on technological innovation

| Variable | TI: decision to technologically innovate | LNTIN: money spent on technological innovation |
|-------------------------------------------------------------------------------|------------------------------------------|------------------------------------------------|
| INT1=Gender*Vocational college | -1.165* | -1.166*** |
| | (0.621) | (0.400) |
| INT2=Gender*Vocational elementary | -0.931*** | -0.400*** |
| | (0.247) | (0.140) |
| INT3=Is a member of the Communist Party*University | 1.297** | 0.342 |
| | (0.644) | (0.457) |
| INT4=Is a member of the Communist Party*SME owner has no knowledge of the law | -0.668* | -0.393* |
| | (0.345) | (0.219) |

| | | |
|----------------------------------------------------------------------|------------|------------|
| INT5=Size of the enterprise*Contract with supplier of the technology | -0.0185** | -0.0156*** |
| | (0.00852) | (0.00581) |
| EXP: SME owner's years of experience | 0.00883 | 0.00868 |
| | (0.00858) | (0.00536) |
| PRT: Member of the Communist Party | 0.369** | 0.292** |
| | (0.182) | (0.123) |
| GENDER: SME owner's gender | -0.0698 | 0.0612 |
| | (0.102) | (0.0673) |
| AGE: SME owner's age | -0.0203*** | -0.0101*** |
| | (0.00451) | (0.00289) |
| PRO2: Professional secondary | 0.349 | -0.0128 |
| | (0.248) | (0.160) |
| PRO3: Technical level without certificate | 0.565*** | 0.115 |
| | (0.216) | (0.139) |
| PRO4: University and higher | 0.237 | 0.0597 |
| | (0.212) | (0.139) |
| PRO5: Unskilled | 0.707** | 0.211 |
| | (0.277) | (0.184) |
| PRO6: Vocational college | 0.763* | 0.306 |
| | (0.418) | (0.282) |
| PRO7: Vocational elementary | 0.585** | 0.126 |
| | (0.234) | (0.150) |
| PRO8: Vocational secondary | 0.658*** | 0.238 |
| | (0.243) | (0.156) |
| MSI: The enterprise is the owner's main source of income | 0.164 | -0.0478 |
| | (0.124) | (0.0793) |
| TRN: The enterprise provides training to employees | 0.456*** | 0.782*** |
| | (0.172) | (0.128) |
| CLB1: Contract with supplier of the technology | 4.275*** | 3.966*** |
| | (1.330) | (0.665) |
| YR: The enterprise's age | -0.00509 | -0.00746* |
| | (0.00680) | (0.00419) |
| LNSIZE: The enterprise's size | 0.547*** | 0.596*** |
| | (0.0485) | (0.0302) |

| | | |
|------------------------------------------------|-----------|----------|
| KLaw2: SME owner has good knowledge of the law | 0.456*** | 0.124 |
| | (0.144) | (0.0981) |
| KLaw3: SME owner has no knowledge of the law | 0.775*** | 0.183 |
| | (0.169) | (0.112) |
| KLaw4: SME owner has weak knowledge of the law | 0.390** | -0.0176 |
| | (0.155) | (0.104) |
| Constant | -2.684*** | 0.113 |
| | (0.345) | (0.218) |
| Observations | 5,180 | 5,180 |
| Number of id | 3,067 | 3,067 |
| Log Lik | -2703 | |

Standard error in parentheses

(***) 1% significance level, (**) 5% significance level, (*) 10% significance level

Source: Group of authors (2022)

SME owners at the university level tend to technologically innovate less, but spend a large amount of money on doing so, whereas, at the elementary level, the percentage is higher, but the amount of money spent is very little. This result is opposite to the research results of Hambrick and Mason (1984), where they proved the opposite that the SMEs owner, whose education level is at the level of no certificate or expertise, or only elementary vocational training, results in more active decisions to innovate, but has no effect on the amount of money spent. It seems that tertiary education of entrepreneurs would not be effective to promote innovation, while upper secondary education of entrepreneurs might be more effective for firm innovation (Trang Thi Thu Pham and Nobuaki Matsunaga, 2019). When it comes to *older SME owners*, the decision to innovate and the amount spent were negatively affected at the 1% significance level. One possible explanation for the aforementioned situation lies in the continuous development of digital transformation, as younger entrepreneurs will often be better updated with new knowledge and thus possess a high level of education. In addition, older SME owners may be more hesitant to make innovative decisions because they are used to traditional business operations (Nguyen Ha Lien Chi, 2016). *SME owners with a good, weak and even no knowledge of the law* are more actively involved in technological innovation than SME owners with an average understanding of legal knowledge. This can be explained by the fact that the latter group of people might only see legal cases from a narrow perspective, or lack more specific information about the law, so they will be more hesitant in making decisions about technological innovation. This outcome matches that of Ngo Hoang Thao Trang (2017). Moreover, *gender, the number of years that the SME owners have been in business or whether the enterprise is the SME owner's primary source of income* have no effect on the choice and the amount of money spent on technological innovation. This is similar to Ngoc, Nahm and Dobbie (2021). The interaction variables *INT1, INT2, INT3 and INT5* all have high significance levels, ranging from 1% to 5%; with variable *INT4* having a 10% significance level. As for variables *INT1* and *INT2*, defined as the interaction between the SME owner's gender with their education at vocational college level and vocational elementary level, regression results show that SME owners who are male, with an academic level at the levels above, will have a considerably negative effect on the decision as well as capital spent on performing technological innovation. As for the interaction variable *INT3*, defined as the interaction between the SME owner being a member of the Communist Party with the SME owner's education at university level, we see that SME owners who possess characteristics related to the variable will have a relatively positive effect on decisions to perform technological innovation, mainly due to most of them belonging to the group of up-and-coming young owners, who have favorable views towards technological

innovation. The regression coefficients of INT4 and INT5 are both negative. These are two variables that show the interaction between the SME owner being a member of the Communist Party with the SME owner having no knowledge of the law as well as the interaction between the enterprise's size and the enterprise having a contract with the supplier of the technology, respectively. The variable INT4 can be explained by how SME owners who lack knowledge regarding financial laws despite being a part of the party would face uncertainties in technologically innovating and spending. Meanwhile, the variable INT5 reflects how larger enterprises with strong human resources that collaborate with research centers tend to be more reliant on innovation linkages, reducing the necessary funds required to innovate while improving the quality and efficiency of each decision. This result is similar to a research by Mai Le Thuy Van et al. (2018). The enterprise's size has a positive effect on the decision and the amount of money spent on technological innovation at the 1% significance level (Nguyen Thi Anh Van and Nguyen Khac Hieu, 2020), but the enterprise's age has a negative effect. This result can be partly explained by the fact that long-standing enterprises have difficulty accessing loans to invest in technology, machinery and equipment; even if they have acquired the necessary loans, most of these enterprises have to buy machinery cheaply from China, affecting innovation activities (Hai Yen, 2015). The company's decision to train employees and cooperate with technology suppliers has a positive effect on the decision and the amount of money spent on technological innovation at the 1% significant level. Regarding training for the employees, through the development of human resources in terms of technology and creativity, employees will have an inventive attitude and thus be able to contribute to the innovation of enterprises (Pham Anh Tuan and Pham Quoc Trung, 2021). In terms of cooperation with technology suppliers, the coordination with research institutes will alleviate the problem of human resources for businesses while also providing significant assistance in the process of researching new goods (Mai Le Thuy Van et al., 2018).

From the model analysis process, the authors realized that boosting human resource training, strengthening cooperation with outsiders, and improving the knowledge of business owners are important to the technological innovation of the enterprise. Furthermore, the government must take steps to aid in the promotion of enterprise innovation.

4.2. Discussion

4.2.1. Interpretations

The model found out that there were 18 variables that were statistically significant. The most impactful variable that had a positive effect was CLB1, followed by INT11, KLA3, PRO6, PRO5, PRO8, PRO7, PRO3, LNSIZE, TRN, KLA2, KLA4 and PRT, in descending order. On the other hand, the variable AGE had the greatest negative effect on the decision and the money spent on technological innovation, followed by INT14, INT9, INT10 and INT12.

4.2.2. Recommendations

Based on the research results, in order to aid SME owners in technological innovation, we propose the following recommendations, focusing on SME owners and for the State:

For the State

Firstly, the State needs to improve and supplement regulations, to aid SME owners in approaching them. In recent years, the Party and the government has placed great importance on improving science and technology, actively enacting policies that aim to help enterprises innovate creatively and sustainably. However, despite the increase in SMEs aided by the government, regulations remain disjointed and inconsistent, with various areas not receiving aid or in some cases, only as a formality. Therefore, policymakers need to create a comprehensive regulatory system that is feasible to enact with the financial situation of each area, and enterprise, following a clear adoption path.

Secondly, continue to promote and implement policies to support enterprises in technological innovation through many creative forms. One possible method is to take advantage of state-owned economic associations and organizations to act as investment funds, or as a bridge for businesses to contact and

cooperate with professional academic institutions. In addition, to ensure uniform and consistent innovation, technology sharing needs to be simplified. Therefore, the government can also support SMEs to connect, thereby improving the quality and efficiency of technology and increasing the international competitiveness and integration of enterprises.

Thirdly, in the 4.0 technology era, operating an enterprise requires a significant amount of knowledge, so we need to have policies supporting the education and development of SME owners. The State must not only emphasize and pay attention to the education of SME owners but also set up and implement programs to assist in training human resources for enterprises with clear goals and regulations. From there, the education level of SME owners will be improved, serving as a sustainable foundation for increasing technological innovation in Vietnamese SMEs.

Finally, in addition to raising the education level of SME owners, the dissemination of information on technological innovation should also be strengthened and promoted. Through media such as television, newspapers, and webinars, the State can help SME owners grasp important information such as the need for technological innovation, administrative procedures to receive support, proactive ways to access investment capital for technology development...

For SME owners

Firstly, constant training to improve the enterprise's labor quality. A high-quality human resource will increase labor productivity and enable creativity to shine. When doing so, enterprises will benefit from sustainable development, ready to face new challenges in the economy. As enterprises and employees have a close relationship with each other, enterprises need workers to ensure production and supply of market goods and services, whereas workers need jobs to settle in. Business owners must consider employees as a crucial resource to take care of by improving working conditions and have a reasonable labor policy. At the same time, employees must also have commitments to the plan that the enterprise has shared through training programs to improve qualifications. From there, businesses will improve their competitiveness and meet the development requirements of the market.

Secondly, enhance cooperation with external companies to improve the implementation of innovative technology. Cooperation with external enterprises will help the company access advanced technology, creating more added values for both the company and society, aiding in sustainable development. To overcome the problem of outdated technology, companies need to seize the opportunity and cooperate with other companies to develop together. Models of cooperation between companies (between large and small companies, between companies and suppliers and companies and competitors), between companies and consumers, research centers, universities,... to jointly build and carry out technology innovation are gradually becoming a key trend in developed countries. SMEs are abandoning the "closed" model of technological innovation to head toward an "open" model. This will help companies and their partners improve their innovation capacity by sharing knowledge, ideas, research results and lower the cost for research.

Thirdly, SME owners should continuously enrich their knowledge pool, develop a keen eye for the latest trends on the market, regularly update to the newest business and international laws, drawing upon all the above to concoct a suitable business and development plan. SME owners need to be capable of absorbing the myriad of technologies all over the world and apply them into the production chain. SME owners at the university level and above will have a higher level of investment once there is the decision to technologically innovate. Conversely, SME owners at the vocational college level and below will invest less. This could show that the education level of SME owners influences the confidence in risky decisions to technologically innovate. A higher education level could help SME owners to absorb and apply the latest market trends. A lack of law-related knowledge could be the reason why SME owners make unwanted mistakes, leading to a loss in finance and resources. Therefore, the SME owner having a firm grasp of the law is one important prerequisite to more efficiently operate the business, find better opportunities to grow and internationally integrate the business. The SME owner investing into themselves is unequivocally important. It is through their vast breadth of knowledge that important decisions can be made with speed and precision.

4.2.3. Limitations

The group of authors used SME datasets from 2013 and 2015, which suffers from several limitations, being not in-depth enough and lacking in the amount of owner characteristics. In addition, because the datasets used are from 2013 and 2015, results will be unable to show fluctuations in the variables over time, especially in the era of technological innovation. As the latest data was not used, the research may not fully reflect the actual issue. The authors hope that future studies can collect the most updated, detailed, and accurate datasets, to obtain more reliable results.

5. Conclusion

This study has used quantitative research (applied econometric models). The study uses the SME datasets from 2013 and 2015 to construct the relatively complete picture of this period's SMEs' reality.

The research shows that using econometric models has allowed for an assessment of the impact of owners' characteristics on the decision to technologically innovate in Vietnamese SMEs. These results provide a quantitative and logical outlook on the significance and direction of said impacts, especially concerning unprecedented or irregular factors.

Accordingly, several significant factors that affect the decisions to innovate technology in Vietnamese SMEs are as follow: the SME owner being a member of the Communist Party, the enterprise provides training to its employees, the enterprise collaborating with technology suppliers, the educational level of the SME owner and the legal knowledge of the SME owner. Therefore, in order to fully utilize the benefits of technological innovation and improve the operational efficiency of the enterprise, the State needs to proactively propose both short-term and long-term policies to support technological innovation. Such policies can guide SME owners to know where to invest, the scale of the projects, as well as provide specific and accurate information about the market. From then on, SME owners can timely grasp market trends, build appropriate development plans, positively improve business efficiency and satisfy the global demand for technological innovation.

6. Appendix

Appendix A. World Bank's criteria to define an SME

| Type of enterprise | Number of employees (person) | Total assets (million U.S. dollars) | Total annual revenue (million U.S. dollars) |
|-------------------------|------------------------------|-------------------------------------|---------------------------------------------|
| Medium-sized enterprise | > 50 | > 3 | > 3 |
| | ≤ 300 | ≤ 15 | ≤ 15 |
| Small-sized enterprise | > 10 | > 100 | > 100 |
| | ≤ 50 | ≤ 3 | ≤ 3 |
| Very small enterprise | < 10 | ≤ 100 | ≤ 100 |

Source: IEG (2008)

Appendix B. Variables used in the model

| Notation | Description | Expected sign | Inherited from |
|-------------------------------|-----------------------------------------------------------------------------------------------------|---------------|---------------------------------------------|
| Dependent variables | | | |
| TI (technological innovation) | =1: the enterprise technologically innovated =0: the enterprise did not technologically innovate | | Nguyen Thi Anh Van, Nguyen Khac Hieu (2020) |
| LNTIN: money | Money spent on technological | | Nguyen Dang Minh (2019) |

| Notation | Description | Expected sign | Inherited from |
|------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|----------------------------------------------------------------------------------------------------------------------------------------------------|
| spent on technological innovation | innovation | | |
| Independent variables | | | |
| <i>Characteristics of the enterprise</i> | | | |
| TRN | The enterprise provides training to employees | + | Pham Anh Tuan and Pham Quoc Trung (2021); |
| CLB | Decision to collaborate to innovate | + | Mai Le Thuy Van et al. (2018) |
| YR | The enterprise's age | + | Quan Minh Nhut (2013, 2014); Nguyen Thi Thu An and Vo Thanh Danh (2015) |
| LNSIZE | The enterprise's size | + | Rizk (2004); Zhu et al. (2006); Chang and Robin (2006); Gomez and Vargas (2009); Autry et al. (2010); Correa et al. (2010); Quan Minh Nhut (2013). |
| <i>Characteristics of SME owners</i> | | | |
| GENDER | SME owner's gender (1: male; 0: female) | +/- | Arch (1993); Barber và Odean (2001); Nguyen Thi Anh Van and Nguyen Khac Hieu (2020) |
| AGE | SME owner's age | +/- | Autry et al. (2010); Correa et al. (2010); Lin (2014). |
| PRT | Member of the Communist Party | +/- | Nguyen Thi Quy (2021) |
| MSI | The enterprise is the owner's main source of income | +/- | N. Hoang, D. Nahm and M. Dobbie (2021) |
| KLAW _i | SME owner's knowledge of business law, including: average knowledge; good knowledge; no knowledge; weak knowledge | + | Ngo Hoang Thao Trang (2017) |
| PRO _i | Dummy variable showing the SME owner's technical qualifications (college, professional secondary, technical level without certificate, university and higher, unskilled, vocational college, vocational elementary, vocational secondary) | + | Autry et al. (2010); Correa et al. (2010); Lin (2014); Romero and Martínez-Román (2015) |

Source: Group of authors (2022)

Appendix C. Goodness-of-fit test for the model

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of ti

chi2(1) = 162.81

Prob > chi2 = 0.0000

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of Intin

chi2(1) = 2185.56

Prob > chi2 = 0.0000

Modified Wald test for groupwise heteroskedasticity

in fixed effect regression model

H0: $\sigma(i)^2 = \sigma^2$ for all i

chi2 (3067) = 5.3e+38

Prob>chi2 = 0.0000

F test that all $u_i=0$: $F(3066, 2089) = 1.37$ Prob > F = 0.0000

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$\chi^2(18) = (b-B)'[(V_b-V_B)^{-1}](b-B)$

= 71.21

Prob>chi2 = 0.0000

Collinearity Diagnostics

| Variable | VIF | SQRT VIF | Tolerance | R- Squared |
|----------|------|-------------|-----------|---------------|
| ti | 1.06 | 1.03 | 0.9416 | 0.0584 |
| exp | 2.65 | 1.63 | 0.3773 | 0.6227 |
| prt | 1.08 | 1.04 | 0.9256 | 0.0744 |
| gender | 1.10 | 1.05 | 0.9069 | 0.0931 |
| age | 1.37 | 1.17 | 0.7321 | 0.2679 |
| pro1 | 1.41 | 1.19 | 0.7105 | 0.2895 |
| pro2 | 1.46 | 1.21 | 0.6872 | 0.3128 |
| pro3 | 2.17 | 1.47 | 0.4601 | 0.5399 |
| pro4 | 2.39 | 1.54 | 0.4190 | 0.5810 |
| pro6 | 1.14 | 1.07 | 0.8784 | 0.1216 |
| pro7 | 2.08 | 1.44 | 0.4806 | 0.5194 |
| msi | 1.08 | 1.04 | 0.9276 | 0.0724 |
| trn | 1.09 | 1.04 | 0.9214 | 0.0786 |
| clb1 | 1.03 | 1.01 | 0.9756 | 0.0244 |
| yr | 2.43 | 1.56 | 0.4120 | 0.5880 |
| lnsize | 1.77 | 1.33 | 0.5660 | 0.4340 |
| klaw1 | 1.82 | 1.35 | 0.5498 | 0.4502 |
| klaw2 | 1.67 | 1.29 | 0.5987 | 0.4013 |
| klaw4 | 1.43 | 1.20 | 0.6978 | 0.3022 |

Mean VIF 1.59

| | Eigenval | Cond Index |
|----|----------|---------------|
| 1 | 7.5941 | 1.0000 |
| 2 | 1.5819 | 2.1910 |
| 3 | 1.1108 | 2.6147 |
| 4 | 1.0637 | 2.6719 |
| 5 | 1.0257 | 2.7210 |
| 6 | 1.0082 | 2.7445 |
| 7 | 0.9955 | 2.7619 |
| 8 | 0.9489 | 2.8290 |
| 9 | 0.8514 | 2.9866 |
| 10 | 0.8260 | 3.0322 |
| 11 | 0.7290 | 3.2276 |
| 12 | 0.7118 | 3.2662 |
| 13 | 0.5309 | 3.7821 |
| 14 | 0.4032 | 4.3399 |
| 15 | 0.1986 | 6.1835 |
| 16 | 0.1437 | 7.2688 |
| 17 | 0.1287 | 7.6807 |
| 18 | 0.0747 | 10.0818 |
| 19 | 0.0563 | 11.6143 |
| 20 | 0.0168 | 21.2614 |

Condition Number 21.2614
 Eigenvalues & Cond Index computed from scaled raw sscp (w/ intercept
 >)
 Det(correlation matrix) 0.0261

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SOLUTIONS TO IMPROVE BUSINESS EFFICIENCY OF LISTED COAL COMPANIES IN VIETNAM

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ABSTRACT

Researching the business performance of the enterprise and the factors affecting the business performance of the enterprise in order to analyse the position and potential of the enterprise, clearly identify the factors that have a positive or negative impact. Specifically, the article determines the direction and extent of influence on return on assets (ROA) and return on equity (ROE) of the following factors: the size of assets (QMTS), net turnover growth (TTLCT), short-term solvency (LIQUIT), debt ratio (TLN), cost ratio (TCP), inventory (HTK). The study was conducted based on data collected from nine coal joint stock companies listed on the stock exchange with 90 observations. The study also uses quantitative method combined with multivariable regression models to examine the hypotheses of the survey with the help of the EVIEWS 8.0 software. Research results indicate that variables of TTLCT, LIQUIT, TLN, VQHTK have the same impact with ROE; TTLCT, LIQUIT, TLN, VQHTK have the same impact with ROA. In accordance with the research findings, the authors propose specific recommendations and solutions to improve the business performance of coal companies listed in Vietnam.

Keywords: coal enterprise, business efficiency, impacting factors.

1. Introduction

The coal industry has been playing an important role in the energy production of economies, currently the coal industry provides more than 36% of electricity globally and in Vietnam too. Because of that, coal enterprises have a great position in the market economy of Vietnam. Understanding this as well as the fact that coal enterprises have not yet optimized their business advantages, the authors chose to study Return on assets (ROA) and return on equity (ROE) - two factors that characterize the business performance of business es. The study analyzes the influence of the basic factors affecting the business performance of coal enterprises, finding solutions to improve business efficiency.

Coal industry enterprises studied in the period 2011 – 2020:

| No. | Firm | Code | Stock Exchange |
|-----|-------------------------------------|------|----------------|
| 1 | Mong Duong Coal Joint Stock Company | MDC | HNX |
| 2 | Ha Tu Coal Joint Stock Company | THT | HNX |
| 3 | Deo Nai Coal Joint Stock Company | TDN | HNX |
| 4 | Coc Sau Coal Joint Stock Company | TC6 | HNX |
| 5 | Vang Danh Coal Joint Stock Company | TVD | HNX |
| 6 | Ha Lam Coal Joint Stock Company | HLC | HNX |
| 7 | Nui Beo Coal Joint Stock Company | NBC | HNX |

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| | | | |
|---|-------------------------------------------|-----|-----|
| 8 | Coal Export Joint Stock Company | CLM | HNX |
| 9 | Northern Coal Trading Joint Stock Company | TMB | HNX |

2. Theoretical framework

Research hypotheses:

Table 1: Research hypothesis to study the basic factors affecting business performance of listed coal enterprises in Vietnam

| No. | Hypotheses | Theoretical basis |
|-----|-------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Firm size (total assets/capital resources) has positive effect on ROA and ROE | - |
| 2 | Growth in net turnover (LCT) has a positive effect on ROA and ROE | - |
| 3 | Inventory turnover has positive effect on ROA and ROE | - |
| 4 | Debt Ratio has positive effect on ROA and ROE | T.A.N.R.Jayarathnea (2014), Mahfuzah Salim & Dr.Raj Yadav (2012), R.Zeitun, G.G.Tian (2007), Alexander Klingensj & Caroline Kihlgren (2015), Md. Imran Hossain (2016) |
| 5 | Short-Term Solvency has positive effect on ROA and ROE | - |
| 6 | Expense Ratio has negative effect on ROA and ROE | - |

3. Research method

Research Model

The research model is a multiple regression model representing the relationship between 6 independent variables and 1 quantitatively dependent variable. The model has the form:

$$Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \beta_6 X_{6i} + \varepsilon_i$$

Including:

$X_{1i}, X_{2i}, X_{3i}, X_{4i}, X_{5i}, X_{6i}$: Express the value of the independent variable 1,2,3,4,5,6 at the i-th observation

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$: partial coefficient

ε_i : a normally distributed random independent variable with the mean = 0 and constant variance (error)

The author builds an overall regression model as follows:

$$ROA = \beta_0 + \beta_1 X + \beta_2 TTLCT + \beta_3 VQHTK + \beta_4 TLN + \beta_5 LIQUIT + \beta_6 TCP + \varepsilon$$

$$ROE = \beta_0 + \beta_1 X + \beta_2 TTLCT + \beta_3 VQHTK + \beta_4 TLN + \beta_5 LIQUIT + \beta_6 TCP + \varepsilon$$

Stands for: X, TTLCT, VQHTK, TLN, LIQUIT, TCP: are the value of the variables LnQMTS, TTLCT, VQHTK, TLN, LIQUIT, TCP.

Table 2: Summary table of research models of factors affecting ROA

| No | Variable symbol | Variable name | Formula | Research hypothesis |
|----|-----------------|------------------------|----------------------------------------|---------------------------|
| | ROA | | | Dependent variable |
| 1 | QMTS | Size of total assets | TTS | + |
| 2 | TTLCT | Growth in net turnover | (LCT1- LCT0)/LCT0 | + |
| 3 | LIQUIT | Short-term solvency | Short-term assets/short-term debt | + |
| 4 | TLN | Debt ratio | Total debt/total asset | - |
| 5 | TCP | Expenses ratio | Total expenses/LCT | - |
| 6 | HTK | Inventory turnover | Cost of goods sold/Average inventories | + |

Table 3: Summary table of research models of factors affecting ROE

| No | Variable symbol | Variable name | Formula | Research hypothesis |
|----|-----------------|------------------------|----------------------------------------|---------------------------|
| | ROE | | | Dependent variable |
| 1 | QMTS | Size of total assets | TTS | + |
| 2 | TTLCT | Growth in net turnover | (LCT1- LCT0)/LCT0 | + |
| 3 | LIQUIT | Short-term solvency | Short-term assets/short-term debt | + |
| 4 | TLN | Debt ratio | Total debt/total asset | + |
| 5 | TCP | Expenses ratio | Total expenses/LCT | - |
| 6 | HTK | Inventory turnover | Cost of goods sold/Average inventories | + |

4. Results and discussion

Research model results

With the dependent variable ROA:

$$ROA = \beta_0 + \beta_1 X + \beta_2 TTLCT + \beta_3 Y + \beta_4 TLN + \beta_5 LIQUIT + B_6 TCP + \varepsilon$$

The model after data analysis is:

$$ROA = 1,4202 + 0,0132LIQUIT - 1,1227TCP + 0,0053TLN - (2,69E+05) TTLCT + 0,0002VQHTK - 0,0215X$$

With the dependent variable ROE:

$$ROE = \beta_0 + \beta_1 X + \beta_2 TTLCT + \beta_3 Y + \beta_4 TLN + \beta_5 LIQUIT + B_6 TCP + \varepsilon$$

The model after data analysis is:

$$ROE = 4,199 + 0,0815LIQUIT + 0,0086TLN - 3,9881TCP + (3,74E-05) TTLCT + 0,0015VQHTK - 0,016X$$

Table 4: Statistics data ROA, ROE

| | ROA | ROE |
|---------------|------------|------------|
| Mean | 0,032540 | 0,154358 |
| Median | 0,024350 | 0,123150 |
| Maximum | 0,156100 | 0,684700 |
| Minimum | 0,000100 | 0,000400 |
| Std.Dev. | 0,027477 | 0,108660 |
| Skewness | 2,002326 | 2,028347 |
| Kurtosis | 7,71643 | 9,021404 |
| Jarque - Bera | 143,5573 | 197,6777 |
| Probability | 0 | 0 |
| Sum | 2,9286 | 13,8922 |
| Sum Sq.Dev. | 0,067193 | 1,050832 |
| Observations | 90 | 90 |

(Source: Calculating in Eviews)

Based on the above results, it can be seen that for the Coal industry, the research team considers profitability based on two factors: profitability of total assets (ROA) and return on equity (ROE).

The results show that the average return on total assets for 10 years from 2011-2020 is 3,254%. Besides, the highest rate of return on total assets of coal enterprises is 15,61% and the lowest is 0,01%. The standard deviation of the total sample is 2,7477%.

The results show that for the average return on equity for 10 years from 2011-2020 it is 15,46%. Besides, the highest rate of return on total assets of coal enterprises is 68,47% and the lowest is 0,04%. The standard deviation of the total sample is 10,86%.

Table 5. Statistics of factors affecting ROA and ROE

| | X | TCP | TLN | VQHTK | TTLCT | LIQUIT |
|---------------|----------|------------|------------|--------------|--------------|---------------|
| Mean | 14,14516 | 0,982808 | 0,885042 | 14,44533 | 1,373029 | 0,882542 |
| Median | 14,09924 | 0,9862 | 0,807 | 10,905 | 0,0561 | 0,8149 |
| Maximum | 15,24625 | 1 | 7,2758 | 65,86 | 85,9328 | 1,7553 |
| Minimum | 13,20235 | 0,9203 | 0,5664 | 2,51 | -0,7545 | 0,2073 |
| Std.Dev. | 0,515878 | 0,013749 | 0,706689 | 12,17652 | 9,471646 | 0,337184 |
| Skewness | 0,375697 | -1,902079 | 8,461503 | 1,990319 | 8,269354 | 0,524602 |
| Kurtosis | 2,38137 | 7,828846 | 76,23793 | 7,182981 | 72,81952 | 2,749482 |
| Jarque - Bera | 3,552364 | 141,7102 | 21188,18 | 125,0355 | 19306,1 | 4,363454 |
| Probability | 0,169283 | 0 | 0 | 0 | 0 | 0,112846 |
| Sum | 1273,065 | 88,4527 | 79,6538 | 1300,08 | 123,5726 | 79,4288 |
| Sum Sq.Dev. | 23,68554 | 0,016825 | 44,44748 | 13195,83 | 7984,375 | 10,11871 |
| Observations | 90 | 90 | 90 | 90 | 90 | 90 |

(Source: Calculating in Eviews)

According to Table 5, the results of descriptive statistical analysis among the variables in the model demonstrate that:

Variable X with a mean of 14,14516, ranging from a minimum of 13,2024 to a maximum of 15,246, with a standard deviation of 0,5159. For the remaining variables, we also have a similar way of reading the results with the mean values of the variables not differing too much, the mean value is from 0,88 to 14,445. And to measure the volatility of low or high variables, we rely on the ratio between the standard deviation and the mean, and based on table 5 we can see that the variables have a standard deviation that is not too large compared to the mean. jar.

If comparing variables with each other, the variable TLN, VQHTK has the largest volatility compared to the other variables; variables TTLCT, X, LIQUIT have moderate volatility and variable TCP has the lowest volatility. In general, however, the data are uniform across the variables. The study sample size consisted of 90 observations, which is the largest sample size in statistics. The input data is suitable to implement the regression model.

- The matrix of correlation coefficients for the model's variables:

Table 6. Autocorrelation matrix results for the dependent variable ROE

| | ROE | TCP | TLN | TTLCT | VQHTK | X | LIQUIT |
|--------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| ROE | 1,000000 | -0,457252 | 0,036058 | -0,070876 | 0,017802 | -0,139964 | 0,173056 |
| TCP | -0,457252 | 1,000000 | -0,042508 | 0,149864 | 0,104203 | -0,122032 | 0,089272 |
| TLN | 0,036058 | -0,042508 | 1,000000 | 0,005161 | -0,079272 | 0,023059 | -0,104830 |
| TTLCT | -0,070876 | 0,149864 | 0,005161 | 1,000000 | -0,075449 | 0,038669 | 0,066236 |
| VQHTK | 0,017802 | 0,104203 | -0,079272 | -0,075449 | 1,000000 | -0,064313 | -0,383476 |
| X | -0,139964 | -0,122032 | 0,023059 | 0,038669 | -0,064313 | 1,000000 | -0,459517 |
| LIQUIT | 0,173056 | 0,089272 | -0,10483 | 0,066236 | -0,383476 | -0,459517 | 1,000000 |

(Source: Calculating in Eviews)

Table 7. Autocorrelation matrix results for the dependent variable ROA

| | ROA | TCP | TLN | TTLCT | VQHTK | X | LIQUIT |
|--------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| ROA | 1,000000 | -0,496296 | 0,127862 | -0,104265 | -0,016934 | -0,411271 | 0,247810 |
| TCP | -0,496296 | 1,000000 | -0,042508 | 0,149864 | 0,104203 | -0,122032 | 0,089272 |
| TLN | 0,127862 | -0,042508 | 1,000000 | 0,005161 | -0,079272 | 0,023059 | -0,104830 |
| TTLCT | -0,104265 | 0,149864 | 0,005161 | 1,000000 | -0,075449 | 0,038669 | 0,066236 |
| VQHTK | -0,016934 | 0,104203 | -0,079272 | -0,075449 | 1,000000 | -0,064313 | -0,383476 |
| X | -0,411271 | -0,122032 | 0,023059 | 0,038669 | -0,064313 | 1,000000 | -0,459517 |
| LIQUIT | 0,247810 | 0,089272 | -0,104830 | 0,066236 | -0,383476 | -0,459517 | 1,000000 |

(Source: Calculating in Eviews)

Based on the above correlation table, we can see:

+ Independent variables: X_{it} , TCP_{it} , $VQHTK_{it}$ have the opposite effect on ROA. The remaining independent variables have a positive impact on ROA.

+ Independent variables: X_{it} , TCP_{it} , $TTLCT_{it}$ have the opposite effect on ROE. The remaining independent variables have a positive effect on ROE.

+ There is no serious multicollinearity (autocorrelation among the independent variables in the model) because the correlation coefficients are quite low.

The above correlation results are consistent with most previous studies in the world and in line with the author's expectations during this research period in Vietnam.

- Regression results

Dependent Variable: ROA
Method: Least Squares
Date: 06/06/22 Time: 17:15
Sample: 1 90
Included observations: 90

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|-----------|
| C | 1.420210 | 0.176610 | 8.041496 | 0.0000 |
| X | -0.021450 | 0.004893 | -4.383771 | 0.0000 |
| TTLCT | -2.69E-05 | 0.000229 | -0.117558 | 0.9067 |
| LIQUIT | 0.013168 | 0.008189 | 1.607967 | 0.1116 |
| TLN | 0.005335 | 0.003064 | 1.741186 | 0.0854 |
| TCP | -1.122721 | 0.159539 | -7.037279 | 0.0000 |
| VQHTK | 0.000198 | 0.000202 | 0.981130 | 0.3294 |
| R-squared | 0.501519 | Mean dependent var | | 0.032540 |
| Adjusted R-squared | 0.465484 | S.D. dependent var | | 0.027477 |
| S.E. of regression | 0.020089 | Akaike info criterion | | -4.902745 |
| Sum squared resid | 0.033495 | Schwarz criterion | | -4.708316 |
| Log likelihood | 227.6235 | Hannan-Quinn criter. | | -4.824340 |
| F-statistic | 13.91763 | Durbin-Watson stat | | 1.581724 |
| Prob(F-statistic) | 0.000000 | | | |

(Source: Calculating in Eviews)

Table 8. Regression results and testing of model regression assumptions for the variable ROA

Based on the results of Table 8, it can be seen that the R-squared value of 0,5015 shows that the regression results of the group in the regression table have certain accuracy. Looking at the table, it can be seen that, of the 6 factors affecting the rate of return on assets (ROA), there are 3 factors that are statistically significant at 10% and 5%, namely: TCP, X, TLN.

Besides, based on the results table 18, it can be seen that the relationship between the factors and the rate of return on total assets (ROA) is as follows:

The factors that have a positive influence on the rate of return on total assets (ROA) include the following factors: LIQUIT, TLN, VQHTK, which have a positive influence, and factors X, TCP, and TTCT have the opposite effect with the ratio. return on assets (ROA).

Dependent Variable: ROE
Method: Least Squares
Date: 06/06/22 Time: 17:25
Sample: 1 90
Included observations: 90

| Variable | Coefficient | Std. Error | t-Statistic | Prob. |
|--------------------|-------------|-----------------------|-------------|-----------|
| C | 4.199048 | 0.833577 | 5.037381 | 0.0000 |
| X | -0.015999 | 0.023095 | -0.692748 | 0.4904 |
| TTLCT | 3.74E-05 | 0.001081 | 0.034561 | 0.9725 |
| LIQUIT | 0.081529 | 0.038651 | 2.109329 | 0.0379 |
| TCP | -3.988141 | 0.753004 | -5.296306 | 0.0000 |
| TLN | 0.008629 | 0.014462 | 0.596637 | 0.5524 |
| VQHTK | 0.001492 | 0.000954 | 1.564701 | 0.1215 |
| R-squared | 0.289927 | Mean dependent var | | 0.154358 |
| Adjusted R-squared | 0.238596 | S.D. dependent var | | 0.108660 |
| S.E. of regression | 0.094815 | Akaike info criterion | | -1.799182 |
| Sum squared resid | 0.746167 | Schwarz criterion | | -1.604753 |
| Log likelihood | 87.96321 | Hannan-Quinn criter. | | -1.720777 |
| F-statistic | 5.648232 | Durbin-Watson stat | | 1.646273 |
| Prob(F-statistic) | 0.000059 | | | |

(Source: Calculating in Eviews)

Table 9. Regression results and testing of model regression assumptions for the ROE variable.

Based on the results of Table 9, it can be seen that the R-squared value of 0,2899 shows the regression results of the group in the regression table with certain accuracy. Looking at the table, it can be seen that, of the 6 factors affecting the return on capital (ROE), there are 2 factors that are statistically significant at 10% and 5%, namely: LIQUIT, TCP.

Besides, based on the table of results 9, it can be seen that the relationship between the factors and the return on capital (ROE) is as follows: there are 4 factors of CI, LIQUIT, TLN, VQHTK that affect the same direction and factor X, TCP has the opposite effect.

- Test the model's estimated hypotheses:

The results of testing the fit of the explanatory variables in research model 01 after using the feasible generalized least squares method (GLS):

With the dependent variable ROA, after using the least squares method (LS) to overcome autocorrelation and variance, the model is significant at 1% significance level (due to Prob. = 0.000000) so the model results are consistent and usable.

The results of the research model have the following equation:

$$ROA = 1,4202 + 0,0132LIQUIT - 1,1227TCP + 0,0053TLN - (2,69E+05) TTLCT + 0,0002VQHTK - 0,0215X$$

The variable TLN has a positive effect of 0,0053 to ROA and is statistically significant at the 10% level of significance.

The variable TCP has the opposite effect (1,1227) to ROA and is statistically significant at the 5% level of significance.

Variable X has the opposite effect (0,0215) to ROA and has statistical significance at 5% significance level.

With the collected data set, the remaining variables are not statistically significant at the 5% and 10% significance levels.

With the dependent variable ROE, after using the least squares method (LS) to overcome autocorrelation and variable variance, the model is significant at 1% significance level (due to Prob. = 0.000000) so the model results are consistent and usable.

The results of the research model have the following equation:

$$ROE = 4,199 + 0,0815LIQUIT + 0,0086TLN - 3,9881TCP + (3,74E-05) TTLCT + 0,0015VQHTK - 0,016X$$

LIQUIT variable has a positive effect of 0,0815 to ROE and has statistical significance at 5% significance level.

The variable TCP has the opposite effect (3,9881) to ROE and is statistically significant at the 5% level of significance.

With the collected data set, the remaining variables are not statistically significant at the 5% and 10% significance levels.

With the use of the LS method, the following observations are made: variables of TTLCT, LIQUIT, TLN, VQHTK have the same impact with ROE; LIQUIT, TLN, VQHTK have the same effect as ROA.

5. Conclusion and recommendation:

With the use of the LS method, the following observations are made: variables of TTLCT, LIQUIT, TLN, VQHTK have the same impact with ROE; LIQUIT, TLN, VQHTK have the same effect as ROA.

Regression model and hypothesis testing

* Regression defects testing:

- Testing overall significance in regression

In order to see the influence of six independent variables: QMTS, TTLCT, LIQUIT, TLN, TCP, HTK on two dependent variables ROA, ROE or the business performance of Coal enterprises, we will use analytical methods.

First, testing for the fitness of the model will show the influence of the independent variables on the dependent variables.

Table 10: Results of Testing overall significance in regression

| | ROA | ROE |
|-------------------------|----------|----------|
| Prob > F | 0.0000 | 0.0000 |
| Adjust R-squared | 0,4655 | 0,2386 |
| P value | 0.000000 | 0.000059 |

(Source: Calculating in Eviews)

For return on assets (ROA):

From the results calculated on Eviews, the adjusted R2 (Adjust R-squared) is 0,4655. Thus, 46,55% change in return on total assets of listed coal companies in Vietnam is explained by independent variables included in the proposed model.

The P-value of F-test = 0,000000 < 0,05 means that the model fits the actual data, the independent variables are linearly correlated with the dependent variable ROA with a confidence level of 95%.

For return on equity (ROE):

From the results calculated on Eviews, adjusted R2 (Adjust R-squared) is 0,2386. Thus, 23,86% change in return on equity of listed coal companies in Vietnam is explained by independent variables included in the proposed model.

The P-value of F-test = 0,000 < 0,05 means that the model fits the actual data, the independent variables are linearly correlated with the dependent variable ROE with a confidence level of 95 %.

- Detecting multicollinearity:

Table 11: Multicollinearity test results of independent variables

Variance Inflation Factors
Date: 04/10/22 Time: 12:50
Sample: 1 90
Included observations: 90

| Variable | Coefficient Variance | Uncentered VIF | Centered VIF |
|----------|----------------------|----------------|--------------|
| C | 0.031191 | 6956.267 | NA |
| LIQUIT | 6.71E-05 | 13.33043 | 1.681503 |
| TLN | 9.39E-06 | 2.674278 | 1.034108 |
| TCP | 0.025453 | 5484.036 | 1.061159 |
| TTLCT | 5.25E-08 | 1.060054 | 1.037997 |
| VQHTK | 4.08E-08 | 3.234684 | 1.334890 |
| X | 2.39E-05 | 1069.818 | 1.405284 |

(Source: Calculating in Eviews)

Based on the above results, the average centered VIF is lower than 10, so the model does not have multicollinearity.

Table 12: Summary of research results

| No. | Independent Variables | Impact | |
|-----|-----------------------|-------------|-------------|
| | | ROA | ROE |
| 1 | QMTS | - | Meaningless |
| 2 | TTLCT | Meaningless | Meaningless |
| 3 | LIQUIT (LIQUID) | Meaningless | + |
| 4 | TLN | + | Meaningless |
| 5 | TCP | - | - |
| 6 | HTK | Meaningless | Meaningless |

- Size of total assets (QMTS):

In the theoretical part, asset size has a positive impact on operating profitability as well as business performance, but in this study, asset size has no impact on the results of the regression model. associated with the dependent variable ROE, has only significant, negative impact on the dependent variable ROA.

- Net turnover growth (TTCT):

Theoretically, net working capital growth has a positive effect on return on equity (ROE) and return on total assets (ROA), but through the research results, the return on equity is not significant. affect the dependent variable ROE and ROA.

- Short-term solvency (LIQUIT):

Through the research results, short-term solvency has no significance and affects the return on equity and return on total assets.

- Debt Ratio (TLN):

Through the research results, the debt ratio has no significant impact on the return on equity but has a positive impact on the return on total assets. From the logic, we still have the basis that they affect each other, but because of some limitations, the data results do not fully represent this.

- Cost Ratio (TCP):

The cost ratio has a negative impact on return on equity and return on total assets. This is the same as the previous hypothesis. High total turnover but also high total costs will lead to a decrease in the company's profit after tax – the most important indicator for businesses. So, it is obvious that costs will also affect return on equity and assets.

- Inventory Turnover (VQHTK):

Through the research results, inventory turnover is not significant for return on total assets and return on equity. From the logic, we still have the basis that they affect each other but because of some limitations the data results do not show this.

Limitations in business efficiency of coal enterprises and solutions from research results

* Limitations and causes:

Return on assets (ROA) has a large variation from year to year and from company to company. For some companies, their ROA is quite variable. With TC6, they have a ratio that sometimes reaches close to 8% (7,44% in 2011) but also in other years, this ratio is only 0,06% in 2016 - the difference is quite large between ratios according to TC6. each year of this business. With MDC, the situation is similar: in 2011, return on total assets was 10,15% but this ratio dropped to 0,01% in 2015. This represents instability. in capital management and capital use in production and business activities of the above enterprises.

Return on equity (ROE): From 2012 to 2020, most businesses maintain a relatively similar ROE, except Coal Coc Sau Joint Stock Company and Mong Duong Coal Joint Stock Company. These two joint stock companies have large fluctuations in return on equity. With TC6, they have a ratio that sometimes reaches nearly 40% (39,36% in 2011) but also in other years, this ratio is only 0,28% in 2016 - the difference is quite large between the ratios according to TC6. each year of this business. With MDC, the situation is similar: in 2015, return on equity was 0,04%, but in 2011 it increased to 38,57%. This shows the instability in capital management and capital use in production and business activities of the above enterprises.

Operating profit margin (ROS): In contrast to businesses with impressive performance, Northern Coal Trading Joint Stock Company - TMB has this ratio among the coal companies with the lowest ROS. Even in 2016, TMB's ROS was only 0,09%, remaining below 1% in the following years. In addition, Mong Duong Coal Joint Stock Company - MDC has a large fluctuation in operating profit margin. With MDC, they have a ratio that sometimes reaches over 5% (5,14% in 2011) but also in other years, this ratio is only 0,01% in 2015 - there is a large variation between operating ratios. year-to-year performance of this business. With TC6, the situation was similar: in 2016 the operating margin was 0,03%. This shows the instability in capital management and capital use in production and business activities of the above enterprises.

Earnings per share (EPS): Even so, there are many companies with large fluctuations in EPS, but in the remaining years, EPS only reaches thousand dong. This represents a problem in the business of this company. Like TMB, Ha Lam Coal Joint Stock Company - HLC also had a big spike in EPS in 2018 when it hit the mark of VND 70 thousand per share but then fell deeply, to only VND 0,6 thousand per share. votes for the next two years.

Actual value to book value of a share (P/B): Although the average P/B of coal companies is quite high, it also shows that corporate debt is at a high level, making prices book value decreases, leading to an increase in P/B. To see the financial position more clearly in this respect, we need to read the notes to the financial statements as well as the attached documents of the enterprises.

Size of assets: Among the above coal companies, for TVD, in 2014, the business had a significant decrease when it decreased from 1.807.950 million VND in 2013 to 599.096 million VND in 2014. However, in 2015, the company regained its advantage, but the above drop point still needs to be noted and remembered to avoid happening again. In contrast, Ha Tu Coal Joint Stock Company - THT is the Coal enterprise with the smallest asset size as well as little growth in the period 2011 - 2020 among the above enterprises - this shows that the enterprise has not financially strong enough to compete with other players in the industry.

Debt ratio: Among the studied enterprises, Deo Nai Coal Joint Stock Company and Vang Danh Coal Joint Stock Company have high variable debt ratios. In 2014, Vang Danh Coal Joint Stock Company had a debt ratio of 240,83%. In 2018, Deo Nai Coal Joint Stock Company had a debt ratio of 727,58%. Understand the characteristics of the Coal industry, but they are an unstable debt ratio for the financial background of a business. With this debt ratio, the above businesses will be under great pressure with each creditor, and the risk of bankruptcy will increase. Besides, we can see that Ha Lam Coal Joint Stock Company - HLC is one of the coal enterprises with the largest debt ratio when almost all of them fluctuate in the range of 80 - 90%, with no special fluctuations. From 2011 to 2020. A high debt ratio shows the creditworthiness of the business as well as helps businesses reduce management costs and increase production and business opportunities, but will cause great financial pressure in the long term. term and liquidity risk for the business.

Cost Ratio (TCP): Most companies have an expense ratio of over 90%, especially with Mong Duong Coal Joint Stock Company in 2015, the expense ratio is 100%. Ha Lam Coal Joint Stock Company has the most volatile expense ratio: in 2013, the expense ratio was 98,47%; In 2014, the cost ratio decreased to 92,03% - the lowest cost ratio of the above enterprises over all the years from 2011 to 2020. Although the characteristics of the coal industry are unique, these businesses need to adjust their cost policies to avoid causing losses and waste.

Inventory: The inventory of these enterprises is quite large and tended to increase sharply in the past period with an average growth rate of 22,6%/year, especially in some enterprises such as: Ha Lam Coal Joint Stock Company - HLC, Vang Danh Coal Joint Stock Company - TVD with a growth rate of over 40%/year.

* Solutions:

- Financial solutions:

In order to chronologically approach and meet customer demand, coal companies on the HNX need to restructure the company's business activities, upgrade equipment and production lines in order to increase their business scale. business (size of total assets).

In order to ensure production and business efficiency of enterprises as well as improve their attractiveness to investors, a reasonable capital structure must be established. Enterprises are required to consider adjusting the debt ratio in their capital structure to create a large investment, minimize appropriate capital management costs, and the pressure from loan risk is affordable. In addition, businesses should increase capital mobilization from profits and owners' contributed capital. This is a form of mobilization in which businesses can mobilize long term large quantities at a fixed cost, without worrying about capital accumulation depending on market changes, contributing to improving business efficiency.

The research results have demonstrated that the relationship between debt ratio and business performance is inverse, that is, when the debt ratio increases, the performance of the business decreases. This reflects the current situation of coal mining enterprises on the Vietnamese stock exchange market. Therefore, to ensure production and business efficiency of enterprises as well as improve their attractiveness to investors, a reasonable capital structure must be built. Debt capital of companies now accounts for a relatively high proportion of total capital, affecting financial safety and business efficiency. Therefore, businesses need to consider reducing the debt ratio in their capital structure, increasing capital mobilization from profits and owners' contributed capital, and improving the capital contribution ratio of the Coal - Mineral Group. Vietnam (TKV). This is a form of mobilization that businesses can mobilize in large quantities at a fixed cost for a long time, without worrying about capital accumulation depending on market changes, contributing to improving business efficiency.

The majority of the current receivables of companies come from customers who are processing and consuming enterprises of TKV, in order to deal with this situation, companies need to propose TKV to have flexible financial mechanisms between businesses in charge of consumption and mining enterprises to improve liquidity for businesses.

Companies need to secure a certain amount of cash in reserve to pay off near-maturity loans. Besides, it is also necessary to set up provisions for risks in Payment.

Due to the industry characteristics, the quantity of inventory in this kind of enterprise is very large. Therefore, businesses need to review their inventory to free up to mobilize capital to invest in essential activities. In fact, the inventory value of these enterprises is quite large. Therefore, businesses need to recommend TKV to be proactive in finding customers and improving consumption efficiency. In addition, it is necessary to appropriately organize the procurement of equipment and materials and to store goods in accordance with actual business needs so that they can reduce the minimum inventory. At the same time, frequently detect and immediately handle the stagnation for too long to avoid capital stagnation, which both reduces the financial burden and ensures the liquidity of the business.

This is a fundamental long-term direction for coal mining enterprises due to the huge costs. Therefore, businesses need to find ways to manage costs in the most effective way, for example, applying costing to all stages of the production process.

- Non-financial solutions:

Problems of natural conditions and environment: Natural coal mines are being over-exploited, negatively affecting Coal businesses. Open-pit coal mines are over-exploited, affecting the natural environment and the living environment. Therefore, coal enterprises need to fully exploit each coal mine and close open-pit coal mines to avoid affecting the people's living areas. This will not greatly affect the output

of Coal enterprises when they will switch from open pit mining to underground mining. Thereby, coal businesses will partly improve the environment and beautify the natural landscape.

Human resources: employees and management. Listed coal enterprises need to tighten the quality of recruitment for staff and management positions because the coal industry has its own characteristics, affecting the health and lives of workers, so it needs someone who understands the industry to reduce it. minimize the occurrence of incidents. In addition, for employees, they not only need to have industry knowledge but skills also need attention because businesses are modernizing, equipment will be upgraded. Each employee needs to have good skills to use and operate them. For managers, managers need to be highly responsible and have a good strategic vision, in order to be able to handle the problem of underdeveloped asset size in accordance with industry opportunities and unreasonable usage costs., ... - problems of enterprises Coal listed on HNX have been pointed out by the authors in the research results section.

Working environment: improving incentives, processing relationships and improving labor safety. As mentioned, this is an industry with a relatively high level of toxicity, so it is necessary to give reasonable treatment to workers as well as provide standard protective equipment. Furthermore, they should issue and apply units associated with safety and worker protection to avoid unfortunate cases in the history of the coal mining and production industries. Last but not least, they should build a corporate culture system, create a corporation to combine internally, and create a close relationship between managers and employees.

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FACTORS AFFECTING STUDENTS'S INTENTION OF USING E-WALLETS – AN EMPIRICAL RESEARCH WITH MOMO E-WALLET

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ABSTRACT

Cashless transactions are becoming increasingly popular across the world. According to the Statista digital market outlook research, Vietnam ranked third in the world in terms of the proportion of users paying through mobile in 2021. In 2020, MoMo Wallet was the most popular financial app in Vietnam. Recognizing the potential for e-wallets, notably MoMo e-wallets, to flourish and expand in the Vietnamese market, we looked for gaps and created a study to examine the impact of digital wallets. Factors influencing students' willingness to use e-wallets: empirical research using MoMo e-wallets focuses on students living and studying in Hanoi. Based on the theory of e-wallet intention and inherited from previous research models, we propose a research model affecting the intention to use Momo e-wallet, which includes "Performance Expectancy", "Effort Expectancy", "Perceived Credibility", "Social Influence", "Facilitating Conditions" and "Government Support". The results showed that four factors affect the dependent variable: "Effect Expectancy", "Perceived Credibility", "Social Influence" and "Government Support" using survey data from questionnaires for 1966 students at 15 universities in Hanoi, the Likert scale, and structural equation modeling analysis (SEM). Our component "Effect Expectancy" was created by combining the criteria "Performance Expectancy" and "Effort Expectancy". It is obvious that the factor "Social Influence" has a significant impact on students' willingness to use the MoMo e-wallet according to the survey results. Besides, the factor "Facilitating Conditions" factor has no statistical significance. We recommend and offer some solutions based on the study's findings to encourage students to use e-wallets. At the same time, we provide some suggestions to businesses and regulators to promote the benefits of students utilizing MoMo e-wallets.

Keywords: intention, e-wallet, UTAUT, students.

1. Introduction

Online payment via e-wallet tools is one of the most popular services in the 21st century—a fairly new concept that is fast gaining traction. An E-wallet is a virtual wallet that stores payment card information on computers or mobile devices to support not only online purchases but also payments at retail locations (Tolety, 2018). Because COVID-19 is slowing down all aspects of life, this could be viewed as a "test" to encourage e-commerce. According to the WorldPay report from FIS (Financial Information System), by 2024, cash will account for less than 10% of in-store payments in the US and 13% of payments worldwide, while e-wallets make up 1/3 of payments in stores in the world. Although there were concerns about the alleged risks of online transactions, it has gradually turned out to be a favorable method in a contemporary context.

Phyo Min Tun (2020) discovered that trust and perceived usefulness determinants influence behavior intention to use an electronic wallet in Myanmar. In an electronic survey of 1080 academic society members from three different Hungarian universities who used e-wallets during the COVID-19 pandemic, consumer self-efficacy was found to be the most important factor influencing their sustained use (Ahmad et al, 2021). Furthermore, several studies by authors such as Phan, T. N., Ho, T. V., & Le-Hoang, P. V. (2020); Khang, N. D., Yuan, C. K. (2020); Tan, T.N. (2019); Phuong, N. T. L (2013); Son, N.V., Ngan. N.T.T, Long, N.T. (2021) have shown that social effects have a significant impact on consumer intent.

Despite there being a lot of research on e-commerce and e-payments, little research is done to comprehend the specific responses of young people in developing markets to mobile-payment systems. Moreover, there were contradictory results. So, in this research, we will illustrate the factors affecting students' intention to use e-wallets and point out the strongest influencing factors, thereby proposing recommendations to students and e-commerce business companies. Accordingly, the team conducted experimental research with the MoMo e-wallet trading company.

E-commerce enterprises are still "burning money" and increasing sales marketing in order to attract customers. Will customers (particularly students - people who love technology but can't afford significant quantities) continue to use MoMo if there aren't any more sales? This study will provide an answer to the above topic as well as help with practical issues in Vietnam.

The paper is organized as follows: after the Introduction, Section 2 presents the literature review. Section 3 is devoted to methodology. The obtained results are in Section 4. Section 5 provides discussion and recommendations. Finally, conclusions, limitations, and future research directions are given in Section 6.

2. Literature review

2.1. Some basic definition

Intention

According to Ajzen (1991), intentions are assumed to capture the motivational factors that influence a behavior, they are indications of how hard people are willing to try, of how much of an effort they are planning to exert, in order to perform the behavior. As a general rule, the stronger the intention to engage in a behavior, the more likely should be its performance' (Ajzen, 1991: 181). According to the theory of planned behavior, perceived behavioral control, together with behavioral intention, can be used directly to predict behavioral achievement.

E-wallet

E-Wallet is a system based on a safety payment data storage software and user's passwords for many payment methods and websites (Caldwell, 2012). By using an e-wallet, customers can conduct their buying process more easily and quickly. They can also create a stronger password without worrying that they may forget their password. An E-wallet can be used with a mobile payment system, which allows customers to pay transactions with their smartphones. E-wallet is additionally an effective tool to store card data of close customers and digital vouchers (Van.T.P, 2021).

2.2. Backgrounds theories

Technology Acceptance Model (TAM)

Davis (1989) invented the technology acceptance model (TAM), which is more precisely connected to the prediction of an information system's acceptability. Davis' model comprises five components and accepts that "perceived usefulness" and "perceived ease of use" influenced "attitude toward using," which in turn influenced "behavioral intention to use" usage and "actual system use". The TAM model is a common model for studying system use because it is a model for assessing and anticipating the use of an information system. As a result, the model has been verified in terms of quality and dependability in several experiments. However, the model only applies to one type of technology at a particular time, and the model's variables have been disputed in studies spanning a wide range of businesses and disciplines. Furthermore, environmental and constraint factors are not taken into consideration in the model.

Unified Theory of Acceptance and Use of Technology (UTAUT)

According to Venkatesh et al., (2003), the Unified Theory of Acceptance and Use Technology (UTAUT) is proposed to take into account technological adoption. More specifically, UTAUT is a combination of theories ranging from rational action theory, technology acceptance model, planned behavioral theory, diffusion of innovation theory, and social cognitive theory. In particular, behavioral intention is built on eight scales with performance expectations, effort expectations, and social factors that have a direct impact on behavioral intent and direct determinants of behavior are the favorable conditions. Williams, Rana, Dwivedi,

and Lal (2011) applied the UTAUT theory to test various technologies (Junadi & Sfenrianto, 2015; Slade, Dwivedi, Piercy & William, 2015) rediscovering various online payment tools. This research also focuses on technology adoption; therefore, it is theoretical and practical to use UTAUT as a theoretical basis for this study. The four vital independent constructs applied in this study are the same as the original UTAUT theory. We strongly believe that in order to accept a new technological payment method like e-wallets, students in Vietnam would have to consider those kinds of elements.

2.3. Theoretical Framework and hypothesis

Performance Expectancy (PE)

According to research by Tran Nhat Tan (2019), "Performance Expectancy" can be defined as the degree to which the users expect that the use of the system will help to achieve achievement at work. The performance expectancy of an e-wallet is also the degree to which users believe that using an e-wallet will help them achieve higher performance than other methods (Venkatesh et al., 2003). Performance is the strongest factor that significantly influences behavioral intent in the TAM model (Karim et al., 2020; David et al., 1989). Customers have the right to choose the service they want, thus in today's e-wallet market, the more performing the e-wallet, the more appealing it is to use. This makes even more sense when e-wallet firms compete aggressively in all aspects. (Nguyen Van Son et al., 2021).

Hypothesis H1: The factor "Effect Expectancy" has a positive impact on the intention of using MoMo e-wallet.

Effort Expectancy (EE)

According to Davis (1989), "Effort Expectancy" is the extent to which a person believes in using a particular system without much effort. The fewer efforts users make to use the e-wallet, the more they intend to use it (Nguyen et al., 2014). "Effort Expectancy" also reflects the user's understanding of the accessibility and flexibility of using an e-wallet instead of conventional payment methods. In fact, e-wallet is increasingly optimizing operations and processes most conveniently and simply to meet a wide range of customers.

Hypothesis H2: The factor "Effort Expectancy" has a positive impact on the intention of using MoMo e-wallet.

Social Influence (SI)

"Social Influence," according to Venkatesh et al. (2003), is one of four factors that directly and positively influence a customer's intention to use an e-wallet. "Social Influence" is defined as the extent to which an individual perceives others who are important to him or her and believes he or she should use the new system. Individuals are influenced by advice or feedback from those around them in the early stages of adopting technology, according to experimental research by Soodan and Rana (2020), and Nguyen Van Son et al. (2021), because they do not have enough experience or trust to use an e-wallet. Sisters, parents, friends, and influencers may believe that the individual should use an e-wallet.

Hypothesis H3: The factor "Social Influence" has a positive impact on the intention of using the MoMo e-wallet.

Perceived Credibility (PCr)

"Perceived Credibility" is an individual's assessment of an e-wallet system's security and safety (Amin, 2009). In Internet Banking study (Wang, 2003; Yuen, 2011), Mobile Banking research (Laurin & Lin, 2005; Yu, 2012 và Amin, 2008), and "Perceived Credibility" research (Wang, 2003; Yuen, 2011), "Perceived Credibility" has been shown to have an impact on individual customer intent. Furthermore, Mahwadha (2019) explains that when two or more parties have mutual trust, financial transactions will take place. Users will respect the privacy and security policies of e-wallet service providers if there is confidence (Madan & Yadav, 2016). Customers will be concerned about the security of their data while using an e-wallet if there is a lack of trust. As a result, perceived credibility is a precursor factor that influences decision-making.

Hypothesis H4: The factor "Perceived Credibility" has a positive impact on the intention of using the MoMo e-wallet.

Facilitating Conditions (FC)

Individuals' perceptions of how good organizational and technical infrastructure will aid them in using the system are referred to as "Facilitating Conditions." Venkatesh et al. (2003) investigated and discovered relevant information when researching facilitation circumstances, including: essential resources are available to utilize the system, interoperability with other systems, and a specific individual (or group) are available to support users. Smartphones, as well as bank cards with functions such as internet banking, e-commerce, and SMS banking, are facilitating conditions for e-wallets.

Hypothesis H5: The factor "Facilitating Conditions" has a positive impact on the intention of using the MoMo e-wallet.

Government Support (GS)

Internal and external influences, as well as government assistance, influence the consumer acceptability of technology systems (Haderi, 2014; Hai & Kazmi, 2015). Network infrastructure, policy packages, access speed, and security assurance in digital transactions are aspects of "Government Support." When customers perceive official assistance, they are more likely to use e-wallets. Government Support is critical for the development of e-commerce in Vietnam. In addition to the infrastructural investment, the government also needs to support and encourage the usage of electronic payment services (Chong et al., 2010). One of the most important variables influencing the intention to use online banking services has been Government Support (Tan & Teo, 2000; Jaruwachirathanakul & Fink, 2005 và Chong et al., 2010).

Hypothesis H6: The factor "Government Support" has a positive impact on the intention of using MoMo e-wallet.

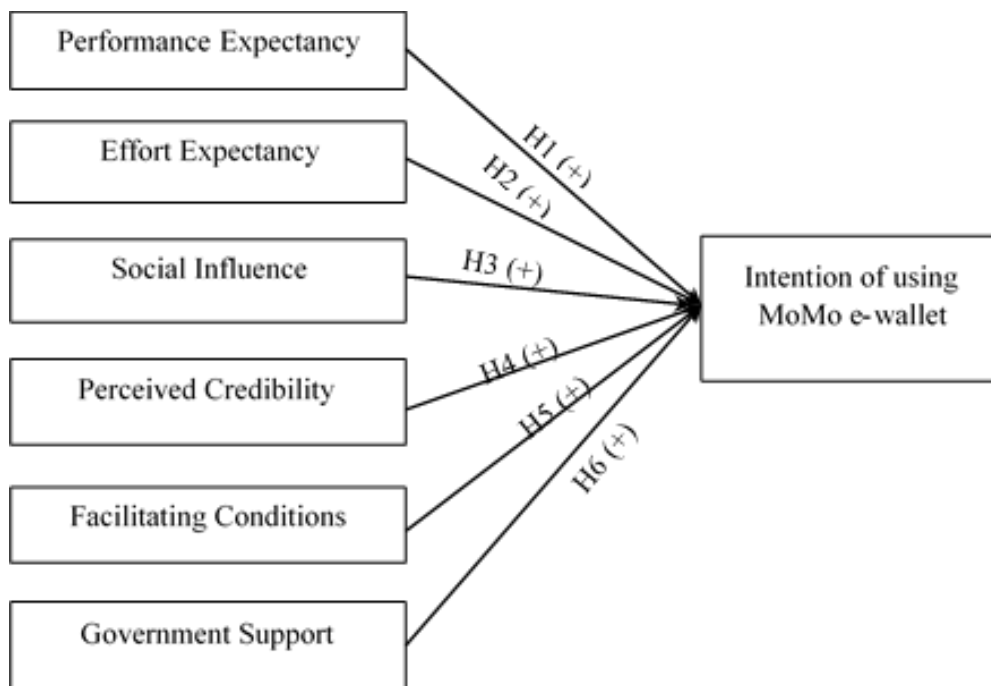


Figure 1. Research model

3. Research method

3.1. The scale

The scale's seven primary variables were acquired from various sources (table 1). As a result, Performance Expectancy, Effort Expectancy, Perceived Credibility, Social Influence, Facilitating Conditions, and Government Support will impact a person's propensity to use an e-wallet.

Table 1. Scales of research

| Variables | Code | Items | Source |
|--------------------------------------|-------------|---------------------------------------------------------------------------------------|-------------------------------|
| Performance Expectancy | PE1 | MoMo wallet has many incentives | (Junadi, 2015) |
| | PE2 | MoMo e-wallet saves me time when paying | |
| | PE3 | MoMo e-wallet helps me manage and control payment transactions easily and efficiently | |
| | PE4 | MoMo e-wallet associated with many websites helps me conveniently in payment | |
| Effort Expectancy | EE1 | Learning how to use a MoMo e-wallet was easy for me | (Nguyen Van Son et al., 2021) |
| | EE2 | The user manual for the MoMo e-wallet is complete and specific | |
| | EE3 | I can use the MoMo e-wallet fluently | |
| | EE4 | The interactive interface on the MoMo e-wallet is simple and easy to use | |
| | EE5 | MoMo e-wallet payment process is clear and easy to understand | |
| Social Influence | SI1 | My family members use MoMo e-wallet to pay | (Junadi, 2015) |
| | SI2 | My friends and colleagues use MoMo e-wallets to pay | |
| | SI3 | People who are reputable with me think that Momo e-wallet should be used to pay | |
| | SI4 | I see that the MoMo e-wallet has many positive reviews on the app store | |
| | SI5 | I see ads for MoMo wallets on TV, newspapers, social networks, and supermarkets. | |
| Perceived Credibility | PCr1 | My personal information is confidential | (Shumaila et al, 2003) |
| | PCr2 | I can make secure transactions through MoMo e-wallet | |
| | PCr3 | I trust the information that MoMo e-wallet provides | |
| | PCr4 | MoMo e-wallet always has a plan to be prepared to deal with the risks | |
| | PCr5 | MoMo e-wallet puts user's interests first | |
| Facilitating Conditions | FC1 | I have a network-connected device to use MoMo wallet | (Tran Nhat Tan, 2019) |
| | FC2 | I have a bank account to activate MoMo wallet | |
| | FC3 | I have the necessary knowledge to use MoMo wallet | |
| | FC4 | I will always find help from the call center when using MoMo wallet | |
| | FC5 | MoMo wallet has the same usage as other e-wallets that I have used | |
| Government Support | GS1 | Government promotes e-commerce and e-payments | (Tan & Teo, 2000) |
| | GS2 | Developing technology infrastructure and internet to meet e-wallet payments | |
| | GS3 | The Government fully promulgates laws and regulations for e-wallet payments | |
| The intention of using MoMo e-wallet | BI1 | I plan to use MoMo e-wallet | (Tran Nhat Tan, 2019) |
| | BI2 | I'm going to introduce MoMo e-wallet to everyone | |
| | BI3 | I would use a MoMo e-wallet rather than using another e-wallet | |
| | BI4 | I will use payment services on MoMo e-wallet | |

The questionnaire is divided into two sections. Part 1 consists of seven introductory questions and 31 items relating to seven variables in the research model. In the preliminary question, we give questions about the frequency of usage, the purpose of use, the advantages of use, and the intention of using the MoMo e-wallet in the future in the preliminary inquiry. Each item is scored on a 5-point Likert scale, with 1 being "strongly disagree" and 7 being "strongly agree". Part 2 is concerned with pupils' personal information, such as gender and current income.

3.2. Sample and data collection

Concerning the research subjects, we performed a survey of students from 15 Hanoi universities, including the University of Commerce, National Economics University, Foreign Trade University, Academy of Finance, and University of Science and Technology. Banking Institute, University of Technology, University of Civil Engineering, Hanoi National University of Economics, Hanoi National University of Technology, Hanoi National University of Education 1, Diplomatic Academy, Hanoi University of Pharmacy, University of Architecture, Hanoi Law University, Hanoi Open University. We also prioritize delivering questionnaires to students with e-wallet access and collecting survey responses from students who have used MoMo e-wallets. November 2021 is the greatest e-commerce sales month of the year, so this was the time to inquire. To attract the attention of young people, MoMo organized a series of great bargains and refunds. At the same time (as the end of the year approaches), there was a lot of interest in e-wallet programs since the demand for student purchasing was high. As a result, holding the poll at that time made getting students' consent easier.

In terms of sample size, we evaluate our research model using structural equation modeling analysis (SEM), hence sample size selection is targeted at establishing circumstances for this research. In the theory, there are several points of view on sample size. According to Bentler and Chou (1987), 5 to 10 observed variables are required for an estimated parameter, Boomsma (1982) advised a sample size of 100-200, while Erika et al. (2013) stated that SEM analysis requires 30 to 460 observations, which depending on the research model. We have established an aim of surveying 2000 students based on the aforementioned parameters. Online postings, learning groups, student groups, and scientific research groups are used to conduct the assessment. At the same time, we used electronic messaging software to send communications. The actual number of votes collected and analyzed was 1966 (98.3% of the original goal) - this is the sample size that surpasses the theoretical criteria and aspires to fulfill the sample reliability analysis.

3.3. Data analysis

After filtering and cleansing the data, we perform four primary analytical steps. To assess the characteristics of the sample, a descriptive statistical analysis was performed on seven questions regarding students' personal information. EFA analysis and reliability analysis were used to do preliminary testing on the scale, finding the key factors, the loading coefficient of each factor, and the scale's reliability (Cronbach alpha). Analyze the CFA to retest the scale and identify model fit indicators. When the scale's indications are adequate, we do structural equation modeling analysis (SEM) to test the research hypotheses. The findings of the analysis are reported in the next section. SPSS 26.0 software was used for descriptive statistical analysis, exploratory factor analysis (EFA), and reliability analysis, whereas Amos 20.0 software was used for confirmatory factor analysis (CFA), and linear structure (SEM).

4. Results

4.1. Descriptive statistics analysis

The descriptive statistics analysis is presented in Table 2.

Table 2. Descriptive statistics analysis

| Name of category | Items | Frequency (number of students) | Percentage (%) |
|---------------------------------------------------------|-------------------------------|--------------------------------|----------------|
| Gender | Male | 185 | 16.0 |
| | Female | 938 | 84.0 |
| Student year | 1 st year | 391 | 34.8 |
| | 2 nd year | 472 | 42.0 |
| | 3 rd year | 185 | 16.5 |
| | 4 th year | 69 | 6.1 |
| | 5 th year | 6 | 0.6 |
| Personal income | No income | 641 | 57.0 |
| | < 1.000.000 VND | 239 | 21.3 |
| | 1.000.000 VND – 3.000.000 VND | 151 | 13.4 |
| | 3.000.000 VND – 5.000.000 VND | 12 | 1.2 |
| | > 5.000.000 VND | | |
| | | | |
| Frequency of using MoMo e-wallet | 1 - 5 times a week | 937 | 83.4 |
| | 5 - 10 times a week | 114 | 10.2 |
| | 10 – 15 times a week | 28 | 2.5 |
| | > 15 times a week | 44 | 3.9 |
| Purpose of using MoMo e-wallet | Money transfer | 951 | 46.7 |
| | Online shopping | 638 | 31.4 |
| | Paying bill | 315 | 15.5 |
| | Buy tickets | 110 | 5.4 |
| | Other | 20 | 1.0 |
| The most interesting thing when using the MoMo e-wallet | Convenient | 686 | 61.1 |
| | Brand image | 37 | 3.3 |
| | Preferential price | 254 | 22.5 |
| | Time-saving | 129 | 11.5 |
| | Other | 17 | 1.6 |
| The long term intention to use the MoMo e-wallet | Yes | 1021 | 90.9 |
| | No | 102 | 9.1 |
| Total | | N=1123 | 100 |

Source: SPSS 26.0

The survey was conducted from November 13, 2021, to February 27, 2022, and reached 1966 students of universities in Hanoi. After excluding invalid answers, 1123 responses were obtained to conduct data analysis. The number of female students was the majority due to surveys sent to universities in the field of economics - these schools have a high percentage of female students. In terms of personal income, due to the time of the survey coinciding with the time of separation of covid 19, students had difficulty finding employment and wanted to spend a lot of time researching academic knowledge in the lecture hall, so a large number of students answered that there was no income. The majority of students (83.4%) only used the MoMo e-wallet 1 - 5 times a week, they didn't consider the MoMo e-wallet as a daily access application and only accessed it when using payment services. Only 9.1% of students responded that they didn't use the MoMo e-wallet for a long time. For categories such as student year, the purpose, or the most interesting thing when using the MoMo e-wallet, it was quite balanced in terms of student distribution rate.

4.2. Scale verification

4.2.1. Exploratory Factor Analysis (EFA)

Exploratory factor analysis and scale verification were performed on the initial 31 questions. Two scales "Performance Expectancy" and "Effort Expectancy" were extracted into the same group and had the new name

“Effect Expectancy”. The scale “Facilitating Conditions” consisted of 5 items removed because all 5 items had a load factor of less than 0.5. With two scales “Effort Expectancy” và “Social Influence”, each scale removed an item to make Cronbach's Alpha more reliable. The Cronbach Alpha of 5 scales was greater than 0.7 and less than 0.95, which was the reliable level (Nunnally, 1978). The factor loading of all items was greater than 0.5, which indicated that the scales ensured value and reliability. The research model was reduced from the initial 31 items to 24.

Table 3. Cronbach's Alpha & EFA

| Scales, items, and Cronbach's Alpha | Factor Loading |
|--------------------------------------------------------------------------------------------|-----------------------|
| 1. Effect Expectancy, $\alpha = 0.923$ | |
| PE2. MoMo e-wallet saves me time when paying | .599 |
| PE3. MoMo e-wallet helps me manage and control payment transactions easily and efficiently | .525 .596 |
| PE4. MoMo e-wallet associated with many websites helps me conveniently in payment | .767 .646 |
| EE1. Learning how to use a MoMo e-wallet was easy for me | .738 |
| EE2. The user manual for the MoMo e-wallet is complete and specific | .760 |
| EE3. I can use MoMo e-wallet fluently | .759 |
| EE4. The interactive interface on MoMo e-wallet is simple and easy to use | |
| EE5. MoMo e-wallet payment process is clear and easy to understand | |
| 2. Social Influence, $\alpha = 0.846$ | |
| SI1. My family members use MoMo e-wallet to pay | .819 |
| SI2. My friends and colleagues use MoMo e-wallets to pay | .604 |
| SI3. People who are reputable with me think that Momo e-wallet should be used to pay | .770 |
| SI4. I see that MoMo e-wallet has many positive reviews on the app store | .549 |
| 3. Perceived Credibility, $\alpha = 0.923$ | |
| PCr1. My personal information is confidential | .763 |
| PCr2. I can make secure transactions through MoMo e-wallet | .729 |
| PCr3. I trust the information that MoMo e-wallet provides | .752 |
| PCr4. MoMo e-wallet always has a plan to be prepared to deal with the risks | .725 |
| PCr5. MoMo e-wallet puts user's interests first | .696 |
| 4. Government Support, $\alpha = 0.872$ | |
| GS1. Government promotes e-commerce and e-payments | .712 |
| GS2. Developing technology infrastructure and internet to meet e-wallet payments | .704 |
| GS3. The Government fully promulgates laws and regulations for e-wallet payments | .709 |
| 5. Intention of using MoMo e-wallet, $\alpha = 0.876$ | |
| BI1. I plan to use MoMo e-wallet | .842 |
| BI2. I'm going to introduce MoMo e-wallet to everyone | .873 |
| BI3. I would use a MoMo e-wallet rather than using another e-wallet | .849 |
| BI4. I will use payment services on MoMo e-wallet | .855 |

Note:

Independent variable: KMO = 0.971 >0.5; Sig = 0.000 < 0.05 (Bartlett's Test), use Principal Components extraction method and Varimax rotation, percent of variance explains 4 factors = 67.223% > 50%.

Dependent variable: KMO = 0.824 >0.5; Sig = 0.000 < 0.05 (Bartlett's Test), use Principal Components extraction method, percent of variance explains factor = 73.054% > 50%.

Source: SPSS 26.0

So the research model has changed from 6 independent variables to 4 independent variables including Effect Expectancy (H1&2); Social Influence (H3); Perceived Credibility (H4); Government Support (H6).

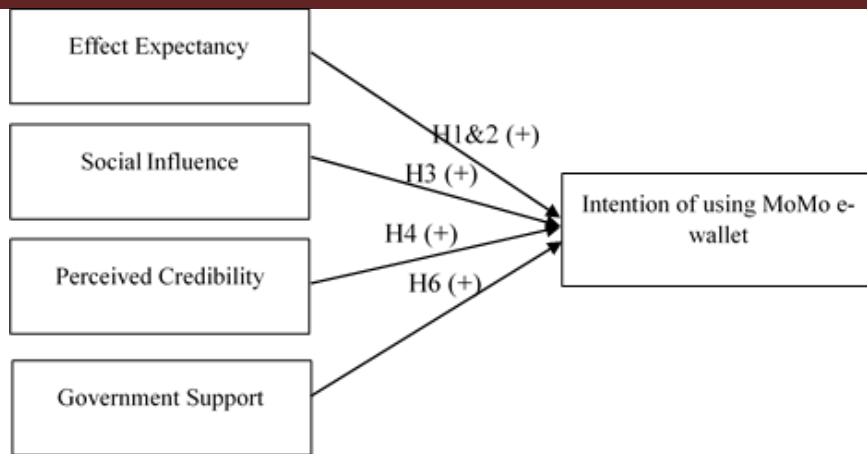


Figure 2. Adjusted research model

4.2.2. Confirmatory Factor Analysis (CFA)

The results of the Confirmatory Factor Analysis are shown in figure 3 and table 4.

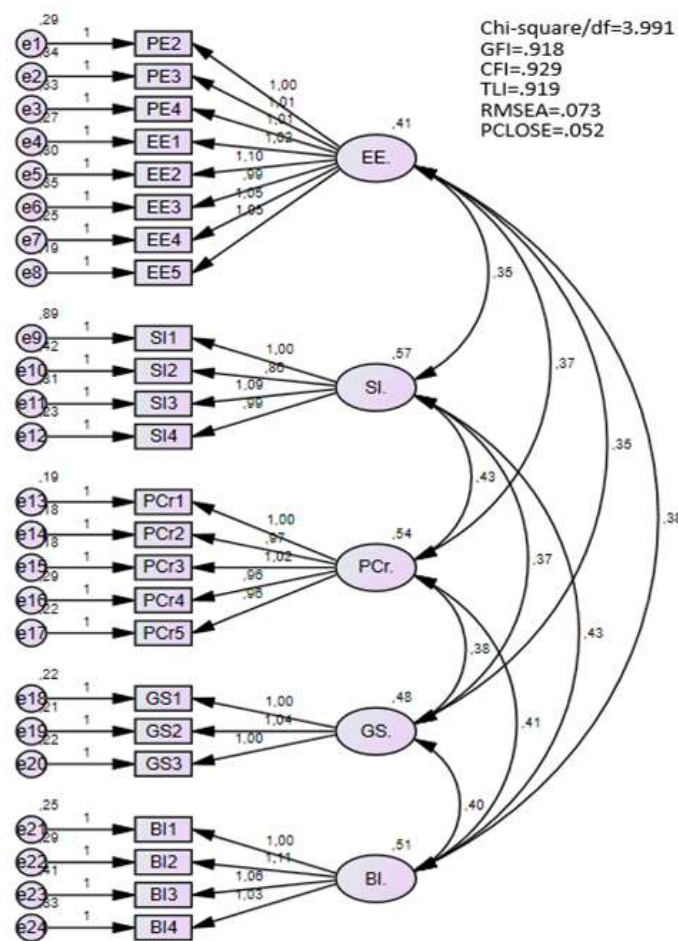


Figure 3: Diagram of CFA

Table 4. The results of CFA (standardized coefficients)

| | | | Estimate | S.E. | C.R. | P |
|------|------|-----|-----------------|-------------|-------------|----------|
| PE2 | <--- | EE | .767 | | | |
| PE3 | <--- | EE | .744 | .039 | 26.258 | *** |
| PE4 | <--- | EE | .751 | .038 | 26.548 | *** |
| EE1 | <--- | EE | .784 | .036 | 27.935 | *** |
| EE2 | <--- | EE | .793 | .039 | 28.306 | *** |
| EE3 | <--- | EE | .732 | .039 | 25.749 | *** |
| EE4 | <--- | EE | .805 | .036 | 28.825 | *** |
| EE5 | <--- | EE | .838 | .035 | 30.254 | *** |
| SI1 | <--- | SI | .624 | | | |
| SI2 | <--- | SI | .707 | .044 | 19.508 | *** |
| SI3 | <--- | SI | .830 | .050 | 21.831 | *** |
| SI4 | <--- | SI | .834 | .045 | 22.037 | *** |
| PCr1 | <--- | PCr | .856 | | | |
| PCr2 | <--- | PCr | .856 | .026 | 37.344 | *** |
| PCr3 | <--- | PCr | .871 | .027 | 38.457 | *** |
| PCr4 | <--- | PCr | .792 | .029 | 32.740 | *** |
| PCr5 | <--- | PCr | .829 | .027 | 35.279 | *** |
| GS1 | <--- | GS | .827 | | | |
| GS2 | <--- | GS | .841 | .032 | 32.285 | *** |
| GS3 | <--- | GS | .829 | .032 | 31.665 | *** |
| BI1 | <--- | BI | .818 | | | |
| BI2 | <--- | BI | .826 | .035 | 31.749 | *** |
| BI3 | <--- | BI | .765 | .037 | 28.574 | *** |
| BI4 | <--- | BI | .789 | .035 | 29.777 | *** |

Note: ***: .000

Source: AMOS 20.0

(Footnote): EE: Effect Expectancy; SI: Social Influence; PCr: Perceived Credibility; GS: Government Support; BI: Intention of using MoMo e-wallet

According to the results of the CFA, the main indicators of the suitability of the model include Chi-square/df = 3.991 < 5; GFI > 0.9; CFI > 0.9; TLI > 0.9; RMSEA < 0.08; PCLOSE > 0.05. These indicators ensured the relevance of the data to the research model (Hu & Bentler, 1999). P (p-value) = 0.000 < 0.05, so the items in the model were meaningful. Considering the standardized regression weighting, the values ran from 0.624 to 0.856 > 0.5, so the items were highly relevant. Which items with a greater standardized regression weight will contribute to the scale more.

4.3. Structural Equation Modeling Analysis (SEM)

Conduct model analysis: the dependent variable is “Intention of using MoMo e-wallet”, and 4 independent variables include: “Effect Expectancy”, “Social Influence”, “Perceived Credibility”, and “Government Support”. The results of SEM analysis are shown in figure 4 and table 5.

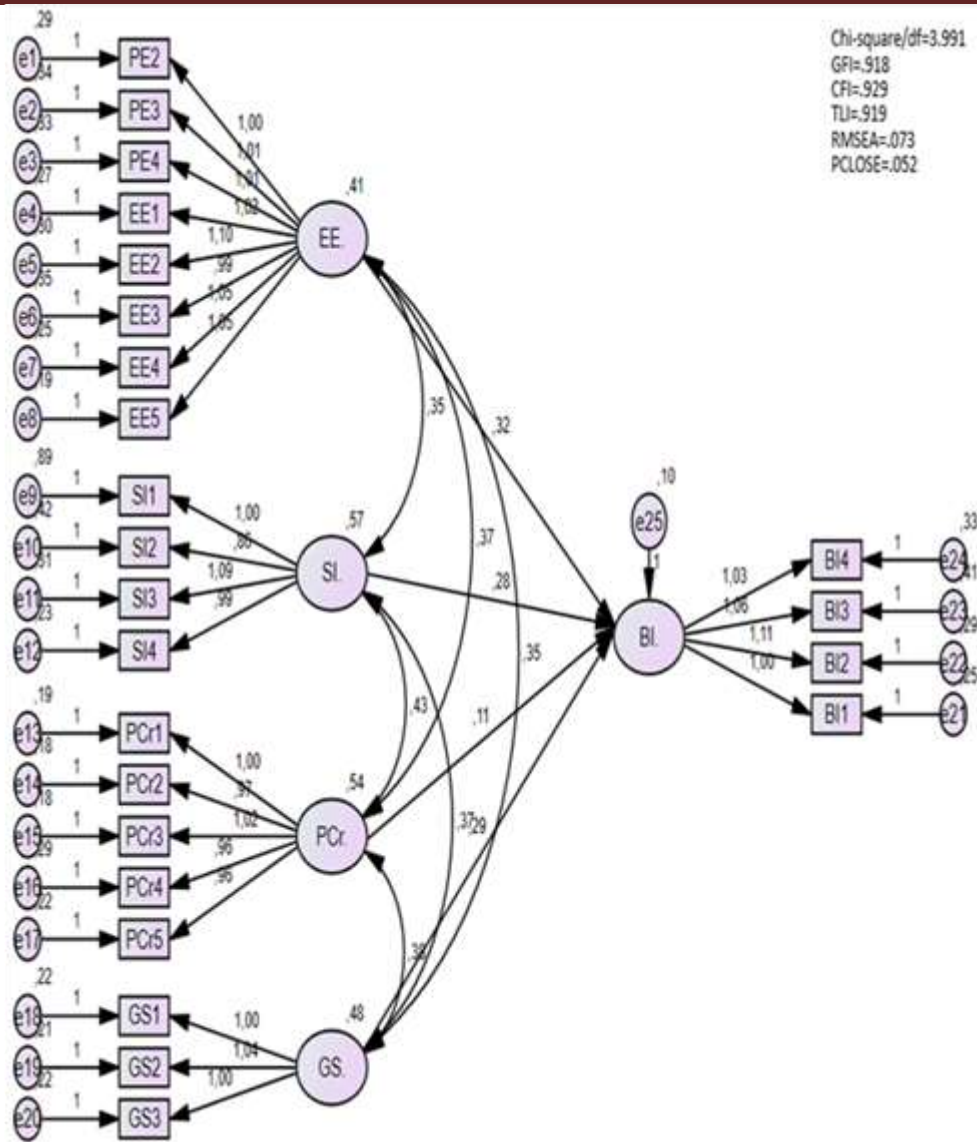


Figure 4: Diagram of SEM analysis
Table 5. The results of SEM analysis
(standardized coefficients)

| | | | Estimate | S.E. | C.R. | P |
|----|------|-------|----------|------|-------|------|
| BI | <--- | EE | .289 | .046 | 6.980 | *** |
| BI | <--- | SI | .299 | .039 | 7.342 | *** |
| BI | <--- | PCr | .113 | .041 | 2.696 | .007 |
| BI | <--- | GS | .285 | .041 | 7.055 | *** |
| | | R^2 | .796 | | | |

Note: ***: .000

Source: AMOS 20.0

The main indicators show that the analysis model was suitable for the data collected. In the analysis results table, the P-value of all four independent variables < 0.05 demonstrated that independent variables had an impact on the intention of using MoMo e-wallet. “Social Influence” was the most important role (0.299), next were “Effect Expectancy” (0.289), Government Support (0.285), and Perceived Credibility (0.113). The results showed that all four of these factors had the same effect on the dependent variable, and the four

hypotheses for the research model were satisfactory. $R^2=0.796$, so factors of the model explained 79.6% of the variability of the intention of using MoMo e-wallet.

5. Discussion and Recommendations

5.1. Discussion

The research verified hypotheses related to the impact of six factors: Performance Expectancy, Effort Expectancy, Social Influence, Perceived Credibility, Facilitating Conditions, and Government Support for “The intention of using MoMo e-wallet”. During the research, Performance Expectancy and Effort Expectancy were combined into a new factor: Effect Expectancy. The results of verified hypotheses were compiled in table 6, there are four satisfactory hypotheses and one hypothesis is eliminated.

Table 6. The results of verifying hypotheses

| Code | Hypotheses | Conclusion |
|------|----------------------------------------------------------------------------------------------------|---------------|
| H1&2 | The factor “Effect Expectancy” has a positive impact on the intention of using MoMo e-wallet | Supported |
| H3 | The factor “Social Influence” has a positive impact on the intention of using MoMo e-wallet | Supported |
| H4 | The factor “Perceived Credibility” has a positive impact on the intention of using MoMo e-wallet | Supported |
| H5 | The factor “Facilitating Conditions” has a positive impact on the intention of using MoMo e-wallet | Not supported |
| H6 | The factor “Government Support” has a positive impact on the intention of using MoMo e-wallet | Supported |

According to the results of the research, “Social Influence” was the most important factor in shaping students' intention of using MoMo e-wallet. This result was consistent with the results of the research “Factors affecting intention of using MoMo e-wallet when shopping online of students from Industrial University Ho Chi Minh City” (Nguyen Van Son, 2021). However, the level of impact of this factor (Beta coefficient) on the intention of using MoMo e-wallet was quite small when standing with the main factors such as “Performance Expectancy” or “Perceived Credibility”. Students at Industrial University Ho Chi Minh City appreciated “Perceived Credibility” rather than “Social Influence”, which is the opposite of students in Hanoi. The reason given that the survey subjects of students of Industrial University Ho Chi Minh City were male accounting for 35.6%, in this research, female students made up 84% of the overall research subjects, and indeed, female students were more often affected by the consumption habits of those around them than male students. Besides, there is an additional "Government Support" factor that also affects the intention of using MoMo e-wallet, it had the third-highest level of impact among the four impact factors. Therefore, “Government Support” was considered a new factor when compared to the research of students of Industrial University Ho Chi Minh City in particular and research of e-wallet in general.

5.2. Recommendations

5.2.1. Recommendations to students

According to the survey, the frequency of students using MoMo e-wallets 1-5 times per week accounted for 83.4%. Although the long-term intention of using MoMo e-wallet accounted for 90.9%, the majority of students didn't use it regularly. Leading to missing out on attractive features and incentive programs from MoMo, students should increase the frequency of using MoMo e-wallet. In addition, using e-wallets regularly help students to limit cash use, and avoid the case of falling, losing, and paying the wrong money. The survey had the question "What is the purpose of using MoMo e-wallet?" and the answer to choose an option accounted for 44.1%. That said, students haven't made all of the features of MoMo e-wallet, so students should make the most of MoMo and smartly use the new features of MoMo e-wallet. Specifically, the refund feature is a

specificity not only students but several customers are not interested in and it can allow users to save from a few hundred to several million per month. Or feature “monthly spending comparison”, this feature helps students manage their finances better through statistics of transactions that customers have made in the previous 6 months. According to the results of the analysis, the "Perceived Credibility" had the same effect as the students' intention of using MoMo e-wallet but this is the lowest impact factor (0.113). Basically, that said students were interested in MoMo e-wallet security. Therefore, students need to raise awareness about security issues and change their passwords every 3-6 months in case bad guys log into their accounts, use their wallets illegally and avoid sharing passwords or sharing accounts with multiple people, limiting transactions through electronic accounts at public computers. Students should also check and retain information about the status of the transactions made.

5.2.2. Recommendations to MoMo's service provider

The results of the research showed that "Social Influence" is the strongest factor influencing students' intention of using MoMo e-wallet (0.299). MoMo e-wallet service provider needs to take advantage of the spread of information, television, social networks, and online forums to introduce and disseminate propaganda about its product. For example, there are a few effective ways: outdoor advertising is located at large intersections, LED screens located in public areas or using the form of advertising overflowing bus glass. In addition, MoMo should leverage the influence of celebrities and reputable people to promote e-wallet or they can fund artists' art projects for the MoMo brand to appear on their products. Moreover, MoMo e-wallets need to have policies to care for and retain customers to build a community of consumers because customers are the most effective communicators for MoMo. They should link and cooperate with major brands, brands, businesses, and website applications with a high number of users to help MoMo both add new customers and build an ecosystem where MoMo e-wallets are intermediary payment services.

6. Conclusions, Limitations, and Future Research

The topic refers to the theoretical and research basis of some domestic and foreign authors on the MOMO e-wallet using intention in particular and e-wallets in general. On that basis, the topic has built a research model of factors affecting students' intention of using MoMo e-wallet, the research identified four factors that impact the intent of using MoMo e-wallet: Effect Expectancy, Social Influence, Perceived Credibility, Government Support, in which "Social Influence" is the most crucial factor reflecting the intention of using MoMo e-wallet. Therefore, researchers can use these scales and research models to conduct research in the field of electronic payments such as Mobile Banking, Internet Banking, ATM, credit card or future research may be repeatedly researched to check and confirm the results of the research. MoMo e-wallet provider, businesses/individuals providing goods/services on online booths, e-commerce websites, and regulatory agencies can refer to the results of this research to offer appropriate solutions for the sustainable development of e-commerce business activities and better manage the e-wallet market.

In addition to practical contributions in theory and practice to MoMo e-wallet provider and regulatory agencies, there are some limitations to the research. Firstly, the research period was conducted in a short time (for 3 months from 13/11/2021 to 13/2/2022). Therefore, the next research will require a longer research time to increase the quantity and quality of the research sample and consult more experts as well as ensure accuracy in the analysis and conclusion of the problem. Secondly, the research was conducted only with students who were living/studying in Hanoi. Therefore, the results of the research didn't reflect the overall level of all Vietnamese students using MoMo e-wallet. Next research will need to expand the scope of research to increase generality, reflect on the situation and make clear recommendations for each region in Vietnam. Thirdly, the research selected samples according to the convenient method - one of the methods of selecting non-probability samples so the representation is also low and the ability to generalize the crowd is not high. The next research should choose the methods of selecting the probability sample, the statistical effect will be higher. The new research only stops at the research of intent to use, future research may be gone deeper into the problem by researching the behavior used to detect more obvious impact factors because the behavior of user is resolutely directly affected by the use of e-wallet.

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ONLINE FOOD DELIVERY SERVICES (OFDS) IN HO CHI MINH CITY IN THE NEW NORMAL STATE: A STUDY OF THE FACTORS INFLUENCING CONSUMERS' BEHAVIORAL DECISION, SATISFACTION AND LOYALTY

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ABSTRACT

Online food delivery services (OFDS) have been widely used in the context of the new normal of the COVID-19 pandemic, especially in a developing country like Viet Nam. The purpose of this study is to determine the factors that influence the decision to use OFDS of customers, thereby affecting the satisfaction and loyalty of young people in Ho Chi Minh City. Over 300 people participated in the survey on the online Google Form platform and the author team collected 247 valid samples were selected out of nearly 300 participants via Google Form. Structural equation modeling (SEM) shows that "Fear of COVID-19" has the greatest influence on the decision to use OFDS, followed by "Convenience", "Promotion" and "Attitude". A special feature of the study is that it has been discovered that the factor "Subjective norm" does not affect consumers' decision to use OFDS in HCM City in the context of the new normal. This study can serve as a theoretical foundation that could benefit OFDS investors, and authors of research on the topic. Finally, this study can be applied and extended to identify the factors influencing the decision to use OFDS in the context of the new normal in HCM City.

Keywords: Online food delivery, OFDS, Actual use, Satisfaction and loyalty, New normal and COVID-19.

1. Introduction

1.1. Problem

First mentioned in the 70s of the twentieth century, the Internet from a concept has become one of the greatest inventions of mankind. It has a great influence on socio-economic development around the world. E-commerce in the globe in general, and in Vietnam in particular, has been going through significant changes, infiltrating all markets, as a result of the Internet aura. Retail sites, classified forums, online marketplaces and online food delivery services are examples of business fields.

According to the statistics of some organizations, the current online food delivery market in Vietnam is very promising. As reported by the Vietnam Retailers Association, in 2017, only 30% of urban residents used online ordering services in Ha Noi and Ho Chi Minh City, however, after the first six months of 2018, this number has increased to more than 70%. Thus, within one year, the number of users of this service has increased by 40%, although it only appears in urban areas. Just as the market research and consumer data company Statista (2019), the revenue in the online food delivery segment in Vietnam reached 146 million USD in 2019. The process of delivering food directly from the restaurant to the customer reached 127 million USD, with 7.3 million users, while the transaction through the application portal (platform to consumers) is 19 million USD, equivalent to 1.2 million users and growing by 68.8% annually. GCOMM (2019) stated that the frequency of using online food ordering services by urban people is quite high, opening up great potential for this market in Vietnam in the future. Specifically, 99% of survey participants said they use online food delivery services at least 2-3 times/month. Notably, 39% of survey respondents ordered food through the app 2-3 times a week. And although it still accounts for a very small percentage (1%), the market has begun to form a group of customers who have the habit of ordering food online daily.

Especially, in the context of the global pandemic of COVID-19 raging, when people are advised to stay at home and limit going out when not necessary, online food delivery services have now become popular and useful. The safe distance between the buyer and the shipper has helped users feel more secure and continue to use. Some restaurant owners who both sell on the spot and associate with online food delivery applications said that, after the period of social distancing, the number of customers who have returned to eat at the restaurant gradually increased, while figures recorded on online platforms are still performing well. The new normal of post-COVID has contributed to the formation and maintenance of this online ordering habit of some users. Therefore, some service providers have improvised their business strategy to expand online.

Stemming from the stressful reality caused by the COVID-19 pandemic and the variety of online food ordering platforms above, we have come up with the topic “Online food delivery services in Ho Chi Minh City in the state of the new normal: A study of factors influencing behavioral decisions, customer satisfaction and loyalty” in order to help young users consider choosing the right food ordering and delivery service in terms of quality and economy, and thereby helping related businesses improve and enhance service delivery.

1.2. Research objective

- Identify, measure and analyze the factors affecting customer satisfaction and loyalty when using OFDS in the new normal state.
- Establish relationships of the factors affecting satisfaction and loyalty through mediating variable Actual use.
- Propose suggestions and corporate governance methods to adapt and advance positive experience for customers when using OFDS.

1.3. Research population and research focus

Research population: Sampling is gathered information from 387 young people between the ages of 18 and 25 years living in Ho Chi Minh City.

Research focus: This research focuses on those who are using or used to use OFDS in the new normal state.

1.4. Research scope

Research area: sampling gathered information from 387 young people ranging from 18 to 25 years of age living in Ho Chi Minh City.

Research time: initialize subject and study from December 2021 to February 2022.

1.5. Research methods

1.5.1. Data collection

The study was mainly carried out on quantitative research and statistical analysis whilst designing the scale of measurement. As regards convenience sampling and snowball sampling, research information sent out online surveys via Messenger, Zalo... Time survey was conducted from December 30th, 2021 to January 14th, 2022.

1.5.2. Data analysis

In order to identify factors influencing customer using OFDS, the research uses the data analysis methods including:

Sampling Method: based on convenience, accessibility, and easy access to information, the survey method used in the study is a convenience sampling method.

Descriptive Statistics: based on a general look at the sample and collected data rundowns.

Document Analysis: based on the analysis, synthesis, review of documents, theories, and previous studies to compare, evaluate, provide the foundation for the research hypotheses development.

Primary data in the research is handled by SPSS 20 software and Amos 20 with data analysis techniques used mainly: Reliability Analysis, Exploratory Factor Analysis (EFA), Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM) that will be discussed further in section 3.

1.6. Research Structure

This research has been divided into five sections. Introduction and reasons for choosing research topics are mentioned in Section 1. Section 2 follows the introduction presenting the literature review. The methods used in the paper are described in Section 3. Section 4 discusses the findings. Section 5 summarizes the paper's findings, conclusions and suggests future research directions.

2. Theoretical framework

2.1. Theoretical background

2.1.1. Online food delivery services (OFDS)

Online food delivery services (OFDS) are understood as services that allow users to place food orders through digital platforms such as applications on phones or other smart devices. Customers can look up all nearby restaurants, view menu options, and choose the food or drink they want (Kapoor, A.P.; Vij, M., 2018). OFDS will deliver food on the behalf of the restaurant (Statista, 2019a) and charge a commission on orders placed.

OFDS emerged out of a need for speed and convenience. Consumers need not worry when thinking and planning meals. Plus, they can save time by not leaving their home or workplace.

At the same time, OFDS offers many opportunities to the food industry by providing new ways to promote, communicate and distribute products to their target customers. Nowadays, academics, marketing executives and even the retail industry are constantly engaged in the enhancement of OFDS, with the aim of minimizing costs and maximizing the number of users (Prasetyo, Y. T. et al, 2021)

In the current context, “new normal” was coined as a term that denotes the major social change that the COVID-19 epidemic has caused globally. As the virus is constantly evolving, we must live with and adapt to this new normal (Denworth, 2020).

2.1.2. New normal state

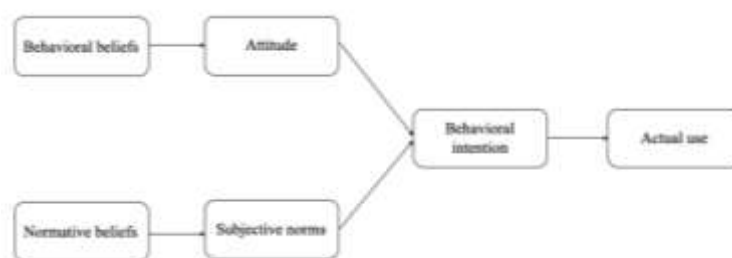
The term “new normal” is described as the accepted, habitual, state of affairs normally after an event has occurred (Urban Dictionary, 2009). According to Davis, I. (2009), the new normal is formed by the amalgamation of some that arose directly and possibly before the crisis occurred.

In the current context, “new normal” was coined as a term that denotes the major social change that the COVID-19 epidemic has caused globally. As viruses are constantly evolving, we must live with and adapt to this new normal (Denworth, 2020).

Since 2019, the COVID-19 pandemic has been changing the way people live, work and connect in society. Among them is the skyrocketing demand for OFDS due to social distancing protocols and the fear of infection.

In the new normal, many consumer lifestyle trends can arise and the use of OFDS is no exception. This requires businesses to have appropriate and smart adjustment policies to adapt to the above change.

2.1.3. Theory of Reasoned Action (TRA)



(Model TRA)

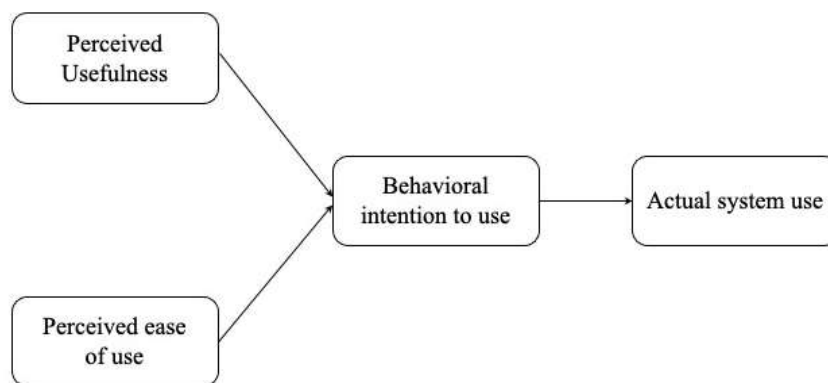
Ajzen and Fishbein first proposed the Theory of Reasonable Action (TRA) in 1967, and it was revised and broadened in 1975. Behavioral intention is the best predictor of customer behavior, according to the TRA model (Ajzen and Fishbein, 1975). According to the same study, the two most important elements influencing behavioral intention are attitude and subjective norm.

In the TRA model, attitude is measured by perceptions of product attributes. Consumers will pay attention to attributes that provide essential benefits and of varying importance. If we know the weights of those attributes, we can roughly predict the results of the consumer choice.

The TRA theory shows that the stronger the intention, the greater the motivation to perform the behavior, leading to an increased likelihood of voluntarily performing the behavior. The biggest limitation of this theory stems from the assumption that behavior is under the control of the will. That is, this theory only applies to pre-thought conscious behavior. Unreasonable decisions to behave, act out of habit, or behaviors actually considered unconscious cannot be explained by this theory (Ajzen & Fishbein, 1975). That is also why there is the intentional behavioral theory (TPB).

In this study, the authors believe that Attitude and Subjective norm will be two factors that can have a positive impact on the decision to use OFDS.

2.1.4. Technology Acceptance Model (TAM)



(Model TAM)

Based on the theory of rational action (TRA), Davis (1986) developed the Technology Acceptance Model (TAM) which is more specifically related to the prediction of the acceptability of an information system. The purpose of this model is to predict the acceptability of a tool and determine the modifications that must be introduced into the system to make it acceptable to users. This model shows that the acceptability of an information system is determined by two main factors: Perceived usefulness and Perceived ease of use.

Perceived usefulness is defined as the degree to which a person believes that using a system will enhance their job performance. Perceived ease of use refers to the degree to which a person believes that using a system will be free from effort. Several factorial analysis have demonstrated that usefulness and perceived ease of use can be viewed as two different dimensions (Hauser et Shugan, 1980; Larcker et Lessig, 1980; Swanson, 1987).

As shown in the theory of rational action, the technology acceptance model postulates that the use of an information system is determined by behavioral intentions, but on the other hand, behavioral intentions are determined by the person's attitude towards using the system and also by his perception of its utility. According to Davis, an individual's attitude is not the sole determinant of the use of a system, but also its impact on performance. Besides, the Technology Acceptance Model hypothesizes a direct link between perceived usefulness and ease of use.

2.2. Hypotheses Development and Research Model

2.2.1. Factor “Attitude”

Attitude is defined as the overall assessment of consumers when deciding to use a particular product/service. According to Ajzen (1991), attitude refers to “the degree to which a person has favorable or unfavorable evaluation or appraisal of the behavior in question”. That is, the more positive an individual's attitude toward the behavior is, the stronger the individual's behavioral intentions will be, more likely to be easily realized, and vice versa.

Attitude plays as an important role when predicting consumer behavior for a long time (Ajzen, 1985, 1991; Bagozzi et al., 2003; Fishbein & Ajzen, 1975; Kiatkawsin and Han, 2017a). In TRA theory and TAM model, attitude is one of the main factors that lead individuals to take action. Many studies have demonstrated that consumer attitudes will greatly influence purchase intention and are an important factor in helping a transaction to be made (Fishbein & Ajzen, 1975).

Accordingly, we predict that the habit of using online food delivery services during the new normal will also be strongly influenced by consumers' attitudes. This expectation is completely consistent with the literature that has been studied. Before that, Hsu et al. (2014) found that attitude towards online shopping has a positive influence on purchasing decisions. Yeo et al. (2017) also confirmed a positive relationship between attitude and desire to use OFD services. In addition, Troise et al. (2020) also points out the positive effects of this factor on individuals who intend to use OFDS. All of the above studies demonstrate that, when consumers believe that ordering food online is useful and has the potential to reduce risks in their daily lives, they are more motivated to develop a positive attitude, which leads to the behavior of its use. We expect this trend to be even more pronounced under the influence of the COVID-19 pandemic, especially during the new normal.

In addition, this factor also expresses good or bad judgments based on sustainable perception, emotional feelings and action tendencies of a person towards an object or a certain idea. Accordingly, attitude will cause us to behave fairly consistently with similar things. Therefore, it is very difficult to change one's attitude. This is the premise showing the close relationship between this factor and customer satisfaction and loyalty.

Customers expressing a more favorable attitude in comparison to competitors can increase loyalty and satisfaction when using OFDS. Attitude research provides insight into why a customer displays loyal behavior. That is, measuring attitudes will help businesses understand why a customer is satisfied and continues to use their brand. Therefore, we propose the hypothesis:

H1a: Attitude has a positive impact on actual use OFDS in the new normal

H1b: Attitude has a positive imoact on customer satisfaction and loyalty in the new normal

2.2.2. Factor “Subjective norm”

An individual's perception with his or her key references, that the behavior should or should not be performed (Fishbein & Ajzen, 1975). In other words, this factor refers to the extent to which people feel pressure from others (family, friends, colleagues...) of their community who are important to them to act in a certain way (Abdullah & Ward, 2016; Ham et al., 2015).

Usage practices are positively shaped by supportive views from key people in an individual's circle, as they reduce hesitations and strengthen confidence when making decisions. Many previous empirical studies have demonstrated a positive relationship between these two factors, including those related to OFDS. Troise et al. (2020) found that subjective norm has a significant and positive influence on trust in OFDS as well as decision to use services. In addition, Gunden et al. (2020) also confirmed that social influence has a positive relationship in persuading consumers to use these services.

In the context of the new normal, it is necessary and meaningful to cooperate in complying with safety guidelines and spread influence, helping others by sharing information about safety measures. As a result, consumers' choices for OFDS are more likely to be strongly influenced by the recommendations of those

around them to protect them from COVID-19. If shoppers perceive social pressures to use OFDS in the new normal as high, they will be more likely to intend to use these services. Therefore, we propose the following hypothesis:

H2: Subjective norm has a positive impact on actual use OFDS in the new normal

2.2.3. Factor “Fear of COVID-19”

According to Mertens et al (2020), fear refers to “an adaptive emotion that serves to mobilize energy in response to a potential threat”. Fear of COVID-19 has been defined as “a negative emotional state, indicative of anxiety and depression, resulting from awareness of the possible consequences of the COVID-19 pandemic” (Jian et al. al., 2020, p.2). When the threat is uncertain and persistent, like the COVID-19 pandemic, fear can be worse than ever (Mertens et al., 2020).

In a pandemic situation, people tend to have increased levels of fear and anxiety than usual (Asai et al., 2021; Chen & Eyoun, 2021; Torales et al., 2020). Risks can also include fear of contagion through the community by sharing a restaurant space or simply through customer service by staff. Therefore, from the above fears, it is possible to increase the use of OFDS.

In addition, people reduce their perception of risk based on many aspects to legitimize their activities (Andrade. D et al, 2021). If consumers perceive a high risk of COVID-19 infection when receiving food, there will be conflicts with other factors in favor of this practice, creating anxiety. This anxiety is a psychological response to feeling threatened (Taha, S. A., 2014), which in turn is rationalized as a risk. Consumers with high continued usage intent can reduce their risk of COVID-19 awareness, reduce anxiety, and legitimize the use of OFDS. This impact can occur because people are uncertain about the spread of coronavirus through food or its packaging, despite the direction of international organizations (Food and Drug Administration, 2020; World Health Organization, 2020). Therefore, we propose the hypothesis:

H3: Fear of COVID-19 has a positive impact on actual use OFDS in the new normal.

2.2.4. Factor “Application quality”

Application quality is the most important concern when it comes to a customer's use of a technology, and it is critical to customer satisfaction. Technology advancements and a competitive environment necessitate new actions. Companies that fail to consider and meet the required quality standards for their products and services will fail to survive in the market. Companies must persevere in order to understand their customers’ needs and must strive to exceed their customers’ expectations. As a result, quality is critical for business success and growth in the future.

In the context of a food delivery app, application quality can be defined as a multidimensional interface that elicits negative or positive responses to the app's use. In reality, scholars have been pointing out for the past two decades that the ease-of-use of technological innovations has a significant positive association with use intention (Davis, 1989). As a result, we contend that application quality is likely to be positively associated with ease of use. Therefore, we propose the hypothesis:

H4: Application quality has a positive impact on actual use OFDS in the new normal

2.2.5. Factor “Promotion”

Promotion is defined as incentives, mainly short-term, used to stimulate consumers and/or dealers to speed up the purchase process or increase sales. The company is increasingly realizing the importance of having a well-planned and structured sales promotion program. More specifically, businesses need to communicate to consumers what they have to offer (Jobber and Lancaster, 2006). Laroche et al. (2003) explained sales promotion in the context of the cognitive-affect-behavioral model and suggested that compared with other tools in the marketing mix, sales promotion has the strongest impact on the final stage of product purchase. Promotions in OFDS will affect everyone using these services. Many researchers have described how different types of promotions trigger different promotional responses (Laroche et al., 2005). People will prefer to use OFDS if it offers cheaper prices than restaurants. Furthermore, OFDS need to

consider their terms and conditions when offering promotions. For example, a short expiration date will directly affect people by encouraging them to use an OFDS that is faster than usual.

Therefore, to make people more interested in using OFDS, promotion can be a good solution. Simultaneously, a recent study found that promotion has a significant direct effect on actual usage ($\beta = 0.15$, p -value = 0.019). According to Oyeniyi, O. (2011), sales promotion techniques not only help consumers pay attention to the product but also provide incentives to repurchase it. In other words, promotion is an important tool in creating satisfaction (or pleasure) and reinforcing customer loyalty. Consumers will make a judgment about the overall satisfaction or dissatisfaction of a promotion after experiencing it, and will foster an intention to repeat the process in the future. Oyeniyi, O. (2011) also argues that the essence of business existence is to produce goods and services according to customers' requirements and make a profit from that activity. Therefore, in the context of fierce competition in the market today, service providers must develop marketing strategies that not only win customers but also help retain them. From there, we propose the following hypothesis:

H5a: Promotion has a positive impact on actual use OFDS in the new normal

H5b: Promotion has a positive impact on customer satisfaction and loyalty in the new normal

2.2.6. Factor "Convenience"

In the context of OFDS, convenience is defined as a factor that will help consumers increase their access to OFDS that can save them resources (time, effort, ...) thereby creating value for consumers. Research has shown that convenience is considered as a continuous influencing factor on the intention to use OFDS (Seiders et al, 2005). Jiang et al (2011) argue that the convenience factor will be one of the official motivations for users to use online food delivery applications because customers need to be convinced of the value they receive before use. When the developers introduced the online delivery service along with the delivery system to the public, the convenience made consumers interested and used it. Kime (2011) mentioned that with users having the ability to use new electronic technologies, easily and safely along with allowing consumers to order and receive food anytime, anywhere, customers would prefer using an online delivery service to buying food at a store. At the same time, using OFDS will have many advantages such as helping customers avoid poor service experience at the restaurant (Chen & Hung, 2015) and reduce the number of customers overloading the store (Katawetawarakas & Wang, 2011). The convenience of time and effort will be an important attribute for consumers to decide to use OFDS (Collier & Kimes, 2013). Therefore, we propose the hypothesis:

H6: Convenience has a positive impact on actual use OFDS in the new normal

2.2.7. Factor "Satisfaction and loyalty"

Once the necessary factors that motivate a purchase have been achieved, consumers will engage in different behavior and reactions after the purchase process: either continue to use the product again and recommend it to people around, or stop buying and have negative feedback that affects others... In general, satisfaction or dissatisfaction with the product will greatly affect the buying behavior later on. Therefore, every organization desires customer satisfaction and loyalty.

Satisfaction is a subjective assessment of product performance in association with the customer's prior expectations (Suhartanto, Brien, Sumarjan, & Wibisono, 2018). Accordingly, dissatisfaction occurs when performance does not meet expectations, while satisfaction occurs when performance exceeds expectations. There are many previous documents that claim that the purchased product/service and its characteristics profoundly affect the customer's perception such as research by Liu et al. (2017); Ryu & Han. (2009); Suhartanto et al. (2018). Therefore, customer satisfaction serves as an important parameter in determining whether a purchase actually creates positive results for individuals in particular and business organizations in general.

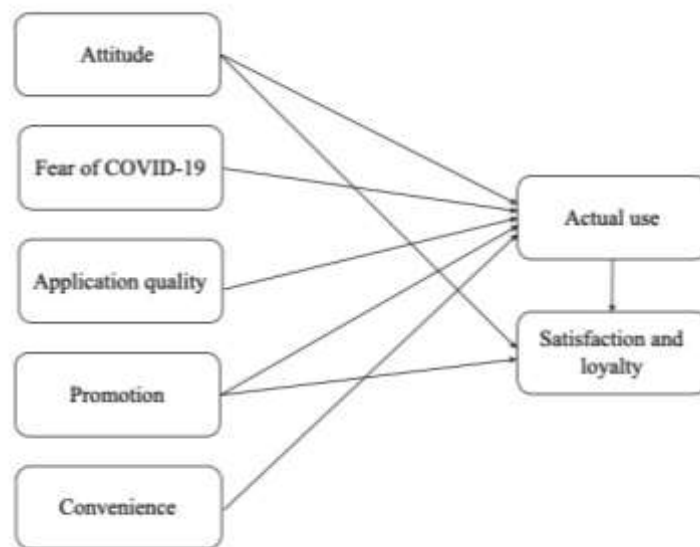
Loyalty is "a deeply held commitment to repurchase or re-patronize a preferred product or service consistently in the future despite situational influences and marketing efforts" (Oliver, 1999). The literature

claims that loyal customers increase a company's profits through their long-term commitment toward the company and enable it to reduce costs in recruiting new clients (Reichheld, Markey & Hopton, 2000). Further studies (Kim et al., 2009; Suhartanto, Chen, Mohi & Sosianika, 2018) also reveal that loyal customers tend to purchase more than newly acquired customers, pay premium prices, refer new customers to the company and reduce operating costs. Therefore, this is considered as one of the ideal values that organizations expect.

The above two factors are considered to be highly meaningful outputs for the business activities of each organization. Many studies have concluded that there is a significant relationship between customer satisfaction and loyalty as studied by He and Song (2009); Mensah (2010); Tee et al. (2012). They assert that high levels of customer satisfaction will lead to increased loyalty for companies. In general, satisfaction and loyalty often appear based on a consumer's positive experience in consuming a product/service. Therefore, we propose the following hypothesis:

H7: Actual use has a positive impact on customer satisfaction and loyalty in the new normal

From the above-developed hypotheses, the research model is given following as:



(Research Model)

3. Research method

3.1. Quantitative research design

The main data collection tool is a questionnaire (using Google Form) - a popular way to quickly get opinions from many people (Gillham, 2000). Based on the results of qualitative research after synthesizing, the authors built a set of 42 question Likert scale questions. Selected questions, further referring to research papers, are determined on a scale of 1 to 5, followed by “Strongly disagree”, “Disagree”, “Normal”, “Agree”, “Totally agree”. The content of the question, in addition to determining basic personal information to select suitable respondents, also focuses on factors affecting the decision to use OFDS, thereby affecting customer satisfaction and loyalty.

3.2. Sample calculation

For SEM linear structural model analysis, according to Hair et al. (2010), the appropriate sample size will be determined based on groups of factors. Minimum sample size is 150 - number of factor groups from 7 groups or less, each group must have 3 observed variables, communality of observed variables must be from 0.5 or more.

Data were collected from students from universities within Ho Chi Minh City but mainly from UEH University students. Time to collect from December 2021 to February 2022. The evaluation has been done

by 300 respondents that completed the questionnaire. *The number of valid surveys eligible to use for the research paper is 247.*

3.3. Quantitative questionnaire

Depending on related scales from previous studies, the author has built a scale for this study. For the reference scales from previous research papers, the author will revise the wording to suit the context of the research paper.

| Construct | Items | Measures | References |
|---------------------|-------|--------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------|
| Attitude | ATT1 | For me, use OFDS are necessary | Cobanoglu & Corte (2021) |
| | ATT2 | For me, use OFDS are wise | |
| | ATT3 | Using OFDS are useful during the new normal | Cho et al (2019) |
| | ATT4 | I am strongly in favor of ordering food through the OFDS | |
| | ATT5 | I desire to use OFDS when I purchase food | |
| Subjective norm | SN1 | People who are important to me (e.g., family members, close friends, and colleagues) think OFDS are beneficial during the new normal | Venkatesh et al., 2003, Zhao & Bacao, 2020 |
| | SN2 | People who are important to me recommend I use OFDS during the new normal | |
| | SN3 | People who are important to me support me to use OFDS | Cobanoglu & Corte (2021) |
| | SN4 | The influencers I care about will have an impact on my use of the OFDS | |
| | SN5 | People whose opinions are valued to me (e.g., experts, government, health ministry) would prefer that I should use OFDS | |
| Fear of COVID-19 | FOC 1 | When watching the news about COVID-19, I become nervous or anxious | Cihan Cobanoglu and Valentina Della Corte (2021) |
| | FOC 2 | I am afraid of losing my life because of the COVID- 19 | |
| | FOC 3 | I am afraid of losing my life because of the COVID-19 | |
| | FOC 4 | I believe that the risk of contaminating myself with COVID-19 when receiving food at home is low | Hakim at el., 2021 |
| | FOC 5 | The risk of COVID-19 contamination is lower using food delivery apps than going to restaurants | |
| Application quality | AQ1 | FDAs allow me to search and locate the information I need quickly and effectively | Jankit Chotigo and Yasuo Kadono (2021) |
| | AQ2 | The information provided by FDAs is accurate and reliable | |

| | | | |
|--------------|-----|--------------------------------------------------------------------------------------------------------------------|-------------------------------------------|
| | AQ3 | I the feature to track order process (order accepted/prepared/picked up) via an FDA | |
| | AQ4 | FDAs are easy to use | |
| | AQ5 | The order placement process via FDA is easy for me | Arghya Raya et al (2019) |
| | AQ6 | I feel that OFD application in terms of design and position are well organized | |
| Promotion | P1 | I feel that the discount provided encourages me to use OFDS | Kapoor, A.P.; Vij, M. (2018) |
| | P2 | Terms and conditions of promotion are important to me before I use OFDS | |
| | P3 | Tempting sales promotion offers drives me to order food frequently | Dipanti, J., Viral, B., (2021) |
| | P4 | I think that promotion expiry date influences me in making an order | |
| | P5 | I tend to buy more from online food delivery applications after I get to know more about different sales promotion | |
| Convenience | CV1 | Using OFDS enable me to purchase food at any time I want | Jankit Chotigo and Yasuo Kadono (2021) |
| | CV2 | Using OFDS enable me to purchase food wherever I am | |
| | CV3 | I find that OFDS are convenient for purchasing food | |
| | CV4 | ODFS help me to avoid traffic | Arghya Raya et al., 2019 |
| | CV5 | I think that OFDS help me to save my time instead of buying food/beverages by myself | Yeo et al. 2017; Prabowo and Nugroho 2018 |
| Actual use | AU1 | When buying food, I always use OFDS | Pine, B.J.; Gilmore, J.H. (2015) |
| | AU2 | I prefer to use OFDS rather than delivery service owned by the restaurant | |
| | AU3 | I always check the available food/restaurants | Rivera, M. (2019) |
| | AU4 | I always check the notification and promotion | |
| | AU5 | I would recommend using OFDS to family, colleagues, and friends | |
| Satisfaction | SL1 | I am satisfied with the way OFDS carried out transaction | Alalwan, A.A. |

| | | |
|-------------|----------------------------------------------------------|----------------------------------------|
| and loyalty | | (2020) |
| SL2 | Overall, I was satisfied with the OFDS | Pine, B.J.; Gilmore, J.H. (2015) |
| SL3 | I always subscribe to OFDS promotions | |
| SL4 | I will use the OFDS again in the future | Cai, R.; Leung, X.Y. (2020) |
| SL5 | I will promote the OFDS to other people | Zhao, Y.; Bacao, F. (2020) |
| SL6 | I will share the testimonial of using OFDS to the public | |

(Quantitative questionnaire)

3.4. Data analysis method

3.4.1. Descriptive Statistics

Descriptive statistics of categorical variables: The demographic information, as well as information about the respondent's MA answers.

Descriptive statistics of observed variables: Statistical study of the largest, smallest, mean, median and standard deviation of the observed variables.

3.4.2. Reliability Analysis

Hair et al. (2014) claimed that Cronbach's Alpha should be 0.7 or higher to have a unidimensional and reliable scale, but as a preliminary discovery study, Cronbach's Alpha can be accepted at 0.6. And according to Cristobal et al. (2007), the Corrected Item - Total Correlation index at 0.3 is able to get a scale with good observed variables Any observed variable that does not meet the Corrected Item - Total Correlation criterion will be discarded and Cronbach's Alpha's test will conduct after removing the non-conforming variable.

3.4.3. Exploratory Factor Analysis (EFA)

Inspecting all observed variables simultaneously. According to Kaiser (1974), KMO values have to be 0.5 or higher to ensure the appropriateness of factor analysis. On that basis, we consider indicators according to following standards:

- The coefficient KMO (Kaiser - Meyer - Olkin) must be within [0.5; 1]
- Bartlett's Test sig coefficient < 0.05
- Eigenvalue > 1
- Total Variance Explained 50%

Factor Loading coefficient, according to Hair et al. (2014) states that in analyzing the exploratory factors EFA, the absolute value of Factor Loading at 0.3 to 0.4 is the minimum condition for the observed variable to be retained, 0.5 up are observed variables with good statistical significance. However, the selection of Factor Loading should also consider the sample size; the number of observations is 247, we choose the threshold for Factor Loading to be 0.5.

3.4.4. Confirmatory Factor Analysis (CFA)

Confirmatory Factor Analysis (CFA) is a type of linear structural model (SEM) that focuses on measurement models, specifically the relationship between observed variables or indicators. Indicators with latent variables or factors.

The evaluation of Model Fit in CFA is extremely important. The scales and latent variables form a measurement model of the concepts used in the research. With a collected data set, we need to test whether

this measurement model with the input data meets the requirements. Do the scales meet the requirements of a good scale, are there any observed variables that do not contribute to the model.

According to Hair et al. (2010), the indicators considered to evaluate Model Fit include:

- CMIN/df 2 is good, CMIN/df 5 is acceptable
- CFI 0.9 is good, CFI ≥ 0.95 is very good, CFI 0.8 is acceptable (CFA ranges from 0 to 1)
- GFI 0.9 is good, GFI 0.95 is very good
- RMSEA 0.08 is good, RMSEA 0.03 is very good

In some cases, due to the limitation of sample size, it is difficult for the GFI value to reach 0.9 because this index depends a lot on the number of scales, the number of observed variables and the sample size. Therefore, if the GFI value is below 0.9 but from 0.8 or higher, it is still accepted according to two studies by Baumgartner & Homburg (1995); Doll, Xia & Torkzadeh (1994).

3.4.5. Structural Equation Modeling

Structural Equation Modeling (SEM) is a powerful statistical technique used for identifying, estimating, and testing causal relationships between the latent variables.. With the confirmatory factor analysis (CFA) technique, the SEM model allows the flexibility to derive the causal relationships of the proposed hypotheses construct.

4. Results and discussion

4.1. Results

This section will present information and general comments about the survey sample and the results obtained when performing the analysis such as: testing the scale; EFA; CFA; SEM. At the same time, provide the final research model after investigating and explaining the relevance and accuracy of all relevant variables.

4.1.1. Sample Description

a) Responders' Information

Gender

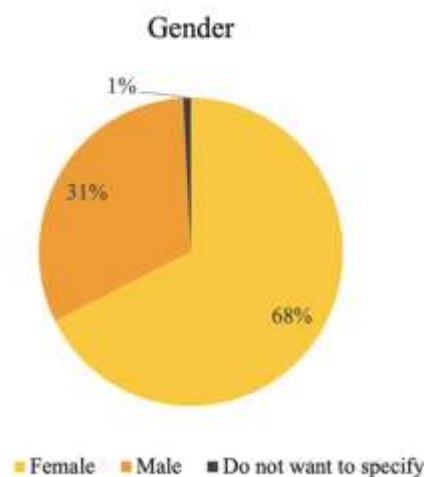


Figure 4: Responders' Information - Gender

The majority of survey respondents are female with 68%, followed by the male with 31% and 1% for group do not want to specify their gender. It presents the number of female respondents approached twice as the male ones.

Monthly income

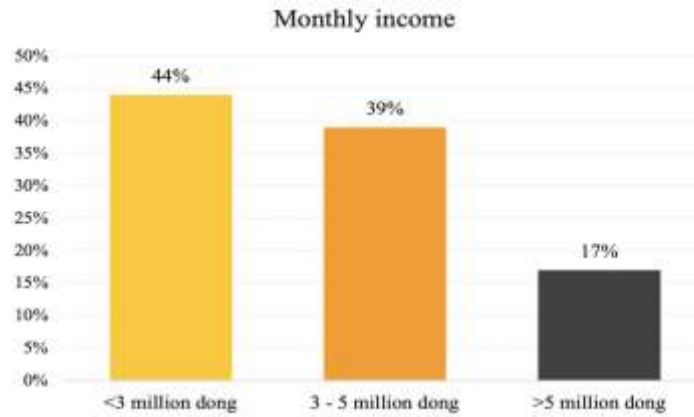


Figure 5: Responders' Information - Monthly income

Through the survey, we can see that most respondents have a monthly income lower than 3 million dong (44%), followed by the level of income 3-5 million dong with 39% and 17% for a group with the income level over 5 million dong.

Age

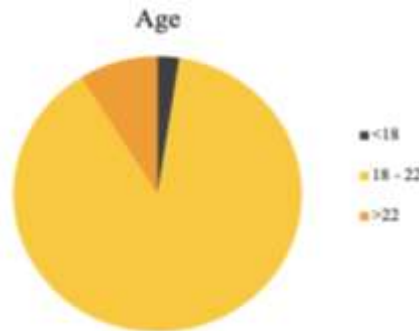


Figure 6: Responders' Information - Age

It can be seen that the majority of respondents are in the age group of 18-22 years old (accounting for 91.6%), the number of respondents >22 years old accounted for 5.8%, the respondents <18 years old accounted for 2.6%. This shows that in the new normal, most young people who are students tend to use online food delivery services more than others.

Usage time

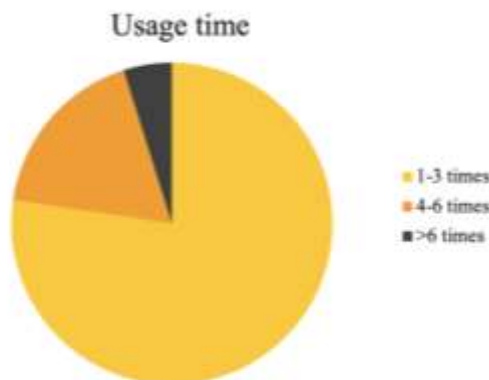


Figure 7: Responders' Information – Usage time

Through the survey, we can see that the majority of respondents use online food delivery services 1-3 times a week (accounting for 77.3%), the level of 4-6 times a week accounts for 18%. This shows that, in the new normal, respondents still have interest and preference for this type of service to ensure their own safety.

b) Descriptive Statistics

Factor 1: Attitude

Table 2: Mean of the observed variable “Attitude”

| Variable | Description | Mean | Std. Deviation |
|----------|----------------------------------------------------------|------|----------------|
| ATT1 | For me, use OFDS are necessary | 4.23 | 0.731 |
| ATT2 | For me, use OFDS are wise | 3.94 | 0.807 |
| ATT3 | For me, use OFDS are trustworthy | 3.72 | 0.754 |
| ATT4 | I am strongly in favor of ordering food through the OFDS | 4.13 | 0.734 |
| ATT5 | I desire to use OFDS when I purchase food | 4.03 | 0.806 |

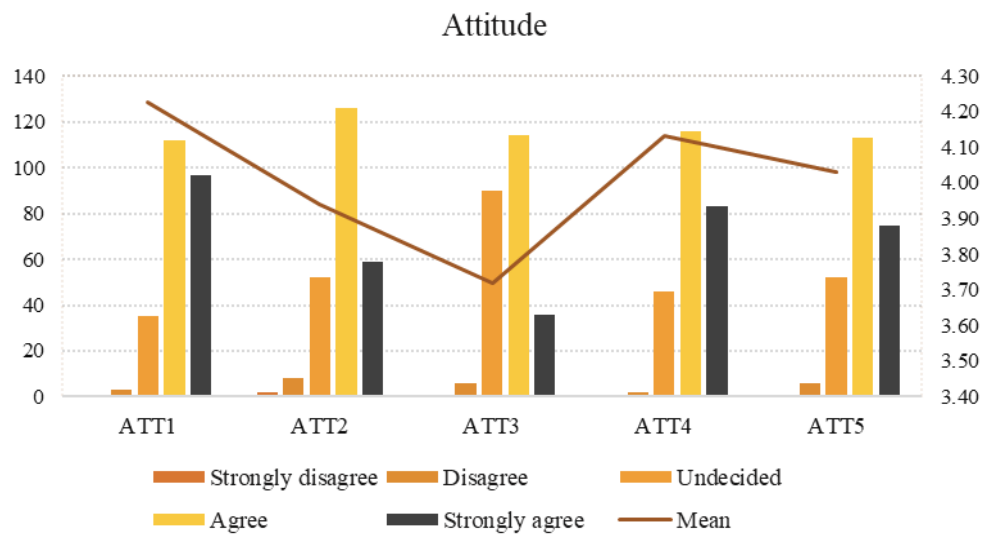


Figure 8: Descriptive statistics for the observed variable “Attitude”

The observed variables of H1 have average values ranging from 3.94 to 4.23, showing that most of the respondents quite agree with the questions posed. In which, ATT1 “For me, use online food delivery service is necessary” received the highest level of agreement from the respondents, proving that everyone is aware of the importance and necessity of online food delivery services in the context of the new normal, although some few are still wondering about the level of reliability when using these services.

Factor 2: Subjective norm

Table 1: Mean of the observed variable “Subjective norm”

| Variable | Description | Mean | Std. Deviation |
|----------|--------------------------------------------------------------------------------------------------------------------------------------|------|----------------|
| SN1 | People who are important to me (e.g., family members, close friends, and colleagues) think OFDS are beneficial during the new normal | 3.84 | 0.815 |
| SN2 | People who are important to me recommend I use OFDS during the new normal | 3.60 | 0.940 |
| SN3 | People who are important to me support me to use OFDS | 3.83 | 0.914 |
| SN4 | The influencers who I care about will have an impact on my use of the OFDS | 3.53 | 0.991 |
| SN5 | People whose opinions are valued to me (e.g,experts, government, health ministry) would prefer that I should use OFDS | 3.67 | 0.993 |

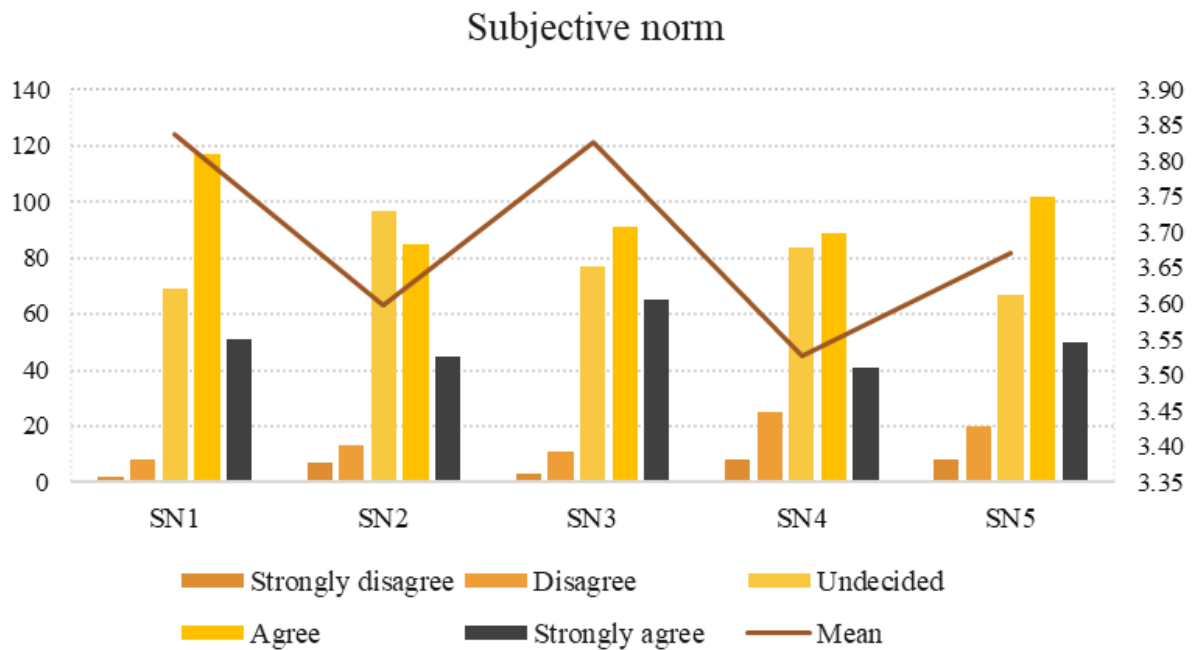


Figure 9: Descriptive statistics for the observed variable “Subjective norm”

Most of the observed variables of H2 have average values ranging from 3.53 to 3.84, demonstrating that most of the respondents have neutral opinions and are not influenced much by people around. In which, the opinions of Influencers are the least trusted, and opinions from important people (family members, close friends and colleagues) receive the highest degree of influence. This proves that, in the context of the new normal, with the danger level not yet cooled down, the respondents tend to worry and worry more about the health of themselves and those close to them. So advice from these people will directly influence their decision to use an online food delivery service. At the same time, with increasing awareness, these subjects will easily find and analyze reliable information and make decisions on their own instead of being influenced by other individuals.

Factor 3: Fear of COVID-19

Table 2: Mean of the observed variable “Fear of COVID-19”

| Variable | Description | Mean | Std. Deviation |
|----------|--------------------------------------------------------------------------------------------------|------|----------------|
| FOC 1 | When watching the news about the COVID-19, I become nervous or anxious | 3,88 | 0.949 |
| FOC 2 | I am afraid of being infected with the COVID-19 | 3,98 | 0.937 |
| FOC 3 | I am afraid of losing my life because of the COVID-19 | 3,57 | 1.037 |
| FOC 4 | I believe that the risk of contaminating myself with COVID-19 when receiving food at home is low | 3,74 | 0.953 |
| FOC 5 | The risk of COVID-19 contamination is lower using OFDS than going to restaurants | 4,07 | 0.793 |

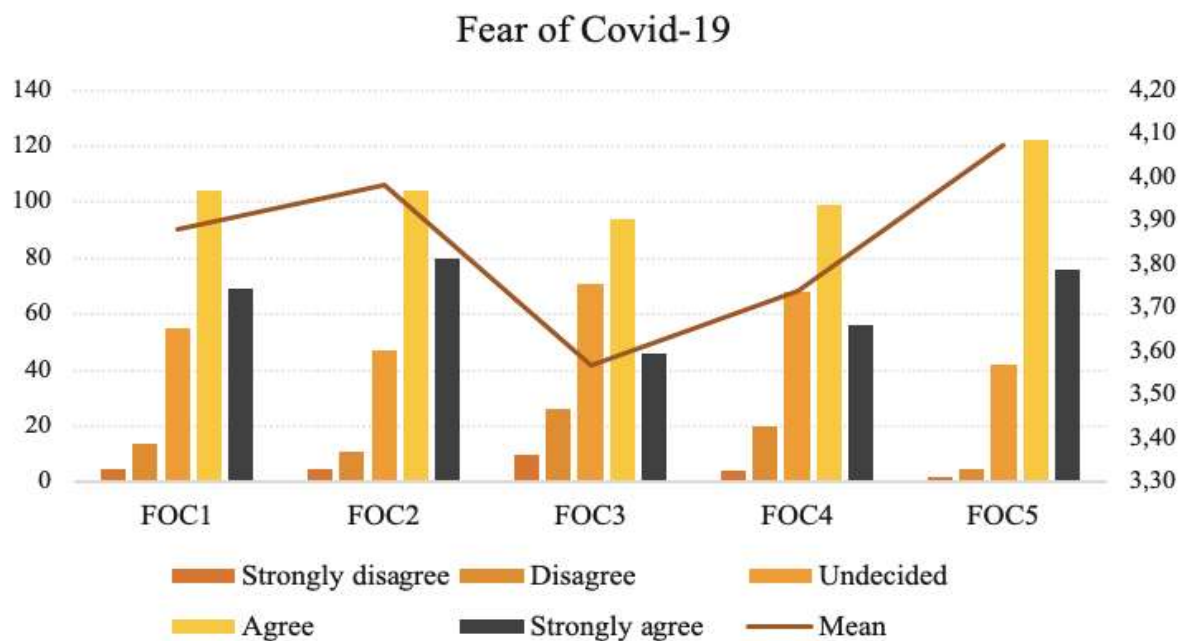


Figure 1: Descriptive statistics for the observed variable “Fear of COVID-19”

The observed variables of H3 have average values ranging from 3.57 to 4.07, showing that most of the respondents quite agree with the questions posed. In which, FOC5 “The risk of COVID-19 contamination is lower using food delivery apps than going to restaurants” received the highest level of agreement from the respondents, showing that everyone is aware of the lower risk of infection when using food delivery services than when eating at a restaurant. This proves that, in the context of the new normal, with the danger level not yet cooled down, respondents are still afraid of the alarming impact of the COVID-19 pandemic, so they tend to use online food delivery services instead of traditional food as before.

Factor 4: Application quality

Table 5: Mean of the observed variable “Application quality”

| Variable | Description | Mean | Std. Deviation |
|----------|--------------------------------------------------------------------------------------------|------|----------------|
| AQ1 | FDA's allow me to search and locate the information I need quickly and effectively | 4.11 | 0.760 |
| AQ2 | The information provided by FDA's is accurate and reliable | 3.96 | 0.788 |
| AQ3 | I like the feature to track order process (order accepted/prepared/picked up) via an FDA's | 4.22 | 0.729 |
| AQ4 | FDA's are easy to use | 4.22 | 0.683 |
| AQ5 | The order placement process via FDA's is easy for me | 4.28 | 0.685 |
| AQ6 | I feel that OFD application in terms of design and position are well organized | 4.13 | 0.738 |

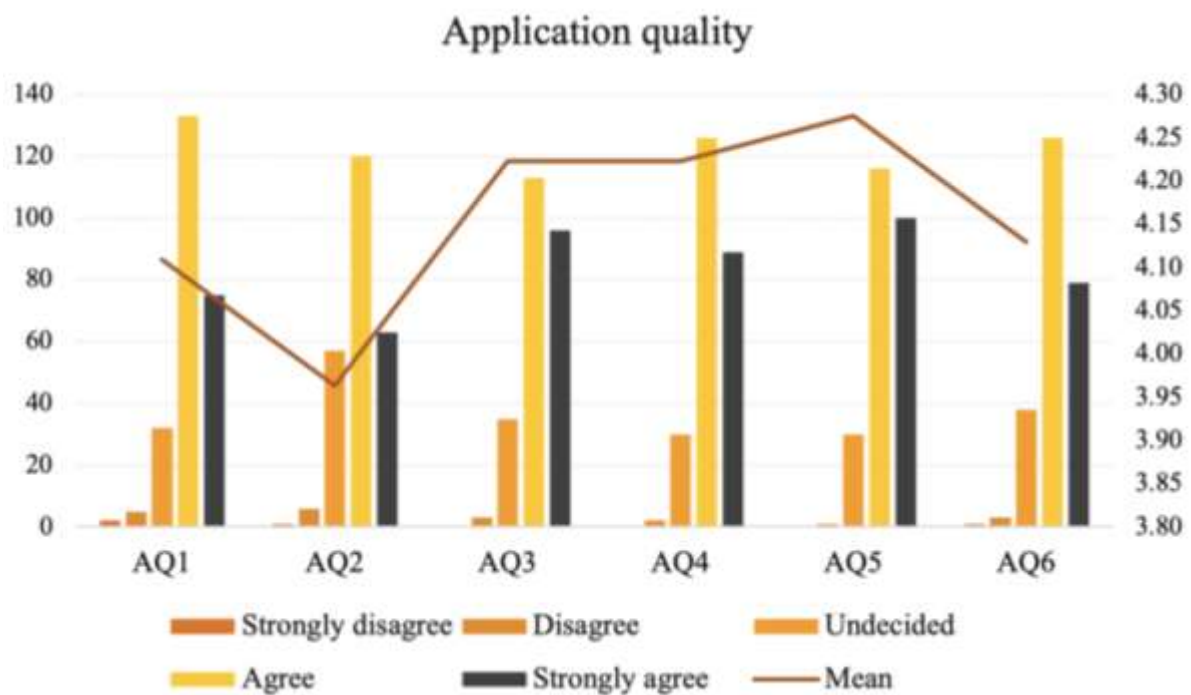


Figure 11: Descriptive statistics for the observed variable “Application quality”

The observed variables of H4 have average values ranging from 3.96 to 4.22, showing that most of the respondents quite agree with the questions posed. In which, AQ4 “FDAs are easy to use” and AQ5 “The order placement process via FDA is easy for me” received the highest level of agreement from the respondents, showing that everyone likes the feature to track order process and feels easy-to-use FDAs. Besides, there is still a section of respondents suspicious about the accurate information on FDAs. In particular, AQ2 received the lowest level of agreement with the average value at 3.96.

Factor 5: Promotion

Table 6: Mean of the observed variable “Promotion”

| Variable | Description | Mean | Std. Deviation |
|----------|--------------------------------------------------------------------------------------------------------------------|------|----------------|
| P1 | I feel that the discount provided encourages me to use OFDS | 4.31 | 0.798 |
| P2 | Terms and conditions of promotion are important to me before I use OFDS | 4.23 | 0.810 |
| P3 | Tempting sales promotion offers drives me to order food frequently | 4.25 | 0.842 |
| P4 | I think that promotion expiry date influences me in making an order | 3.92 | 0.884 |
| P5 | I tend to buy more from online food delivery applications after I get to know more about different sales promotion | 4.10 | 0.852 |

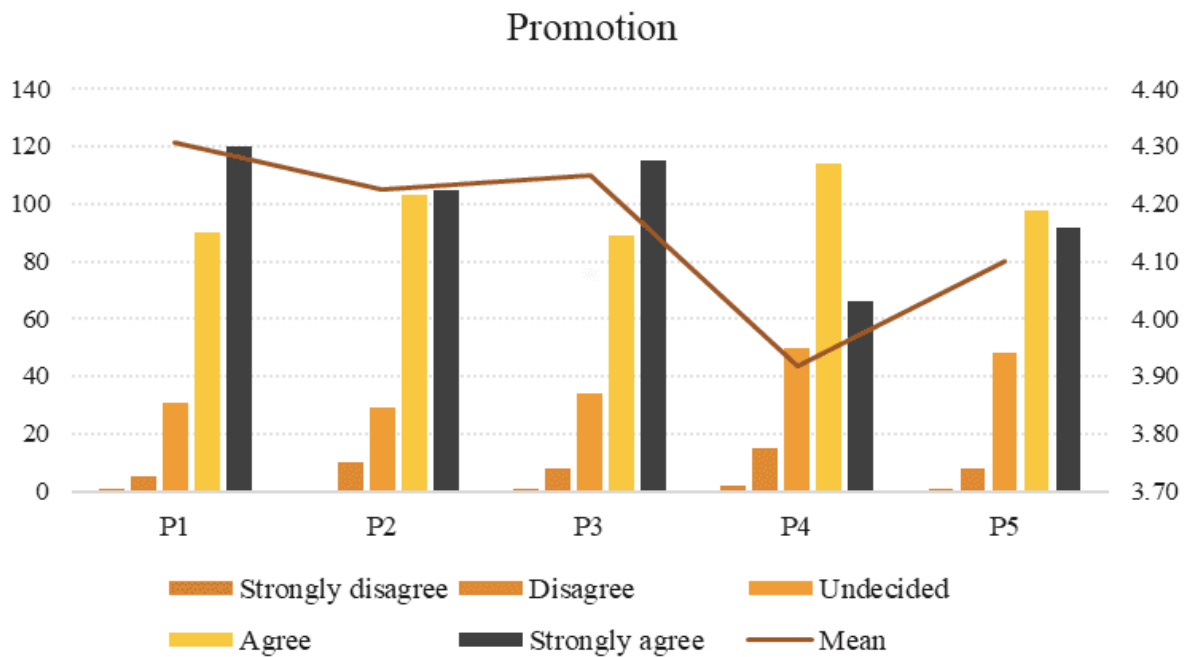


Figure 12: Descriptive statistics for the observed variable "Promotion"

The observed variables of H5 have an average value in the range of 3.92 to 4.31, showing that most of the respondents quite agree with the opinion of the given variable. In particular, P1 "I think the discount encourages me to use online food delivery" has the highest value of consent. The next two high-valued observables are P3 "Fascinating promotions make me use online food delivery more often" and P2 "I think promotion terms and conditions are important to me when using online food delivery services". Thus, promotion acts as an incentive to promote the use of online food delivery services, especially with promotional terms of discounts and promotions.

Factor 6: Convenience

Table 7: Mean of the observed variable "Convenience"

| Variable | Description | Mean | Std. Deviation |
|----------|--------------------------------------------------------------------------------------|------|----------------|
| CV1 | Using OFDS enable me to purchase food at any time I want | 4.09 | 0.824 |
| CV2 | Using OFDS enable me to purchase food wherever I am | 3.91 | 0.911 |
| CV3 | I find that OFDS are convenient for purchasing food | 4.25 | 0.682 |
| CV4 | OFDS help me to avoid traffic | 4.36 | 0.758 |
| CV5 | I think that OFDS help me to save my time instead of buying food/beverages by myself | 4.24 | 0.862 |

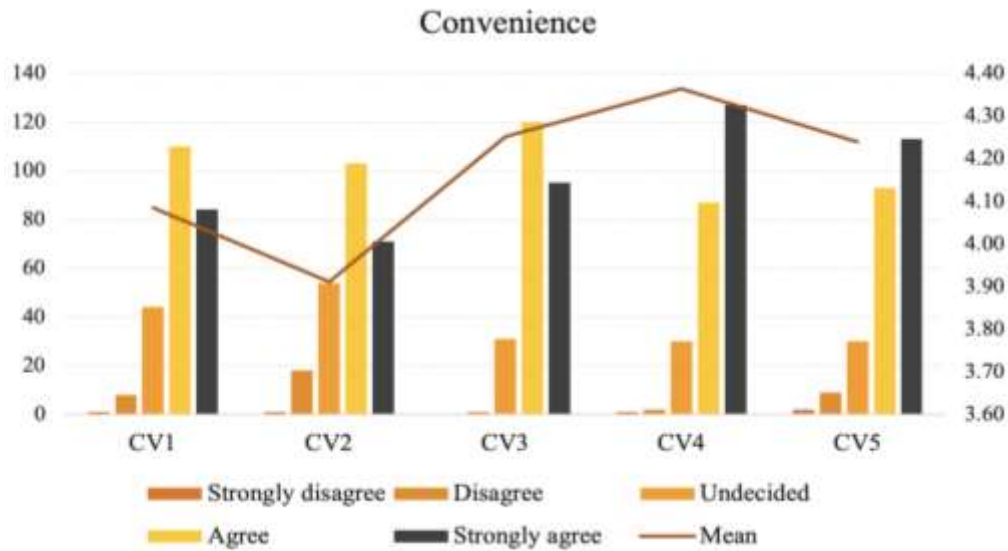


Figure 13: Descriptive statistics for the observed variable “Convenience”

The variables of factor 4 have a mean value in the range from 3.91 to 4.36, showing that most of the respondents quite agree with the opinion of the variable given. In particular, the variable CV4 “I feel very convenient when the delivery service helps me to avoid traffic” has the highest level of consent. It seems that the respondents feel that using online food delivery service will help them avoid traffic; especially during rush hour, which will save them a lot of effort and time.

Factor 7: Actual use

Table 8: Mean of the observed variable “Actual use”

| Variable | Description | Mean | Std. Deviation |
|----------|---------------------------------------------------------------------------|------|----------------|
| AU1 | When buying food, I always use OFDS | 3.82 | 0.832 |
| AU2 | I prefer to use OFDS rather than delivery service owned by the restaurant | 3.79 | 0.889 |
| AU3 | I always check the available food/restaurants | 3.71 | 0.886 |
| AU4 | I always check the notification and promotions | 3.48 | 0.991 |
| AU5 | I would recommend using OFDS to family, colleagues, and friends | 3.77 | 0.842 |

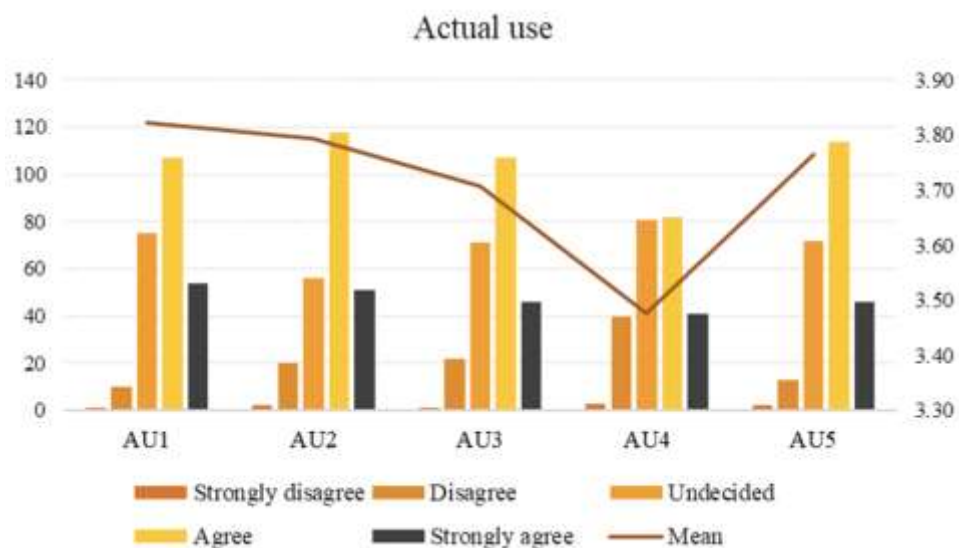


Figure 14: Descriptive statistics for the observed variable “Actual use”

The observed variables of Y1 have mean values in the range of 3.48 to 3.82, showing that most of the respondents quite agree with the opinion of the given variable. In which case, AU1 “When buying food, I always use online food delivery” has the highest value in terms of consent. The next two high-valued observables are AU2 “I choose to use an online food delivery service instead of a store owner's delivery service” and AU5 “I encourage people around me to use this delivery service “online store””. Observable variable AU4 “I always check notifications and promotions on online delivery services” has an average level of agreement of 3.48, lower than other observed variables, but the level of the difference is not too significant, so it can be seen that consumers in Ho Chi Minh City tend to use online food delivery services and introduce them to people around them. On the other hand, online food delivery services are probably becoming closer to consumers, especially in the context of the new normal, so consumers do not take too much attention to “announcements and promotions” when they decide to use these services.

Factor 8: Satisfaction and loyalty

Table 9: Mean of the observed variable “Satisfaction and loyalty”

| Variable | Description | Mean | Std. Deviation |
|----------|----------------------------------------------------------|------|----------------|
| SL1 | I am satisfied with the way OFDS carried out transaction | 4.07 | 0.712 |
| SL2 | Overall, I was satisfied with the OFDS | 4.13 | 0.683 |
| SL3 | I always subscribe to OFDS promotions | 3.64 | 0.890 |
| SL4 | I will use the OFDS again in the future | 4.20 | 0.742 |
| SL5 | I will promote the OFDS to other people | 3.96 | 0.761 |
| SL6 | I will share the testimonial of using OFDS to the public | 3.71 | 0.961 |

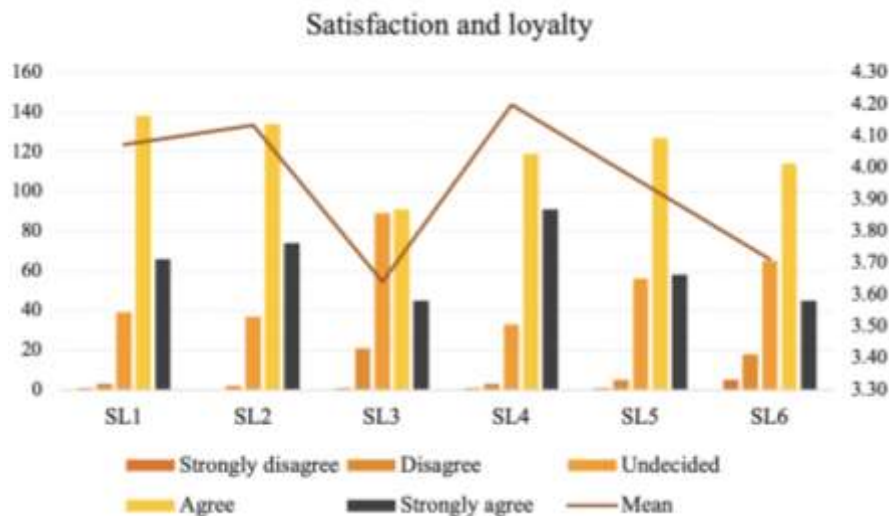


Figure 15: Descriptive statistics for the observed variable “Satisfaction and loyalty”

The observed variables of Y2 have mean values in the range from 3.64 to 4.13, showing that most of the respondents quite agree with the opinion of the given variable. In which, SL4 “I will continue to use online food delivery services in the future” and SL2 “In general, I am satisfied with online food delivery services” are 2 observed variables, respectively. the highest value of consent. The above results explain the satisfaction and loyalty of customers to online food delivery services. At the same time, the survey results once again reaffirm the value of this service in the context of the new normal, consumer demand is strengthened, as shown in the observed variable SL3 “I always subscribe to promotions of online food delivery services” when having the lowest level of agreement among the 6 observed variables. In other words, consumers do not necessarily pay attention to promotions when using services, although this has great significance in promoting consumer demand.

4.2. Result Analysis

4.2.1. Reliability Analysis

Table 10: Cronbach's Alpha Results

| | FACTOR | Cronbach Alpha | Minimum total variable correlation coefficient |
|---|--------------------------|-----------------------|-------------------------------------------------------|
| 1 | Attitude | 0.853 | 0.621 |
| 2 | Subjective norm | 0.778 | 0.432 |
| 3 | Fear of COVID-19 | 0.846 | 0.558 |
| 4 | Application quality | 0.861 | 0.580 |
| 5 | Promotion | 0.838 | 0.530 |
| 6 | Convenience | 0.809 | 0.682 |
| 7 | Actual use | 0.805 | 0.555 |
| 8 | Satisfaction and loyalty | 0.818 | 0.512 |

The Cronbach's Alpha analysis results have found that all variables have values greater than 0.6 factors with high reliability. At the same time, there is no observed variable which has a small correlation item - Total correlation is less than 0.3. From there, it shows that the correlation between the information collected from each factor as well as the connection between the answers is consistent. Therefore, all of these scales are valid for Exploratory Factor Analysis.

4.2.2. Exploratory Factor Analysis

a) KMO, Bartlett's Test and Total Variance Explained

Table 11: KMO and Bartlett's Test

KMO and Bartlett's Test

| | | |
|--------------------------------------------------|------|----------|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | 0.892 |
| Approx. Chi-Square | | 3409.037 |
| Bartlett's Test of Sphericity | df | 351 |
| | Sig. | 0.000 |

The results show that factor analysis is consistent with the research data when the KMO coefficient reaches 0.892 (> 0.5). In which Sig < 0.05 showed a correlation between the observed variables with each other.

Table 3: Total Variance Explained

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings ^a |
|-----------|---------------------|---------------|--------------|-------------------------------------|---------------|--------------|------------------------------------------------|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total |
| 1 | 9.290 | 34.406 | 34.406 | 9.290 | 34.406 | 34.406 | 6.427 |
| 2 | 2.544 | 9.421 | 43.827 | 2.544 | 9.421 | 43.827 | 4.918 |
| 3 | 1.682 | 6.228 | 50.055 | 1.682 | 6.228 | 50.055 | 5.368 |
| 4 | 1.471 | 5.448 | 55.503 | 1.471 | 5.448 | 55.503 | 5.790 |
| 5 | 1.359 | 5.034 | 60.537 | 1.359 | 5.034 | 60.537 | 4.196 |
| 6 | 1.187 | 4.396 | 64.934 | 1.187 | 4.396 | 64.934 | 4.717 |
| 7 | 1.031 | 3.820 | 68.754 | 1.031 | 3.820 | 68.754 | 3.455 |
| 8 | 0.857 | 3.174 | 71.928 | | | | |
| 9 | 0.733 | 2.715 | 74.643 | | | | |
| 10 | 0.646 | 2.392 | 77.036 | | | | |
| 11 | 0.585 | 2.167 | 79.203 | | | | |
| 12 | 0.549 | 2.034 | 81.237 | | | | |
| 13 | 0.517 | 1.914 | 83.150 | | | | |
| 14 | 0.482 | 1.786 | 84.936 | | | | |
| 15 | 0.441 | 1.634 | 86.571 | | | | |
| 16 | 0.416 | 1.541 | 88.112 | | | | |
| 17 | 0.400 | 1.483 | 89.595 | | | | |
| 18 | 0.364 | 1.348 | 90.943 | | | | |
| 19 | 0.354 | 1.310 | 92.253 | | | | |
| 20 | 0.348 | 1.289 | 93.543 | | | | |
| 21 | 0.305 | 1.130 | 94.672 | | | | |
| 22 | 0.296 | 1.096 | 95.768 | | | | |
| 23 | 0.264 | 0.977 | 96.746 | | | | |
| 24 | 0.262 | 0.970 | 97.716 | | | | |
| 25 | 0.252 | 0.935 | 98.651 | | | | |
| 26 | 0.201 | 0.746 | 99.397 | | | | |
| 27 | 0.163 | 0.603 | 100.000 | | | | |

Total Variance Explained has a value of 1.031 at the seventh deduction, therefore, a model with less than 7 factors is the best. The final Eigenvalue of 68.754 shows that the EFA model is suitable, explains almost 70% of the data and has relatively little loss. That is, the 7 factors extracted from EFA can reflect 68.754% of the variation of all the observed variables included.

b) Component Matrix

Table 13: Rotated Component Matrix - EFA

Pattern Matrix^a

| | Component | | | | | | |
|------|-----------|-------|-------|-------|-------|-------|-------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P2 | 0.833 | | | | | | |
| P3 | 0.802 | | | | | | |
| P5 | 0.759 | | | | | | |
| P1 | 0.678 | | | | | | |
| P4 | 0.671 | | | | | | |
| FOC2 | | 0.896 | | | | | |
| FOC1 | | 0.801 | | | | | |
| FOC5 | | 0.716 | | | | | |
| FOC4 | | 0.714 | | | | | |
| FOC3 | | 0.703 | | | | | |
| AQ5 | | | 0.851 | | | | |
| AQ4 | | | 0.828 | | | | |
| AQ6 | | | 0.782 | | | | |
| AQ3 | | | 0.531 | | | | |
| ATT1 | | | | 0.836 | | | |
| ATT5 | | | | 0.835 | | | |
| ATT4 | | | | 0.796 | | | |
| ATT2 | | | | 0.725 | | | |
| AU4 | | | | | 0.732 | | |
| AU2 | | | | | 0.730 | | |
| AU3 | | | | | 0.614 | | |
| AU1 | | | | | 0.559 | | |
| SL5 | | | | | | 0.850 | |
| SL6 | | | | | | 0.808 | |
| SL4 | | | | | | 0.587 | |
| CV1 | | | | | | | 0.871 |
| CV2 | | | | | | | 0.854 |

In the process of analyzing the correlation between the observed variables in the factors with EFA, some observed variables are removed because the standard load factor is not guaranteed or the observed variable is uploaded simultaneously in two factors in the rotation matrix. After removing the bad variables, the analyzed variables were grouped into 7 factors:

- “Promotion”: includes 5 observed variables that are P1, P2, P3, P4 and P5.
- “Fear of COVID-19”: includes 5 observed variables that are FOC1, FOC2, FOC3, FOC4 and FOC5.
- “Application quality”: includes 4 observed variables that are AQ3, AQ4, AQ5 and AQ6.
- “Attitude”: includes 4 observed variables that are ATT1, ATT2, ATT4 and ATT5.
- “Actual use”: includes 4 observed variables that are AU1, AU2, AU3 and AU4.
- “Satisfaction and loyalty”: includes 3 observed variables that are SL4, SL5 and SL6.
- “Convenience”: includes 2 observed variables that are CV1 and CV2.

4.2.3. Confirmatory Factor Analysis (CFA)

CFA analysis is an analysis to confirm the appropriateness of the research data with a predefined theoretical model.

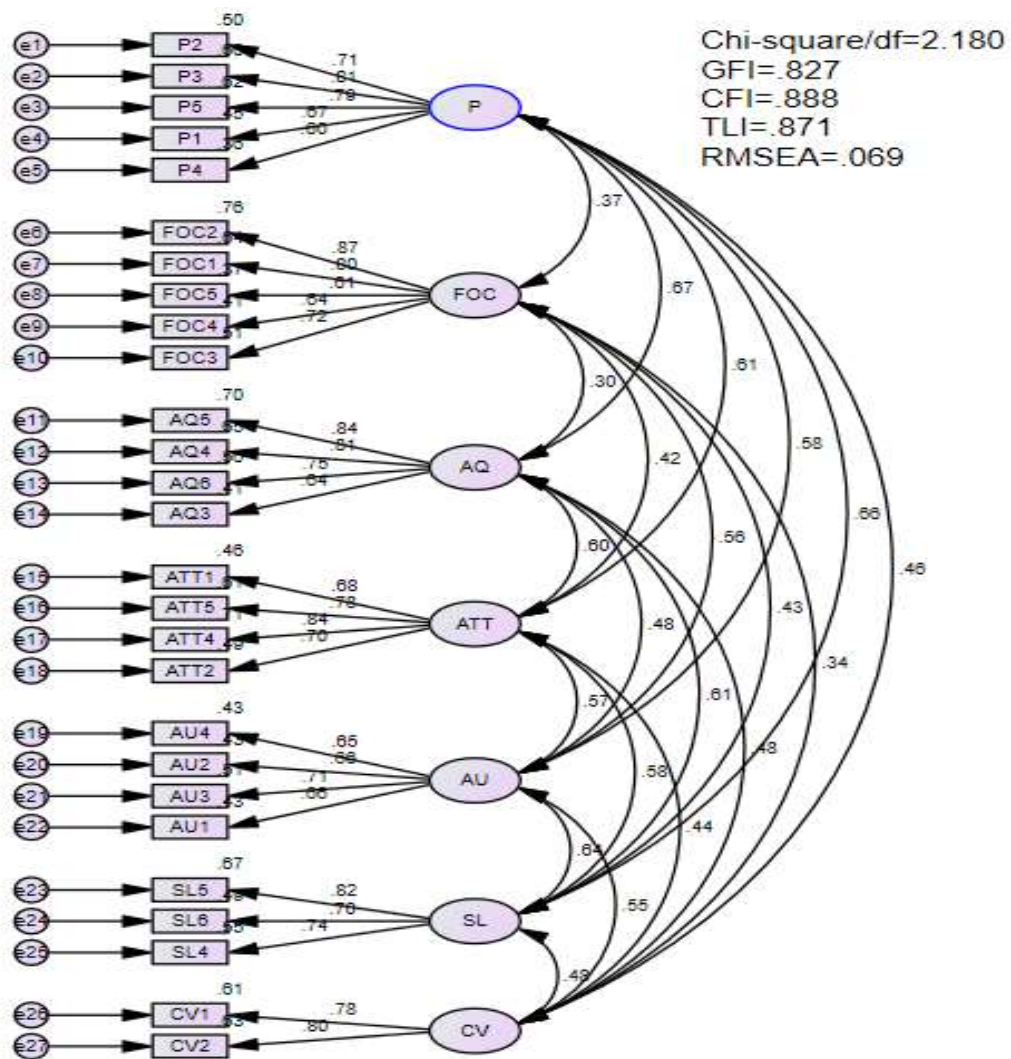


Figure 16: Confirmatory Factor Analysis (CFA)

Table 14: Confirmatory Factor Analysis (CFA)

| Goodness of Fit Measures of SEM | Minimum Cut-Off | Suggested by | Parameter Estimates |
|---------------------------------|------------------------------------------------------------------------|------------------------------|---------------------|
| Chi-square/df | ≤ 2 is good, ≤ 5 is acceptable | Hair et al., (2010) | 2.180 |
| CFI | ≥ 0.95 is very good, ≥ 0.9 is good, ≥ 0.8 is acceptable | Hu & Bentler (1999) | 0.888 |
| GFI | ≥ 0.9 is good, $0.8 \leq GFI \leq 0.9$ is acceptable | Baumgartner & Homburg (1995) | 0.827 |
| RMSEA | ≤ 0.03 is very good, ≤ 0.08 is acceptable | Hair et al. (2010) | 0.069 |

Completing the CFA analysis results, Table 14 describes the model fit, the model's fit indicators are all acceptable and meet the general statistical requirements to conduct Structural Equation Modeling (SEM).

4.2.4. Structural Equation Modeling (SEM)

After getting satisfactory results on the suitability of the model and the constructs, the next step was to evaluate the model based on the hypothesis of the research.

Figure 17 describes the initial SEM to determine the actual use of online food delivery services, thereby affecting the satisfaction and loyalty of young people in Ho Chi Minh City. As seen in Table 15, the only hypothesis is rejected: Application quality (AQ) on actually use (AU) (Hypothesis 3) because $p\text{-value} = 0.114 > 0.05$. All other hypotheses are accepted include H1a, H1b, H4, H5a, H5b, H6 and H7 with $p\text{-value} < 0.05$.

Furthermore, in order to enhance the model's fit, some modification indices were applied. Modification indices is an approach to improve the fitness of the model recommended by Hair et al. (2010). Using the suggested modification indices, discrepancies between the conceptualized and estimated model can be minimized. Subsequently, the final SEM is presented in Figure 18.

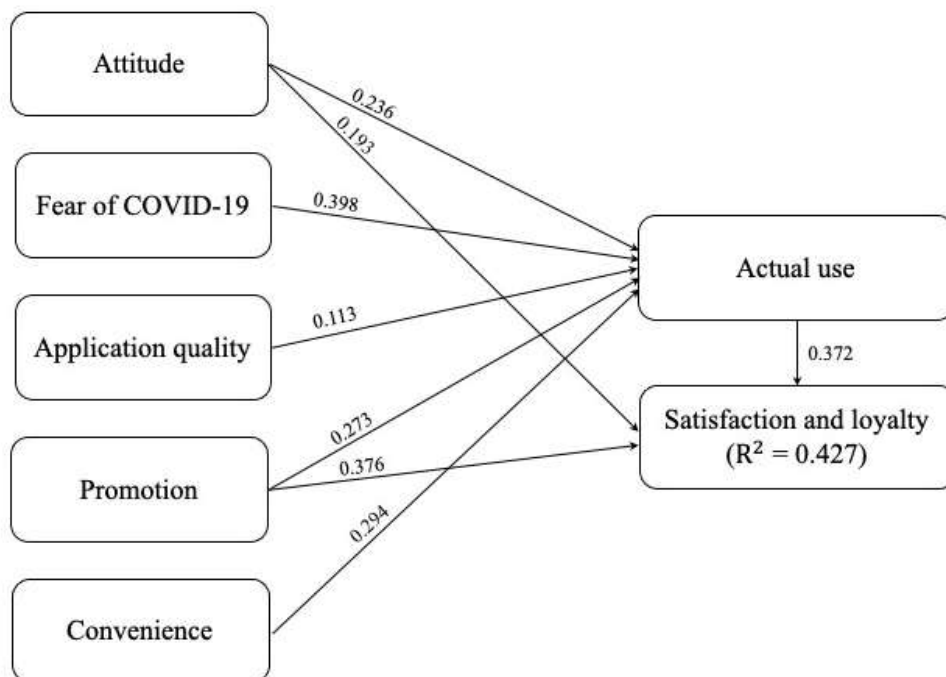


Figure 17: Initial result of SEM

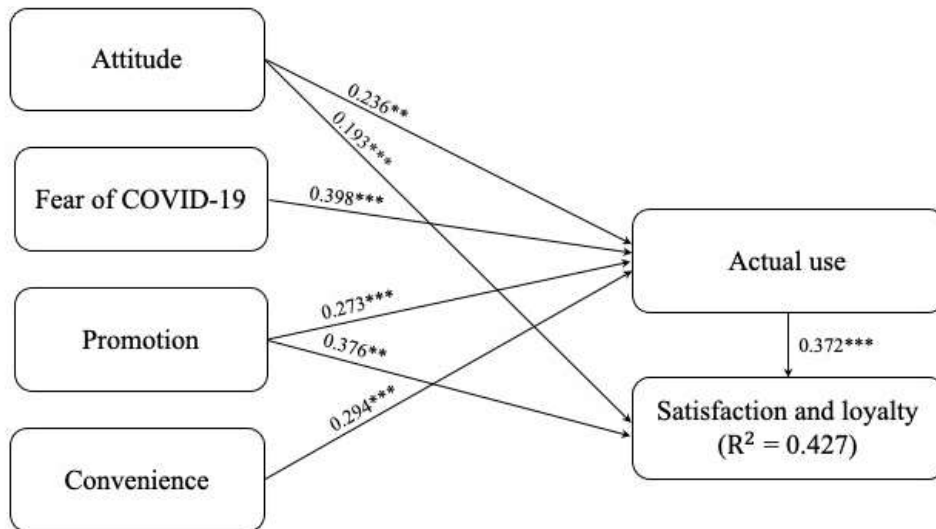


Figure 18: The final SEM to determine the decision to use online food delivery services, thereby affecting the satisfaction and loyalty of young people in Ho Chi Minh City

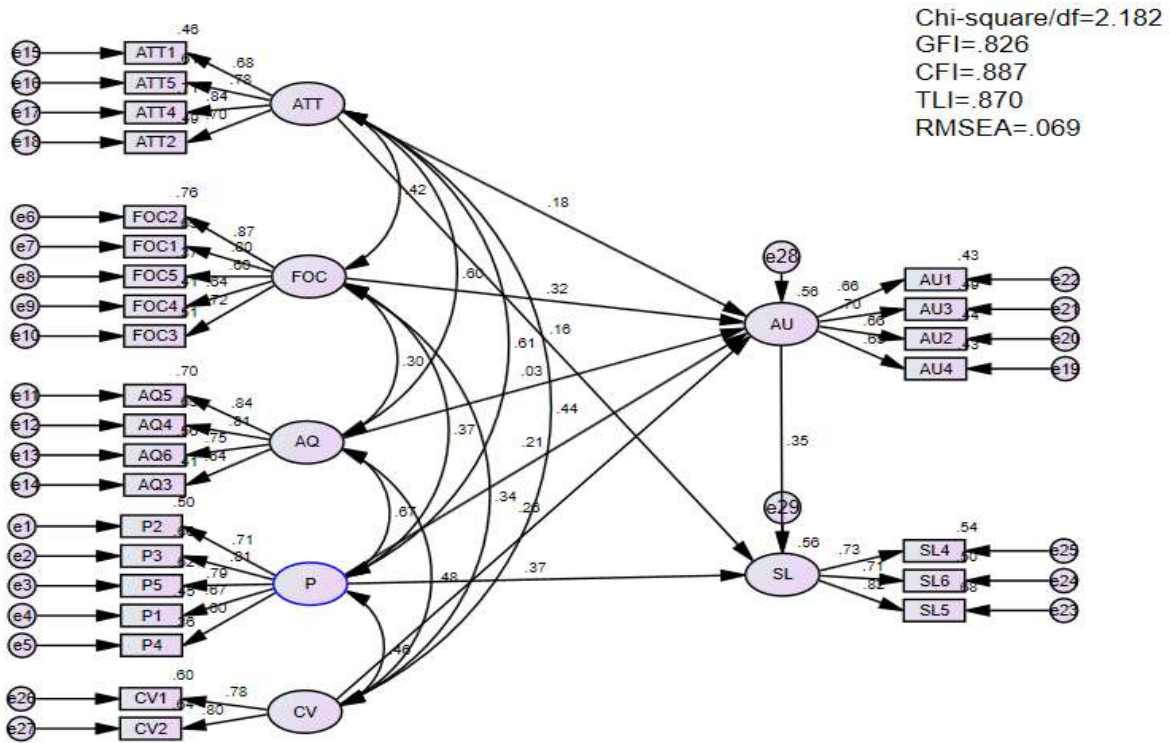


Figure 19: Structural Equation Modeling (SEM)

Table 15: Evaluation of study hypotheses

| Hypothesis | Relationship | Beta (β) | S.E | CR | P-value | Accepted /Rejected |
|------------|---------------------|------------------|-------|-------|---------|--------------------|
| H1a | AU \leftarrow ATT | 0.236 | 0.085 | 3.049 | 0.002 | Accepted |
| H3 | AU \leftarrow FOC | 0.398 | 0.053 | 4.914 | *** | Accepted |
| H4 | AU \leftarrow AQ | 0.113 | 0.066 | 1.579 | 0.114 | Rejected |
| H5a | AU \leftarrow P | 0.273 | 0.074 | 3.480 | *** | Accepted |

| | | | | | | | | |
|------------|----|---|-----|-------|-------|-------|-------|----------|
| <i>H6</i> | AU | ← | CV | 0.294 | 0.080 | 3.915 | *** | Accepted |
| <i>H7</i> | SL | ← | AU | 0.376 | 0.092 | 4.140 | *** | Accepted |
| <i>H1b</i> | SL | ← | ATT | 0.193 | 0.082 | 2.655 | *** | Accepted |
| <i>H5b</i> | SL | ← | P | 0.372 | 0.075 | 4.856 | 0.008 | Accepted |

Note: *** = $p < 0.001$. Source: research data. Note: Attitude (ATT), Fear of COVID-19 (FOC), Convenience (CV), Application quality (AQ), Promotion (P), Actual Use (AU) and Satisfaction and loyalty (SL).

4.3. Discussion

Attitude → Actual use & Satisfaction and loyalty

Through SEM analysis, the authors found that Attitude (TD) has a significant direct influence on the Actual use OFDS in the new normal ($\beta = 0.236$, p -value = 0.002). The results of the study proved that the applied TRA theory framework is completely appropriate, as it supports the theoretical framework that considers attitude as a predictor of customer behavior. Moreover, this result has also contributed to strengthen the results of previous studies such as that of Yeo et al. (2017) in exploring the relationship between attitudes towards online food delivery services and intention to use OFDS. Lee et al. (2017) also found that attitude was a strong predictor of the decision to use these services. Another difference is that in previous studies, attitude plays an important part in predicting consumer behavior. In this study, although there is evidence that attitude affects consumer behavior in the new normal, the effect can only be considered small, with the coefficient β being moderate. This proves that in addition to the subjective perception of individual consumers, there are still many other objective factors affecting their behavioral trends, which in this study are specifically the factors that affect their behavior Fear of COVID-19 and Promotion.

In this context, the study also proves that Attitude contributes a positive part to the Satisfaction and loyalty of consumers ($\beta = 0.217$, p -value = 0.000). This result is reasonable and expected, because it emphasizes the role of cognitive and emotional aspects in customer loyalty and reflects actions; relative to their purchasing limits in the past with a particular brand or a group of brands that are likely to purchase in the future (Evanschitzky et al, 2006). This means that once consumers have gained trust that using OFDS is necessary in the context of the new normal, they will be more willing to make these transactions again on subsequent purchases.

Fear of COVID-19 → Actual use

Through SEM analysis, the authors found that Fear of COVID-19 (FOC) has a direct influence on the Actual use OFDS in the new normal ($\beta = 0.262$, p -value = 0.000). This shows that the results are consistent with the findings of the study, the fear of COVID-19 affecting the behavior of using OFDS. This result is reasonable and expected, because in the context of the new normal, the existing and potential risks of the COVID-19 epidemic still exist very high in the community, so customers tend to direction less to go to restaurants, eateries, to avoid contact with many people in one space, thereby increasing the need to use OFDS. Besides, this result also reinforces the results of previous studies such as that of Troise et al. (2020) when it was discovered that the perception of risks related to COVID-19 in OFDS positively affects the behavioral intention to use OFDS of users in Italy. However, this result is inconsistent with the results of the study conducted by Mehroliia et al. (2020). They found that threats to COVID-19 negatively affected customer purchase intentions for OFDS in India. This proves that although the epidemic is still at an alarmingly dangerous level, in the context of the new normal, there are still some consumers affected by other factors instead of fear and anxiety about COVID-19.

Promotion → Actual use

By SEM analysis, with coefficient, the authors found that Promotion (P) has a direct influence on the Actual use OFDS in the context of the new normal ($\beta = 0.259$ and p -value = 0.000). In the current period, the COVID-19 epidemic is still complicated. Moreover, new variants have appeared with a very high level of

danger and spread. As businesses adapt and seize opportunities from the current situation, more and more businesses develop and promote OFDS services. Therefore, since the level of competition in this field is very fierce, consumers can consider more promotions before making a decision to use them. In a study by Prasetyo, Y. T. et al (2021), they also found that Promotion was a predictor for OFDS service usage. However, with a small impact coefficient, the effect of Promotion was considered insignificant. On the other hand, in this study, the high average β coefficient has reinforced the appropriateness of the hypothesis when proposing the research model, which is evidence that Promotion has a large influence on the Actual use OFDS in the context of the new normal.

Promotion → Satisfaction and loyalty

The study also shows that Promotion (P) acts as a positive motivator, affecting the Satisfaction and loyalty of consumers. The results emphasize the role of Promotion in customer satisfaction and loyalty ($\beta = 0.366$ and $p\text{-value} = 0.008$), which is supported by previous studies. Specifically, the highest standardized parameter of promotion effect on loyalty presented in the study by Tung, G. S. et al. (2011) indicates that “promotion effect” is an important factor for loyalty. Oyeniyi, O. (2011), in exploring the relationship between Promotion and Customer loyalty, also showed that sales promotion has a positive impact on customer retention. Promotions not only attract customers but also tend to warrant continued patronage. Thus, timely sales and the correct application of promotions provided by service organizations will increase customer retention. The difference from previous studies is that this study considers a type of product or service that has not been mentioned before. This reinforces the relevance of Promotion when placed in association with Satisfaction and loyalty, thereby setting the stage for further research exploration.

Convenience → Actual use

Through the research results, the authors believe that the Convenience (CV) variable has a relatively strong impact on the Actual use OFDS ($\beta = 0.294$ and $p\text{-value} = 0.000$). With this result, the research team completely affirms that in the context of the COVID-19 pandemic, OFDS will help consumers more conveniently save resources in terms of energy and time from having to make decisions to use OFDS. Although the results obtained by authors were as expected, this result was quite different from the research papers that the group referenced. In the study of customers in Indonesia when using OFDS, the Convenience variable was not accepted as a factor affecting the use of the service according to Prasetyo, Y. T. et al. (2021). But in Thailand, customers will decide to use OFDS if they are assured of a more convenient service experience in terms of energy and time according to Chotigo and Kadono (2021); in addition to this study, it is also shown that convenience factors strongly affect loyalty and satisfaction that the authors did not mention in this study.

4.3.1. Theoretical implications

Through the research paper, the authors have systematized the theoretical basis, confirmed the scientific validity of the theories and research models that the group has consulted and proposed.

The expansion of a concept of satisfaction and loyalty instead of focusing only on the outcome variable on the decision to use OFDS has also contributed to increasing the predictive power of the model.

Furthermore, aside from the impact of technological qualities on electronic devices, namely “Application Quality”, study also concentrates on the user’s perceptual point of view. This has thoroughly brought into play the expectations of the user’s mental and perceptual in a specific situation when using technology.

4.3.2. Practical implications Theoretical implications

Attitude

Research results show that “Attitude” is a factor that greatly influences the decision to use OFDS of research subjects. It can be said that an individual’s awareness of the importance as well as having a positive attitude in using the above service is an extremely important factor affecting the decision to use the service.

Therefore, in order for the service to be strongly accessible to customers, it is required that businesses provide them with specific and clear information about the service so that consumers can clearly understand how it operates, its advantages, convenience and information related to OFDS that businesses are deploying.

Besides, by adapting to the current context as well as meeting the needs of customers, OFDS was born, leading to a very high level of competition in the market. To gain the trust of customers, business must build a reputable image of their services. Always make sure that the business provides a quality service, ensuring absolute safety for customers so that they can feel secure when choosing your service.

It is necessary to pay attention to market research, conducting surveys, listening to consumers' opinions to have appropriate OFDS business strategies and tactics, towards anticipating consumer trends.

Subjective norm

Although the "Subjective norm" factor is excluded from the research model, other statistics still have a high degree of confidence, so it can still be used for reference and further research in the future. Therefore, businesses should consider using appropriate marketing strategies, using word of mouth to bring their services closer to consumers through the people around them and the influencers they have cared for.

Fear of covid-19

Research results show that "Fear of COVID-19" is a factor that influences the decision to use OFDS of research subjects. Now, citizens get used to living with COVID-19 pandemic, so a very particular food delivery process is essential, especially delivery to customers. Deliverers should follow 5K, avoid putting their masks off, food should be carefully covered and disinfected to establish trust and safety for receivers.

Convenience

Through research, we can see "Convenience" is one of crucial factors affecting actual use OFDS. Hence, businesses need to extend more relationships to restaurants via various forms of cooperation (decrease commission, raise partners' benefits...) in order to diversify restaurant lists, boost satisfied customers and improve competitiveness.

Another

In addition, businesses should consider developing and optimizing OFDS when the trend of preferring to use this service in the context of the new normal is increasing compared to using it directly at the shop because the COVID-19 epidemic is still very complicated.

Another issue is to optimize delivery time, companies should formulate policies, modes to reduce waiting time such as recruiting more deliverers. To increase customer experience and satisfaction, companies should add notification features about the fast or slow order via application go with objective reasons: peak time, crowded restaurant... Or program a new feature showing the area has many deliverers to ensure the amount of them is distributed evenly and the orders are transported faster.

5. Conclusion

In this chapter, the research team will give an intuitive and closer look at the basis of the discussion, put it in correlation with previous studies, and give general conclusions and some limitations on the topic of research. As a result, we will propose some practical solutions to help businesses operating in this field solve the problems they are facing and to enhance their competitiveness. Moreover, we offer an extended research direction for future research on the topic of online food delivery services.

5.1. Summary of research results

The outbreak and complexity of the COVID-19 epidemic in 2020 marked a new milestone that changed everything, with unprecedented developments in the digital field. Among them are the exponential transformations of e-commerce as it creates new types of businesses globally, changing the way traditional tasks and jobs are performed. The food sector is no exception to transformation. With growing insecurity and the expansion of the stay-at-home economy, online food delivery platforms have emerged and are growing in popularity even as they enter the new normal. The widespread use of these services before, during and after

COVID-19 has brought positive implications for the development of the community. Understanding these great influences, the study was carried out to find out the potential factors affecting behavioral decisions, customer satisfaction and loyalty when using OFDS in the new normal with specific factors such as attitude, subjective norm, fear of COVID-19, convenience, application quality, and promotion.

After data processing based on reliability test, exploratory factor analysis EFA, CFA and SEM, there are two factors that have been removed from the model: “Subjective norm” and “Application quality”. The final results of the study show that the remaining factors have a relatively high influence on the intermediate and dependent variables, ranked in order of influence from most to least including: (1) “Fear of COVID-19” has the greatest impact because it has the highest β coefficient compared to the rest (0.398), which proves that consumers have a more optimistic view of the use of OFDS based on the perception of probability of infection risk high. Ranked (2) as “Convenience” – accessibility and quick delivery have made a significant contribution to redirecting consumer behavior from eating out to ordering food through take-out services; followed by (3) “Promotion” and finally (4) “Attitude”.

Research results have supported the explanation for the proposed model and hypotheses. It can be seen that the confusion and anxiety about the future when COVID-19 has not completely ended are the main barriers motivating consumers to increase the use of OFDS in the context of the new normal.

In the golden era of online platforms, with people's ability to self-access and appreciate information, it seems that “Subjective norm” is no longer a factor contributing much to the main decision-making process of people.

Interestingly, this study found that factors related to “Application quality” were shown to have a negligible impact on the intermediate variable. It seems that today's consumers are paying more attention to outputs and other basic factors such as product quality, convenience, promotions, etc., than the actual process of consuming food that starts when a customer searches for and orders food from the company's website or app. Although e-service quality is not the subject of customer satisfaction in this study, it will still affect the perception of food quality, leading to high perceived value and satisfaction, ultimately creating customer loyalty for OFDS. Therefore, this factor still needs to be considered and improved for consumers to use with peace of mind.

Besides the obtained research results, the article also points out some limitations in the implementation process as well as inadequacies affecting consumer behavior, satisfaction and loyalty. At the same time, propose some solutions to help businesses catch up with this potential trend. In general, the study has achieved the research objectives set out. With the development of an online food delivery platform that has never cooled down, the authors hope that this will be a premise for further studies to investigate and explain more about this potential field.

5.2. Limitations and Future Research

5.2.1. Limitations

Firstly, because of time and cost constraints, the sampling method of the research paper is a non-probability sampling method. This sampling method itself has the disadvantage that it is easy to create one-sided selections (Nguyen Dinh Tho and Nguyen Mai Trang, 2009). Since the sample size is 247, representativeness is considered to be low. Therefore, the generalizability of the research results may not be fully reflected.

Secondly, the study has more than 40 observed variables, while the interview is conducted based on the online Google Form tool, which makes survey takers not patient enough to evaluate questions as objectively as possible. Therefore, there are many errors, reducing the reliability of the obtained data. At the same time, the observed variable has quite a bit of content, affecting the display of content on the phone screen, which can lead to certain errors.

Thirdly, the research is carried out by a quantitative method during the design of the scale, which does not clarify the subjective factors of the surveyor, and thus may miss the useful details of the survey because it mainly focuses on testing the hypotheses posed.

Finally, the study did not consider the impact of cultural factors (e.g. lifestyle, family size, eating habits, etc.) but only directly related factors to the use of OFDS in the context of the new normal, specifically: attitudes towards the use of OFDS, concerns about COVID-19, convenience, quality of applications and promotions. Therefore, the research can be limited to some factors that indirectly affect Satisfaction and loyalty with OFDS.

5.2.2. Future Research

Despite the significant contributions of the study and its important findings, given the limitations of the study, the authors suggest a number of future research.

Firstly, the study was conducted in a short time, so the sample size used by the group for the study was only 247 people with unequal distribution of age and income. Therefore, the authors propose to expand the sample size, and at the same time select and filter the respondents so that the demographic distribution is even so that they can find out the unique characteristics of each influential customer group decision to use OFDS services, thereby affecting satisfaction and loyalty.

Secondly, the group's research has shown that two factors, "Attitude" and "Promotion", affect consumer "Satisfaction and loyalty". However, in previous studies, it was also shown that the convenience variable has a direct effect on satisfaction and loyalty; but in the study, we only think that the convenience variable affects actual use. In further studies on user satisfaction and loyalty when using OFDS, factor "Convenience" can be proposed in the study.

Finally, the group's research paper only deal with OFDS services in general. However, currently in the market, most consumers are using online food delivery services through applications such as Baemin, GrabFood, GoFood.... which in the group's research also mentioned factor application quality. But without the expected results, we recommend future studies focusing on the Food Delivery Application (FDA).

6. Appendix

Descriptive Statistics

| | N | Minimum | Maximum | Mean | Std. Deviation |
|--------------------|-----|---------|---------|------|----------------|
| ATT1 | 247 | 2 | 5 | 4.23 | .731 |
| ATT2 | 247 | 1 | 5 | 3.94 | .807 |
| ATT3 | 247 | 1 | 5 | 3.72 | .754 |
| ATT4 | 247 | 2 | 5 | 4.13 | .734 |
| ATT5 | 247 | 1 | 5 | 4.03 | .806 |
| Valid N (listwise) | 247 | | | | |

Descriptive Statistics

| | N | Minimum | Maximum | Mean | Std. Deviation |
|--------------------|-----|---------|---------|------|----------------|
| SN1 | 247 | 1 | 5 | 3.84 | .815 |
| SN2 | 247 | 1 | 5 | 3.60 | .940 |
| SN3 | 247 | 1 | 5 | 3.83 | .914 |
| SN4 | 247 | 1 | 5 | 3.53 | .991 |
| SN5 | 247 | 1 | 5 | 3.67 | .993 |
| Valid N (listwise) | 247 | | | | |

Descriptive Statistics

| | N | Minimum | Maximum | Mean | Std. Deviation |
|--------------------|-----|---------|---------|------|----------------|
| FOC1 | 247 | 1 | 5 | 3.88 | .949 |
| FOC2 | 247 | 1 | 5 | 3.98 | .937 |
| FOC3 | 247 | 1 | 5 | 3.57 | 1.037 |
| FOC4 | 247 | 1 | 5 | 3.74 | .953 |
| FOC5 | 247 | 1 | 5 | 4.07 | .793 |
| Valid N (listwise) | 247 | | | | |

Descriptive Statistics

| | N | Minimum | Maximum | Mean | Std. Deviation |
|--------------------|-----|---------|---------|------|----------------|
| CV1 | 247 | 1 | 5 | 4.09 | .824 |
| CV2 | 247 | 1 | 5 | 3.91 | .911 |
| CV3 | 247 | 2 | 5 | 4.25 | .682 |
| CV4 | 247 | 1 | 5 | 4.36 | .758 |
| CV5 | 247 | 1 | 5 | 4.24 | .862 |
| Valid N (listwise) | 247 | | | | |

Descriptive Statistics

| | N | Minimum | Maximum | Mean | Std. Deviation |
|--------------------|-----|---------|---------|------|----------------|
| AQ1 | 247 | 1 | 5 | 4.11 | .760 |
| AQ2 | 247 | 1 | 5 | 3.96 | .788 |
| AQ3 | 247 | 2 | 5 | 4.22 | .729 |
| AQ4 | 247 | 2 | 5 | 4.22 | .683 |
| AQ5 | 247 | 2 | 5 | 4.28 | .685 |
| AQ6 | 247 | 1 | 5 | 4.13 | .738 |
| Valid N (listwise) | 247 | | | | |

Descriptive Statistics

| | N | Minimum | Maximum | Mean | Std. Deviation |
|--------------------|-----|---------|---------|------|----------------|
| P1 | 247 | 1 | 5 | 4.31 | .798 |
| P2 | 247 | 2 | 5 | 4.23 | .810 |
| P3 | 247 | 1 | 5 | 4.25 | .842 |
| P4 | 247 | 1 | 5 | 3.92 | .884 |
| P5 | 247 | 1 | 5 | 4.10 | .852 |
| Valid N (listwise) | 247 | | | | |

Descriptive Statistics

| | N | Minimum | Maximum | Mean | Std. Deviation |
|--------------------|---------|---------|---------|------|----------------|
| AU1 | 24 7 | 1 | 5 | 3.82 | .832 |
| AU2 | 24 7 | 1 | 5 | 3.79 | .889 |
| AU3 | 24 7 | 1 | 5 | 3.71 | .886 |
| AU4 | 24 7 | 1 | 5 | 3.48 | .991 |
| AU5 | 24 7 | 1 | 5 | 3.77 | .842 |
| Valid N (listwise) | 24 7 | | | | |

Descriptive Statistics

| | N | Minimum | Maximum | Mean | Std. Deviation |
|--------------------|---------|---------|---------|------|----------------|
| SL1 | 24 7 | 1 | 5 | 4.07 | .712 |
| SL2 | 24 7 | 2 | 5 | 4.13 | .683 |
| SL3 | 24 7 | 1 | 5 | 3.64 | .890 |
| SL4 | 24 7 | 1 | 5 | 4.20 | .742 |
| SL5 | 24 7 | 1 | 5 | 3.96 | .761 |
| SL6 | 24 7 | 1 | 5 | 3.71 | .916 |
| Valid N (listwise) | 24 7 | | | | |

Reliability Statistics

| Cronbach's Alpha | N of Items |
|------------------|------------|
| .853 | 5 |

Item-Total Statistics

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|------|----------------------------|--------------------------------|----------------------------------|----------------------------------|
| ATT1 | 15.83 | 6.388 | .636 | .831 |
| ATT2 | 16.11 | 6.060 | .644 | .829 |
| ATT3 | 16.33 | 6.345 | .621 | .835 |
| ATT4 | 15.92 | 6.067 | .737 | .805 |
| ATT5 | 16.02 | 5.890 | .698 | .815 |

Reliability Statistics

| Cronbach's Alpha | N of Items |
|------------------|------------|
| .778 | 5 |

Item-Total Statistics

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|-----|----------------------------|--------------------------------|----------------------------------|----------------------------------|
| SN1 | 14.62 | 8.439 | .510 | .751 |
| SN2 | 14.86 | 7.233 | .673 | .694 |
| SN3 | 14.64 | 7.444 | .649 | .704 |
| SN4 | 14.94 | 7.695 | .517 | .750 |
| SN5 | 14.79 | 8.094 | .432 | .779 |

Reliability Statistics

| Cronbach's Alpha | N of Items |
|------------------|------------|
| .846 | 5 |

Item-Total Statistics

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|------|----------------------------|--------------------------------|----------------------------------|----------------------------------|
| FOC1 | 15.36 | 8.737 | .707 | .801 |
| FOC2 | 15.26 | 8.455 | .783 | .779 |
| FOC3 | 15.68 | 8.633 | .639 | .821 |
| FOC4 | 15.51 | 9.218 | .600 | .830 |
| FOC5 | 15.17 | 10.152 | .558 | .839 |

Reliability Statistics

| Cronbach's Alpha | N of Items |
|------------------|------------|
| .809 | 5 |

Item-Total Statistics

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|-----|----------------------------|--------------------------------|----------------------------------|----------------------------------|
| CV1 | 16.77 | 6.058 | .641 | .758 |
| CV2 | 16.94 | 6.147 | .523 | .799 |
| CV3 | 16.60 | 6.542 | .668 | .757 |
| CV4 | 16.49 | 6.592 | .559 | .784 |
| CV5 | 16.61 | 5.970 | .623 | .764 |

Reliability Statistics

| Cronbach's Alpha | N of Items |
|------------------|------------|
| .861 | 6 |

Item-Total Statistics

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|-----|----------------------------|--------------------------------|----------------------------------|----------------------------------|
| AQ1 | 20.81 | 7.957 | .660 | .837 |
| AQ2 | 20.96 | 8.137 | .580 | .852 |
| AQ3 | 20.70 | 8.203 | .630 | .842 |
| AQ4 | 20.70 | 8.211 | .686 | .833 |
| AQ5 | 20.65 | 8.197 | .689 | .832 |

| | | | | |
|-----|-------|-------|------|------|
| AQ6 | 20.79 | 7.961 | .687 | .832 |
|-----|-------|-------|------|------|

Reliability Statistics

| | |
|------------------|------------|
| Cronbach's Alpha | N of Items |
| .838 | 5 |

Item-Total Statistics

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|----|----------------------------|--------------------------------|----------------------------------|----------------------------------|
| P1 | 16.50 | 7.430 | .591 | .818 |
| P2 | 16.58 | 7.139 | .657 | .800 |
| P3 | 16.55 | 6.760 | .723 | .781 |
| P4 | 16.89 | 7.320 | .530 | .837 |
| P5 | 16.70 | 6.770 | .709 | .785 |

Reliability Statistics

| | |
|------------------|------------|
| Cronbach's Alpha | N of Items |
| .805 | 5 |

Item-Total Statistics

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|-----|----------------------------|--------------------------------|----------------------------------|----------------------------------|
| AU1 | 14.74 | 7.833 | .555 | .777 |
| AU2 | 14.77 | 7.558 | .564 | .775 |
| AU3 | 14.86 | 7.350 | .619 | .758 |
| AU4 | 15.09 | 6.935 | .611 | .761 |
| AU5 | 14.80 | 7.607 | .601 | .764 |

Reliability Statistics

| | |
|------------------|------------|
| Cronbach's Alpha | N of Items |
| .818 | 6 |

Item-Total Statistics

| | Scale Mean if Item Deleted | Scale Variance if Item Deleted | Corrected Item-Total Correlation | Cronbach's Alpha if Item Deleted |
|-----|----------------------------|--------------------------------|----------------------------------|----------------------------------|
| SL1 | 19.64 | 8.841 | .564 | .794 |
| SL2 | 19.58 | 9.058 | .538 | .799 |
| SL3 | 20.07 | 8.312 | .512 | .808 |
| SL4 | 19.51 | 8.438 | .637 | .778 |
| SL5 | 19.76 | 8.063 | .715 | .761 |
| SL6 | 20.00 | 7.959 | .568 | .795 |

Factor Analysis

KMO and Bartlett's Test 1

| | | |
|--------------------------------------------------|------|----------|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .904 |
| Approx. Chi-Square | | 5972.166 |
| Bartlett's Test of Sphericity | df | 861 |
| | Sig. | .000 |

Total Variance Explained

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings ^a |
|-----------|---------------------|---------------|--------------|-------------------------------------|---------------|--------------|------------------------------------------------|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total |
| 1 | 13.802 | 32.861 | 32.861 | 13.802 | 32.861 | 32.861 | 8.830 |
| 2 | 3.498 | 8.328 | 41.189 | 3.498 | 8.328 | 41.189 | 6.151 |
| 3 | 2.208 | 5.256 | 46.445 | 2.208 | 5.256 | 46.445 | 5.553 |
| 4 | 1.929 | 4.593 | 51.038 | 1.929 | 4.593 | 51.038 | 8.219 |
| 5 | 1.584 | 3.773 | 54.811 | 1.584 | 3.773 | 54.811 | 7.761 |
| 6 | 1.385 | 3.297 | 58.108 | 1.385 | 3.297 | 58.108 | 6.108 |
| 7 | 1.176 | 2.800 | 60.908 | 1.176 | 2.800 | 60.908 | 7.412 |
| 8 | 1.143 | 2.721 | 63.629 | 1.143 | 2.721 | 63.629 | 6.577 |
| 9 | 1.014 | 2.413 | 66.042 | 1.014 | 2.413 | 66.042 | 2.145 |
| 10 | .898 | 2.139 | 68.182 | | | | |
| 11 | .871 | 2.074 | 70.256 | | | | |
| 12 | .848 | 2.018 | 72.274 | | | | |
| 13 | .774 | 1.843 | 74.118 | | | | |
| 14 | .735 | 1.750 | 75.868 | | | | |
| 15 | .699 | 1.664 | 77.531 | | | | |
| 16 | .641 | 1.525 | 79.057 | | | | |
| 17 | .604 | 1.438 | 80.494 | | | | |
| 18 | .575 | 1.370 | 81.864 | | | | |
| 19 | .541 | 1.288 | 83.152 | | | | |
| 20 | .508 | 1.209 | 84.361 | | | | |
| 21 | .490 | 1.166 | 85.526 | | | | |
| 22 | .470 | 1.120 | 86.647 | | | | |
| 23 | .448 | 1.066 | 87.712 | | | | |
| 24 | .434 | 1.033 | 88.746 | | | | |
| 25 | .409 | .974 | 89.719 | | | | |
| 26 | .394 | .938 | 90.657 | | | | |
| 27 | .369 | .878 | 91.535 | | | | |
| 28 | .349 | .831 | 92.365 | | | | |
| 29 | .326 | .776 | 93.142 | | | | |
| 30 | .314 | .747 | 93.888 | | | | |
| 31 | .301 | .717 | 94.605 | | | | |
| 32 | .280 | .666 | 95.271 | | | | |
| 33 | .271 | .645 | 95.916 | | | | |
| 34 | .239 | .568 | 96.484 | | | | |
| 35 | .225 | .535 | 97.019 | | | | |
| 36 | .220 | .524 | 97.543 | | | | |

| | | | | | | | |
|----|------|------|---------|--|--|--|--|
| 37 | .203 | .484 | 98.027 | | | | |
| 38 | .199 | .473 | 98.500 | | | | |
| 39 | .183 | .437 | 98.937 | | | | |
| 40 | .176 | .419 | 99.356 | | | | |
| 41 | .139 | .331 | 99.687 | | | | |
| 42 | .132 | .313 | 100.000 | | | | |

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Pattern Matrix^a

| | Component | | | | | | | | |
|-------|-----------|------|------|------|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| AQ6 | .806 | | | | | | | | |
| AQ5 | .775 | | | | | | | | |
| AQ4 | .772 | | | | | | | | |
| AQ3 | .665 | | | | | | | | |
| AQ1 | .607 | | | | | | | | |
| AQ2 | .596 | | | | | | | | |
| SL2 | | | | | | | | | |
| CV4 | | | | | | | | | |
| FOC 2 | | .876 | | | | | | | |
| FOC 1 | | .793 | | | | | | | |
| FOC 5 | | .699 | | | | | | | |
| FOC 4 | | .687 | | | | | | | |
| FOC 3 | | .686 | | | | | | | |
| AU4 | | | .694 | | | | | | |
| SL3 | | | .688 | | | | | | |
| AU2 | | | .606 | | | | | | |
| AU3 | | | .574 | | | | | | |
| AU1 | | | | | | | | | |
| ATT 1 | | | | .774 | | | | | |
| ATT 5 | | | | .770 | | | | | |

| | | | | | | | | | |
|----------|--|--|--|------|------|------|------|------|------|
| ATT 4 | | | | .749 | | | | | |
| ATT 2 | | | | .680 | | | | | |
| ATT 3 | | | | .548 | | | | | |
| P1 | | | | | .748 | | | | |
| P3 | | | | | .741 | | | | |
| P2 | | | | | .737 | | | | |
| P5 | | | | | .718 | | | | |
| P4 | | | | | .563 | | | | |
| SN1 | | | | | | .786 | | | |
| SN3 | | | | | | .741 | | | |
| SN2 | | | | | | .676 | | | |
| SL1 | | | | | | | | | |
| SL5 | | | | | | | .795 | | |
| SL4 | | | | | | | .672 | | |
| SL6 | | | | | | | .648 | | |
| AU5 | | | | | | | | | |
| CV5 | | | | | | | | | |
| CV1 | | | | | | | | .904 | |
| CV2 | | | | | | | | .889 | |
| CV3 | | | | | | | | | |
| SN5 | | | | | | | | | .702 |
| SN4 | | | | | | | | | |

Extraction Method: Principal Component Analysis.

Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 17 iterations.

KMO and Bartlett's Test 2

| | | |
|--------------------------------------------------|------|----------|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. | | .892 |
| Approx. Chi-Square | | 3409.037 |
| Bartlett's Test of Sphericity | df | 351 |
| | Sig. | .000 |

Total Variance Explained

| Component | Initial Eigenvalues | | | Extraction Sums of Squared Loadings | | | Rotation Sums of Squared Loadings ^a |
|-----------|---------------------|---------------|--------------|-------------------------------------|---------------|--------------|------------------------------------------------|
| | Total | % of Variance | Cumulative % | Total | % of Variance | Cumulative % | Total |
| 1 | 9.290 | 34.406 | 34.406 | 9.290 | 34.406 | 34.406 | 6.427 |
| 2 | 2.544 | 9.421 | 43.827 | 2.544 | 9.421 | 43.827 | 4.918 |
| 3 | 1.682 | 6.228 | 50.055 | 1.682 | 6.228 | 50.055 | 5.368 |
| 4 | 1.471 | 5.448 | 55.503 | 1.471 | 5.448 | 55.503 | 5.790 |
| 5 | 1.359 | 5.034 | 60.537 | 1.359 | 5.034 | 60.537 | 4.196 |
| 6 | 1.187 | 4.396 | 64.934 | 1.187 | 4.396 | 64.934 | 4.717 |
| 7 | 1.031 | 3.820 | 68.754 | 1.031 | 3.820 | 68.754 | 3.455 |
| 8 | .857 | 3.174 | 71.928 | | | | |
| 9 | .733 | 2.715 | 74.643 | | | | |
| 10 | .646 | 2.392 | 77.036 | | | | |
| 11 | .585 | 2.167 | 79.203 | | | | |
| 12 | .549 | 2.034 | 81.237 | | | | |
| 13 | .517 | 1.914 | 83.150 | | | | |
| 14 | .482 | 1.786 | 84.936 | | | | |
| 15 | .441 | 1.634 | 86.571 | | | | |
| 16 | .416 | 1.541 | 88.112 | | | | |
| 17 | .400 | 1.483 | 89.595 | | | | |
| 18 | .364 | 1.348 | 90.943 | | | | |
| 19 | .354 | 1.310 | 92.253 | | | | |
| 20 | .348 | 1.289 | 93.543 | | | | |
| 21 | .305 | 1.130 | 94.672 | | | | |
| 22 | .296 | 1.096 | 95.768 | | | | |
| 23 | .264 | .977 | 96.746 | | | | |
| 24 | .262 | .970 | 97.716 | | | | |
| 25 | .252 | .935 | 98.651 | | | | |
| 26 | .201 | .746 | 99.397 | | | | |
| 27 | .163 | .603 | 100.000 | | | | |

Extraction Method: Principal Component Analysis.

a. When components are correlated, sums of squared loadings cannot be added to obtain a total variance.

Pattern Matrix^a

| | Component | | | | | | |
|------|-----------|------|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| P2 | .833 | | | | | | |
| P3 | .802 | | | | | | |
| P5 | .759 | | | | | | |
| P1 | .678 | | | | | | |
| P4 | .671 | | | | | | |
| FOC2 | | .896 | | | | | |

| | | | | | | | |
|------|--|------|------|------|------|------|------|
| FOC1 | | .801 | | | | | |
| FOC5 | | .716 | | | | | |
| FOC4 | | .714 | | | | | |
| FOC3 | | .703 | | | | | |
| AQ5 | | | .851 | | | | |
| AQ4 | | | .828 | | | | |
| AQ6 | | | .782 | | | | |
| AQ3 | | | .531 | | | | |
| ATT1 | | | | .836 | | | |
| ATT5 | | | | .835 | | | |
| ATT4 | | | | .796 | | | |
| ATT2 | | | | .725 | | | |
| AU4 | | | | | .732 | | |
| AU2 | | | | | .730 | | |
| AU3 | | | | | .614 | | |
| AU1 | | | | | .559 | | |
| SL5 | | | | | | .850 | |
| SL6 | | | | | | .808 | |
| SL4 | | | | | | .587 | |
| CV1 | | | | | | | .871 |
| CV2 | | | | | | | .854 |

Extraction Method: Principal Component Analysis.

Rotation Method: Promax with Kaiser Normalization.

a. Rotation converged in 7 iterations.

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MAKE ME TRUST OR GIVE ME JOY: MECHANISMS INDUCING CONSUMER PURCHASE INTENTION IN LIVE STREAMING COMMERCE

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ABSTRACT

The advancement and widespread application of live stream technology has fostered online purchasing via live stream on social media platforms - especially Facebook Live. Using value and trust theories, the study unpacked the mechanisms through which different types of perceived value and trust influence purchase intention in live stream context. We conducted a survey with 585 respondents in Vietnam and used the PLS-SEM analysis method to evaluate the research model. We found that while hedonic value has a direct impact on purchase intention, utilitarian value has to work its way through trust to influence consumer purchase intention. We also confirmed the positive impact that trust in seller has on trust in product and showed the crucial role of trust in product in inducing purchase intention. Our study contributes to the literatures on livestream commerce by elucidating the mechanisms through which different types of perceived value and trust induce purchase intentions. Regarding managerial implications, we suggest companies to encourage purchase intention by building trust in their products through providing utilitarian value, symbolic value and trust in themselves, and by providing hedonic value through giving joy to the audience during their live stream.

Keywords: Live streaming commerce, perceived value, trust, purchase intention.

1. Introduction

The scale of Vietnam's e-commerce market has continuously increased over the years (Vietnam E-commerce and Digital Economy Agency). In particular, it had reached 30.3 million people engaging in purchasing in 2015 with an estimated amount of 160 USD, and the number of users increased to 44.8 million people with a spending level of 225 USD/person by 2019, the latest in 2020 with an increase of 18%, the market size reached 11.8 billion USD (Sach trang dien tu, 2020). While it is a significant opportunity for businesses to enter e-commerce, it requires a huge investment in marketing communications as the industry is becoming more crowded. Livestream is an effective and efficient marketing communication vehicle in the era of e-commerce as it not only enhances presence and social interaction between businesses and consumers but also improves shopping experience by reducing shoppers' perceived uncertainty and increasing their level of trust with online sellers (Hajli, 2015).

The COVID-19 pandemic has contributed to the prevalence and explosive growth of live stream. Faced with the complicated situation of COVID-19, offline marketing communications have shown their limitations and live stream has grown and become an effective communication tool. E-commerce platforms such as Taobao, Amazon, JD, Shopee, etc. have used live stream to sell and interact with online shoppers. In Vietnam, Facebook Live has been the most popular platform on which businesses and individuals live-stream to advertise and sell their products.

Research on consumer behavior in live stream context is emerging with a limited number of studies (Wongkitrungrueng and Assarut, 2020). Unlike previous research which has examined the characteristics of livestream (Overby and Lee, 2006; Gefen et al., 2003; Crosby et al., 1990), consumer engagement (Wongkitrungrueng and Assarut, 2020) and shopping intention without considering the influence of trust

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(Cai, Wohn, Mittal, and Sureshababu, 2018), our study examines the simultaneous impacts of perceived value and trust on consumer purchase intention – the most powerful prediction of actual purchase behavior. Furthermore, there has been inconsistent view on the role of trust in live stream commerce (Wongkitrungrueng and Assarut, 2020 and Lu and Chen, 2021).

As such, the study aims to examine the relationship between perceived value (i.e., utilitarian value, hedonic value, symbolic value) and trust (i.e., trust in product and trust in seller) and purchase intention in live streaming on Facebook Live.

2. . Theoretical framework

2.1. Live streaming commerce

Live streaming commerce or live commerce is a type of social commerce that is characterized by real-time social interaction and shopping with streamers or broadcasters (Cai and Wohn, 2019). Its blend of aspects of social media with e-commerce has attracted companies to use it as a medium to create value for customers through improving brand differentiation and accelerating conversion rate (Arora *et al.*, 2021). Live streaming commerce is categorized into two types: live streaming features embedded in e-commerce platforms (e.g., tikilive on tiki.vn, Shopee Live on shopee.vn), and commercial features integrated into live streaming platforms (e.g., Facebook Live on Facebook, Instagram Live and Live Rooms on Instagram) (Cai *et al.*, 2018; Lu and Chen, 2021). Forrester Research (2019) predicted that live commerce sales of China – the pioneer in live streaming commerce - will reach \$423 billion by 2022 and Southeast Asia would be not that far behind. Live streaming commerce has grown rapidly on a global scale and its growth has been escalated due to the COVID-19 pandemic. According to a report by McKinsey Digital in 2021, live streaming commerce is expected to take up 10 to 20 percent of all e-commerce sales by 2026.

The rise of live streaming commerce has triggered an emerging research interest in exploring how consumers react towards live streaming commerce. Through different theoretical lens, the extant literature has looked into the motivation of consumers to engage in live streaming commerce (Haimson and Tang, 2017; Hu, Hu and Fang, 2017; Chen, Yeh and Chang, 2020; Lind, 2018; Cai and Wohn, 2019), and the factors influencing consumer behavior (i.e., engagement, purchase intention) in live streaming (Kim *et al.*, 2016; Hou *et al.*, 2019; Zhang *et al.*, 2020; Clement, Jiaming and Li, 2020, Wongkitrungrueng and Assarut, 2020).

Departing from the previous research that examines the influence of the characteristics of live streaming platforms and broadcasters on consumer behavior, this study adopts value theory and trust (Overby and Lee, 2006; Gefen *et al.*, 2003; Crosby *et al.*, 1990) to examine consumers' perception of value and trust in live streaming commerce and its impacts on their intention to purchase.

2.2. Perceived value in live streaming commerce

Perceived value is divided into three types of values: utilitarian value, hedonic value, and symbolic value (Childers and *et al.*, 2001; Mathwick, Malhotra and Rigdon, 2001; Kim, Zhao and Yang, 2008; Hsin Chang and Wang, 2011, Wongkitrungrueng and Assarut, 2020).. *Utilitarian value* is defined as the extent to which a product or service provides the expected utility (Babin *et al.*, 2016). Utilitarian value is reflected in authenticity, visualization, and responsiveness. *Hedonic value* - the value received from multi-sensory aspects, more specifically the emotions of the shopping experience (Hirschman and Holbrook, 1982). The hedonic value is associated with the enjoyment, the level of entertainment, and this is also the basic motivation and premise affecting the attitudes and purchasing decisions of consumers in the online platform (Overby and Lee, 2006). According to Baudrillard (1998), *symbolic value* also plays an important role in affecting consumers' trust and online consumption behavior. Symbolic value refers to the immaterial value of an object or an idea and conveys its symbolic meaning. Thereby, online customers can assess how similar they are to the seller, and determine whether they have the same interests and tastes or not.

2.3. Trust

Melorse, Perroy and Careas (2015) and Hwang and Kim (2007) defined *trust* as the belief that the other party in a social exchange relationship will behave ethically, and not act for personal gain. Trust is a multidimensional concept (Morgan and Hunt, 1994; Lewis and Weigert, 1985). It involves cognitive and affective dimensions. According to Wongkitrungrueng and Assarut (2020); Komiak and Benbasat (2004), consumers' online trust is divided into two types: *trust in the product*, and *trust in the seller*.

2.4. Purchase intention

Purchase intention is defined as the individual acting on a trend related to the brand (Ostrom, 1969; Bagozzi and Burnkrant, 1985). In addition, Morinez et al. (2007) emphasized that purchase intention is a situation in which consumers tend to buy a particular product under certain conditions.

2.5. Research model and hypotheses

2.5.1. Utilitarian value and trust

Wongkitrungrueng and Assarut (2020) has shown the significant influence of convenience value on online consumers' trust in products. Moreover, Akinbode, Adegboyi and Agboola (2018) have indicated that there is a positive relationship between utilitarian value and online shopping trust. Thus, Facebook live is the way to create utilitarian value in terms of authenticity, responsiveness, and visualization, which leads to the reduction in uncertainty about the identity of the seller, or the product. Based on the above arguments, we proposed the following research hypothesis:

H1: Utilitarian value of live stream has a positive impact on consumers' trust in the product.

H2: Utilitarian value of live stream has a positive impact on consumers' trust in the sellers.

2.5.2. Symbolic value and trust

Banks et al. (2000) has shown that symbolic value plays a crucial role in building trust. Moreover, one of the best ways to build trust is to increase symbolic value (Haas and Deseran (1981). Again, Thomas (1998) has demonstrated that building and strengthening trust can be done through symbolic value. As such, we propose the following hypotheses:

H3: Symbolic value of livestream has a positive impact on consumers' trust in the product.

H4: Symbolic value of livestream has a positive impact on consumers' trust in the sellers.

2.5.3. Hedonic value and trust

Yahia, Al-Neama, and Kerbache (2018) found that an s-commerce supplier's effort can create hedonic value that is positively related to consumer trust in the sellers; however, they did not consider the effect on trust in the product. Yet, Chen and Lee (2008) found that there is no effect between hedonic value and online customer trust. Albayrak et al. (2020) also does not support the influence of emotional value on customer trust since the activities that sellers create through Facebook live are just antics. However, Dastan and Gecti (2014) showed the positive relationship between emotional value and brand trust. As live streaming contains entertainment characteristics (Sjöblom, & Hamari, 2018; Hu, Zhang, & Wang, 2017; Lu et al., 2018; Todd & Melancon, 2017), we subscribe with the view that hedonic value coming from entertainment characteristics may exert a positive influence on trust. Thus, we put forward the following hypotheses:

H5: Hedonic value of live stream has a positive impact on consumers' trust in the product.

H6: Hedonic value of live stream has a positive impact on consumers' trust in the sellers.

2.5.4. Trust in sellers and trust in products

Consumers' trust in sellers is based on whether sellers accurately provide product quality, and product misrepresentation due to a lack of seller integrity is a major risk (Gefen, Benbasat and Pavlou, 2008). This is especially noticeable in online environments where sellers cannot easily describe product characteristics (Jiang and Benbasat, 2004). In addition, because it is difficult to touch the product, the expertise and

knowledge that the streamer conveys about the product information will foster the viewers to trust it more (Liu, 2021). Therefore, we propose:

H7: Trust in sellers has a positive impact on consumers' trust in the product.

2.5.5. Utilitarian value and purchase intention

In the modern purchase context, the mainstays that help shape consumers' intention to buy a product online are based on forums, communities, ratings, reviews, or referrals and recommendations (Hajli, 2015). Hsu and Lin (2016) also revealed that utilitarian value has a significant influence on the purchase intention. Along with that point of view, Lin and Lu (2015) has also shown that hedonic and utilitarian values significantly influence users' intention. Hence, we propose:

H8: Utilitarian value of live stream has a positive impact on consumers' purchase intention.

2.5.6. Symbolic value and purchase intention

Not only do consumers consider the functional attributes of the product but also express their ego and personality in the consumption process (Choi et al., 2009). While shopping, consumers form perceptions of not only themselves but also sellers and others (El Hedhli, Chebat and Sirgy, 2013; Sandikci & Holt, 1998). Customers have the intention to shop at places where they can meet people with similar characteristics (Massicotte et al., 2011). Then, we propose:

H9: Symbolic value of live stream has a positive impact on consumers' purchase intention.

2.5.7. Hedonic value and purchase intention

Hedonic value has a positive influence on the purchase intention of customers in the B2C e-commerce market (Chiu et al, 2014). Simultaneously, in the field of aviation, once again Kim (2015) confirmed the positive relationship between the two factors. Moreover, Lăzăroiu et al (2020) has asserted that in addition to utilitarian, confidence, and privacy issues, hedonic value positively influences the buyer's attitude towards online shopping. Hence, we propose:

H10: Hedonic value of live stream has a positive impact on consumers' purchase intention.

2.5.8. Trust and purchase intention

Zaremba and Smoleński (2000) argued that a lack of trust prevents consumers from engaging in online transactions, leading to a decrease in purchase intention. Oliveira et al. (2017) and Walsh, Schaarschmidt and Ivens (2017) emphasized that the seller's reputation, expertise, and kindness help to enhance customer trust, thereby contributing to enhancing online shopping intention. Consumers' trust is closely related to product quality reliability; therefore, the higher the product quality, the higher the customers' intention to buy online (Janssen and Hamm, 2012; Daugbjerg et al., 2014; Wang, Tao and Chu, 2020). Therefore, we hypothesize that:

H11: Trust in the product has a positive impact on customers' purchase intention.

H12: Trust in the sellers has a positive impact on customers' purchase intention.

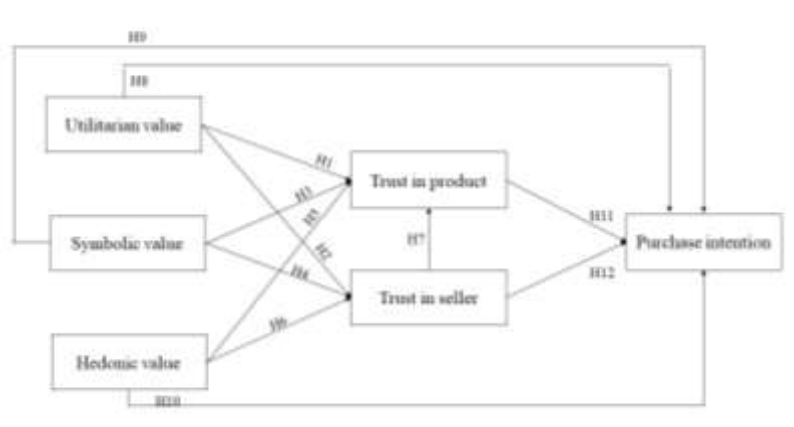


Figure 1. Research model.

3. Research method

We adopted a quantitative research approach in which we used a survey to collect data and PLS-SEM analyse the data.

3.1. Sampling method

We employed non-probability sampling method in which 815 Vietnamese consumers who have watched a Facebook Live about selling fashions or cosmetics from the beginning of 2020 were conveniently surveyed. . Out of a total of 815 questionnaires collected, we conducted data cleaning and 585 valid questionnaires were used to analyze and test the research model. The final sample includes 79.5% female respondents and 20.5% male respondents. The majority of respondents aged from 18 - under 34 years old is 73.0% and followed by under 18 years old with 17% and finally 10% for 34 years old and over.

3.2. Measurement

The original questionnaire was constructed in English, translated, and back-translated and pretested with respondents from the same population. These questions are measured by using a seven-level Likert scale anchored with "strongly disagree" to "strongly agree" from 1 to 7 respectively. According to Cicchetti, D. V., Shoinralter, D., & Tyrer (1985); Preston and Colman (2000), the 7-level Likert scale brings high reliability and discriminant value. Specifically, this study has 40 items divided into 6 variables, including 10 indicators of utilitarian value (Fiore, Kim and Lee (2005); Featherman, Valacich and Wells (2006); Liu (2003); Song and Zinkhan (2008) and Wongkitrungrueng and Assarut (2020), 9 indicators of hedonic value (Babin et al (1994), Arnold and Reynold (2003) ; Chiu et al (2014) and Wongkitrungrueng and Assarut (2020), 9 indicators of symbolic value (Rintamäki et al (2006); Lu, Zhao and Wang (2010), 7 indicators of trust (Ba and Pavlou (2002); Hong and Cho (2011); Gafen et al (2003); Kim and Park (2013) and Wongkitrungrueng and Assarut (2020), and 5 indicators of purchase intention (Lee and Lee, 2009, 2015 and Zhou, Lu and Wang (2016).

3.3. Data analysis

The method of partial least square structural equation modeling (PLS-SEM) is used to analyze data. According to Hair et al. (2014), there are four reasons to use this analysis method. Firstly, PLS-SEM evaluates the model based on the establishment of a measurement model and a structural model to represent and evaluate the relationships between the variables in the research model. Secondly, it is suitable for the research objective of focusing on the predictive power of the dependent variables (Henseler, Ringle and Sinkovics, 2009), explaining the variance of the dependent variables when testing normal distribution models or without the problem of multicollinearity. Thirdly, PLS-SEM allows researchers to use the most recent set of evaluation criteria when examining the validity of formatively measured constructs. Finally, PLS-SEM uses non-parametric data with small sample sizes and considers all path coefficients at once, which helps to avoid errors in model estimation.

4. Results and discussion

4.1. Results

4.1.1. Measurement model

The indicators to estimate the measurement model are factor loadings, composite reliability (CR), rho_A, and Cronbach's alpha. To assess the reliability of the individual items, individual item loadings were checked against the suggested threshold of 0.7. Based on this threshold, there are eight items dropped. There are some indicators that are smaller than 0.7 but higher than 0.6, so they do not have too much influence and still ensure the convergence validity, so they can be kept for further analysis. Table 1 shows that all measurement items are higher than 0.7, indicating adequate internal reliability (Bagozzi and Yi, 1988). The internal consistency, measured by composite reliability and Cronbach's alpha values and rho_A, is higher than 0.7 for all latent variables, indicating high internal consistency (Bagozzi & Yi, 1988; Nunnally & Bernstein, 1994).

Besides, the AVE was calculated to evaluate the validity of the convergence. The AVE for all factors exceeds the standard threshold of 0.5 (Fornell and Larcker, 1981). Table 2 shows that the square root of AVE (value lying on the diagonal) is larger than the correlation coefficient of that variable with the rest of the variables in the model (coefficients outside the diagonal). This proves that the scale achieves discriminant validity.

Table 1: Assessment of measurement model.

| | Factor Loading | Outer | Cronbach's Alpha | rho_A | Composite Reliability | AVE |
|--------|----------------|-------|------------------|-------|-----------------------|-------|
| UTV | | | 0.820 | 0.823 | 0.870 | 0.529 |
| UTV 01 | 0.666 | | | | | |
| UTV 02 | 0.765 | | | | | |
| UTV 03 | 0.756 | | | | | |
| UTV 04 | 0.765 | | | | | |
| UTV 05 | 0.762 | | | | | |
| UTV 06 | 0.638 | | | | | |
| HDV | | | 0.786 | 0.799 | 0.852 | 0.536 |
| HDV 01 | 0.671 | | | | | |
| HDV 02 | 0.736 | | | | | |
| HDV 06 | 0.745 | | | | | |
| HDV 08 | 0.757 | | | | | |
| HDV 09 | 0.748 | | | | | |
| SBV | | | 0.876 | 0.880 | 0.901 | 0.504 |
| SBV 01 | 0.605 | | | | | |
| SBV 02 | 0.747 | | | | | |
| SBV 03 | 0.755 | | | | | |
| SBV 04 | 0.765 | | | | | |
| SBV 05 | 0.732 | | | | | |

| | | | | | |
|----------|-------|-------|-------|-------|-------|
| SBV 06 | 0.659 | | | | |
| SBV 07 | 0.746 | | | | |
| SBV 08 | 0.734 | | | | |
| SBV 09 | 0.629 | | | | |
| TRUST_S | | 0.828 | 0.854 | 0.888 | 0.670 |
| Trust 01 | 0.863 | | | | |
| Trust 02 | 0.903 | | | | |
| Trust 03 | 0.866 | | | | |
| Trust04 | 0.608 | | | | |
| TRUST_P | | 0.868 | 0.868 | 0.919 | 0.791 |
| Trust 05 | 0.889 | | | | |
| Trust 06 | 0.886 | | | | |
| Trust 07 | 0.894 | | | | |
| PI | | 0.887 | 0.889 | 0.918 | 0.691 |
| PI 01 | 0.763 | | | | |
| PI 02 | 0.813 | | | | |
| PI 03 | 0.868 | | | | |
| PI 04 | 0.865 | | | | |
| PI 05 | 0.841 | | | | |

Table 2: Discriminant validity of the measurements

| | 1 | 2 | 3 | 4 | 5 | 6 |
|--------|---------|---------|---------|---|---|---|
| 1. UTV | (0.727) | | | | | |
| 2. HDV | 0.495 | (0.732) | | | | |
| 3. SBV | 0.605 | 0.670 | (0.710) | | | |

| | | | | | | |
|------------|-------|-------|-------|---------|---------|---------|
| 4. TRUST_P | 0.589 | 0.432 | 0.566 | (0.889) | | |
| 5. TRUST_S | 0.593 | 0.426 | 0.613 | 0.699 | (0.819) | |
| 6. PI | 0.524 | 0.660 | 0.676 | 0.549 | 0.536 | (0.831) |

4.1.2. Structural model and hypothesis testing

Table 3 presents the results of the structural model. We use the R square coefficient (R^2), and the Stone-Geisser index (Q^2) (Henseler, Ringle and Sinkovics, 2009) to test. The results illustrate that a coefficient of determination (R^2) of 0.454 for trust in sellers, 0.546 for trust in products, and 0.384 for purchase intention as a dependent variable, suggesting a satisfactory level of predictive power. Moreover, the value of Q^2 of 0.299 for trust in sellers, 0.427 for trust in products, and 0.389 for purchase intention, higher than 0, so the model has well-predictive validity.

Table 3: R^2 , Q^2 :

| | R^2 | Q^2 |
|---------|-------|-------|
| Trust_S | 0.454 | 0.299 |
| Trust_P | 0.546 | 0.427 |
| PI | 0.384 | 0.389 |

Only utilitarian value ($\beta = 0.211$; $p < .001$) can be seen to have a positive impact on consumer trust in products, supporting H1. Both utilitarian, and symbolic value have a good influence on trust in sellers with ($\beta = 0.356$; $p < .001$), and ($\beta = 0.417$; $p < .001$) respectively, so H2, H4 is supported. Since the f^2 (measured variance explain each exogenous variables in the models) of symbolic value is less than 0.02, we did not find its effect on trust in products, thus H3 is not supported (Cohen, 1988). An interesting point we can see is hedonic has a non-significant effect on both trust in products and sellers with $t = 1.097$ and 0.708 respectively, so H5, H6 are rejected. As hypothesized, there is a positive impact between trust in sellers and products. Specifically, trust in sellers is shown to lead to trust in products ($\beta = 0.487$; $p < .001$), supporting H7.

As hypothesized, trust has a positive influence on consumers' purchase intention, but it can be seen that only for the effect of trust in products ($\beta = 0.159$, $p < .001$), not trust in sellers ($f^2 = 0.006$ less than 0.02), supporting H11 not H12. Moreover, we predicted the effect of perceived value on purchase intention, only utilitarian value is seen to non-significantly affect purchase intention ($t = 0.953$), rejecting H8. Both hedonic and symbolic value illustrate the direct effect on purchase intention, with ($\beta = 0.345$; $p < .001$) and ($\beta = 0.287$; $p < .001$) respectively, so H9 and H10 were supported. All of them are shown in Table 4.

Table 4: Results of path analysis.

| Hypothesis | Path coefficient | Standard deviation | t-statistics | f^2 | P-value | Result |
|--------------------------------------------------|------------------|--------------------|--------------|-------|---------|----------|
| Hedonic value \rightarrow trust in product | 0.043 | 0.040 | 1.097 | 0.002 | 0.273 | Rejected |
| Utilitarian value \rightarrow trust in product | 0.211 | 0.040 | 5.283*** | 0.053 | 0.000 | Accepted |
| Symbolic value \rightarrow trust in product | 0.112 | 0.047 | 2.371** | 0.011 | 0.018 | Rejected |

| | | | | | | |
|----------------------------------------|--------|-------|-----------|-------|-------|----------|
| product | | | | | | |
| Hedonic value → trust in seller | -0.032 | 0.045 | 0.708 | 0.001 | 0.479 | Rejected |
| Utilitarian value → trust in seller | 0.356 | 0.037 | 9.560*** | 0.143 | 0.000 | Accepted |
| Symbolic value → trust in seller | 0.417 | 0.043 | 9.636*** | 0.143 | 0.000 | Accepted |
| Trust in seller → trust in product | 0.487 | 0.039 | 12.438*** | 0.286 | 0.000 | Accepted |
| Hedonic value → purchase intention | 0.345 | 0.036 | 9.477*** | 0.149 | 0.000 | Accepted |
| Utilitarian value → purchase intention | 0.039 | 0.041 | 0.953 | 0.002 | 0.331 | Rejected |
| Symbolic value → purchase intention | 0.287 | 0.050 | 5.736*** | 0.075 | 0.000 | Accepted |
| Trust in product → purchase intention | 0.159 | 0.045 | 3.524*** | 0.027 | 0.000 | Accepted |
| Trust in seller → purchase intention | 0.078 | 0.041 | 1.905 | 0.006 | 0.057 | Rejected |

* *p*-value < .05. ** *p*-value < .01. *** *p*-value < .001

4.1.3. Indirect and mediating effects

Trust in products and trust in sellers are used as mediating variables for the impact of the perceived values on online consumers' purchase intention. To build and test confidence intervals (percentile and bias-corrected) for these indirect effects, we performed a Bootstrapping procedure with 5000 samples in PLS-SEM. Table 5 shows the results of indirect/mediating effects. There is a significant direct effect of hedonic/symbolic value on purchase intention when trust in sellers and trust in products are introduced into the model. However, there is only a significant indirect impact of symbolic value on purchase intention through the path from symbolic value to trust in sellers, then trust in sellers, and finally purchase intention (CI = 0.015 to 0.057). As for utilitarian value, which has non-significant direct impact on purchase intention, there was found to be an indirect effect via only trust in products (CI = 0.016 to 0.060), which partially mediates the effect of utilitarian value on purchase intention. And there is the indirect mediation path from utilitarian to trust in sellers, then trust in products, and finally purchase intention (CI = 0.013 to 0.048). Overall, all of three perceived values have a positive total effect on purchase intention, utilitarian ($\beta = 0.128$, $p < .01$) hedonic value ($\beta = 0.347$, $p < .001$) and symbolic value ($\beta = 0.370$, $p < .001$).

Table 5: Indirect and mediating effects

| | Total effect of shopping value on purchase intention | | Direct effect of shopping value on purchase intention | | Indirect effect of shopping value on purchase intention | |
|-----------------|-------------------------------------------------------------|--------------|--------------------------------------------------------------|--------------|----------------------------------------------------------------|-------------------------------|
| | Coefficient | T statistics | Coefficient | T statistics | Coefficient | Bootstrap 95% CI (Percentile) |
| UTV → PI | 0.128 | 3.431** | 0.039 | 0.953 | UTV → PI | 0.089 [0.057:0.128] |
| | | | | | UTV → TP → PI | 0.034 [0.016:0.060] |
| | | | | | UTV → TS → PI | 0.028 [0.001:0.058] |
| | | | | | UTV → TS → TP → PI | 0.028 [0.013:0.048] |
| HDV → PI | 0.347 | 9.455*** | 0.345 | 9.477*** | HDV → PI | 0.002 [-0.017:0.024] |
| | | | | | HDV → TP → PI | 0.007 [-0.004:0.023] |
| | | | | | HDV → TS → PI | -0.002 [-0.014:0.003] |
| | | | | | HDV → TS → TP → PI | -0.002 [-0.01:0.004] |
| SBV → PI | 0.370 | 7.975*** | 0.287 | 5.736*** | SBV → PI | 0.083 [0.048:0.124] |
| | | | | | SBV → TP → PI | 0.018 [0.004:0.041] |
| | | | | | SBV → TS → PI | 0.032 [0.000:0.067] |
| | | | | | SBV → TS → TP → PI | 0.032 [0.015:0.057] |

* *p*-value < .05. ** *p*-value < .01. *** *p*-value < .001

4.2. Discussion

Research results have demonstrated direct and indirect influence; in which perceived values have an impact on customer's trust and purchase intention through Facebook Live. *Firstly*, hedonic value has no effect on customer's trust in product or seller, but shows a direct positive relationship between hedonic value and purchase intention through live stream on Facebook; which is similar to (Bridges and Florsheim, 2008; Kim, 2015). Because bargaining awareness plays an important role in consumers' purchase intention on Facebook Live, so more and more sellers via livestream organize prize-winning games, or give discount codes, shocking prices, consumers are excited, and easy to increase purchase intention because they can buy

merchandises at a better price than buying at the store (Kelley C, 2014). Secondly, symbolic value is one of the factors that positively affects customer's trust in sellers as well as the purchase intention through Facebook Live. This result is similar to many previous studies (Nicholson, Compeau and Sethi (2001); Massicotte et al (2011); Badrinarayanan, Sierra and Martin (2015). The reason is that today the sellers via Facebook Live are the leaders catching up and creating trends for society. The influence of symbolic value is further increased because Vietnam is a collectivist country (according to Hofstede); people are always concerned with social acceptance, how society thinks of them (Wong and Ahuvia, 1998; O'cass and McEwen, 2004). Therefore, the symbolic value always plays a key role in every customer's decision. Thirdly, the utilitarian value has a direct positive effect on customer's trust in product and seller, which is consistent with prior studies (Chiu et al., 2012; Wongkitrungrueng and Assarut, 2020). However, it does not have a direct effect on consumers' purchase intention when watching livestream on Facebook, which is different from the study done by (Amblee and Bui, 2011). The difference in our study may be due to the fact that today it is not so difficult to buy a common product. There are so many ways to buy a product that don't require too much effort in finding and ordering. Consumers also have many different ways to buy goods on online platforms such as Facebook with a popularity of 66%, followed by Shopee, Lazada and Tiki (Picodi's statistics, 2018). Therefore, the convenience factor also somewhat reduces the role in the decision to buy an item. Besides, responsiveness of utilitarian value plays a relatively small role, as customers may have alternative channels that allow them to contact and interact with sellers without a time limit, which is consistent with the study done by Wongkitrungrueng and Assarut (2020). Fourthly, trust in sellers leads to trust in products, which is contrary to Wongkitrungrueng and Assarut's (2020) findings. Yet, the result is in line with Liu (2021) who found that trust in Live streamers positively influenced trust in the products. Fifthly, without the path from trust in sellers to trust in products, utilitarian value would not affect purchase intention. Finally, symbolic value has a positive impact on purchase intention both directly and indirectly via the path from trust in sellers to trust in products. This highlights the importance of social identification enabled by live video, which leads consumers to trust in products and then influence consumers' purchase intention. By contrast, there is nonsignificant indirect effect of hedonic on purchase intention.

4.2.1. Theoretical implications

This study makes several theoretical contributions to the literature on consumer behavior in live stream context. *Firstly*, we clarified the mechanisms through which different types of perceived value and trust exert impacts on purchase intention in live streaming. *Second*, this is one of the few studies to elucidate how live stream works in Vietnam context. *Last but not least*, we tested the relationship between trust in sellers and trust in products, which resolved inconsistency in the previous research findings.

4.2.2. Managerial implications

We suggest that companies should optimize utilitarian and symbolic value that Facebook Live brings to increase trust in the companies which in turn translate into trust in their products. Additionally, to directly increase purchase intention, companies need to build consumers' trust in products. Interestingly, as hedonic value is an important factor that directly affects the consumers' purchase intention, thus giving consumers fun and enjoyment during live stream will help sellers increase the success rate of closing orders.

4.2.3. Limitations and future research

The study is conducted without limitations which we also believe leave room for future research. *First*, we only focused on respondents who watched the Livestream on Facebook. Therefore, future studies may be more diverse than platforms (such as: Tik Tok, Instagram, Shopee, etc.) affect trust or purchase intention. *Second*, this study only focuses on surveying those who have watched Facebook Live for sales, it is not clear whether respondents have ever purchased products through that form or not. Therefore, future studies can collect more samples of consumers who have a buying experience through Facebook Live to compare the difference in attitudes and reactions between these objects.

Appendix

Appendix A. Measurement scales

| Variables | Items | References |
|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|
| Utilitarian value (UTV) | | |
| UTV01 | Streamers who sell via livestream on Facebook seem to be genuine. | Featherman, Valacich and Wells(2006) |
| UTV02 | For me, products sold via livestream on Facebook are genuine. | |
| UTV03 | Products sold via livestream on Facebook are authentic. | |
| UTV04 | Products introduced via Facebook livestream help me visualize the product on a real figure. | Fiore, Kim and Lee (2005) |
| UTV05 | Introducing products via livestream on Facebook give me as much sensory information about the product as I would experience in a store. | |
| UTV06 | I can easily see and visualize the product via Facebook Live. | Liu (2003), Song and Zinkhan (2008). |
| UTV07 | Via Facebook Live, online sellers can reply to me immediately. | |
| UTV08 | Sellers ask and collect responses directly through a Facebook Live. | |
| UTV09 | I feel I can ask the streamers to find the product I'm looking for via Facebook Live. | |
| UTV10 | Products sold via Facebook Live are updated and trending. | |
| Symbolic value (SBV) | | |
| SBV01 | I feel like a smart shopper when I shop via Facebook Live. | Wongkitrungrueng and Assarut (2020); Rintamäki and et al., (2006) |
| SBV02 | Shopping via Facebook Live makes me feel trendy. | |
| SBV03 | I would highly be eager to tell my friends/acquaintances about shopping via Facebook Live. | |
| SBV04 | I feel that I can identify with the streamers. | |
| SBV05 | I feel that the streamers have the similar interests to me. | |
| SBV06 | I feel that the streamers recognize me and remembers my preferences. | |
| SBV07 | I can find products that match my style while I shop via Facebook Live. | |
| SBV08 | I feel like I belong to a streamers' Facebook customer group. | |
| SBV09 | I feel the social acceptance of the product when reading consumers' comments on the livestream. | |
| Hedonic value (HDV) | | |
| HDV01 | Shopping through Facebook Live is an entertaining activity. | Arnold and Reynold (2003); Babin et al (1994) |
| HDV02 | I enjoy shopping through Facebook livestream. | |
| HDV03 | I feel adventurous upon shopping through Facebook Live. | |
| HDV04 | I was able to do a lot of fantasizing upon watching the Facebook Live. | |
| HDV05 | While shopping via Facebook Live, I can forget the problem. | |
| HDV06 | Shopping via Facebook Live is a way to relieve stress. | |
| HDV07 | Shopping via Facebook Live is a thrill to me. | |

| | | |
|------------------------------------|----------------------------------------------------------------------------------------------|---------------------------------------------------------------|
| HDV08 | I enjoy receiving many incentives upon shopping through Facebook Live. | |
| HDV09 | Activities through Facebook Live (giving free gifts, flash sale,...) make me feel excited. | |
| Trust in sellers (TRUST_S) | | |
| TRUST01 | I trust the information that the streamers provide through the livestream on Facebook. | Kim and Park (2013); Gafen et al (2003); Ba and Pavlou (2002) |
| TRUST02 | I can trust Facebook livestream streamers. | |
| TRUST03 | I believe Facebook Live streamers are trustworthy. | |
| TRUST04 | I don't think Facebook Live streamers will take advantage of me. | |
| Trust in products (TRUST_P) | | |
| TRUST05 | I think the product that I shop via Facebook Live will be the same as I imagined. | Gafen et al (2003); Ba and Pavlou (2002) |
| TRUST06 | I believe I can use the product as trial streamers on the livestream. | |
| TRUST07 | I believe that the product I receive will be similar to the product shown on the livestream. | |
| Purchase intention (PI) | | |
| PI01 | I am positive with online shopping. | Lee and Lee (2009), (2015); Zhou, Lu and Wang (2016) |
| PI02 | I intend to shop via Facebook Live. | |
| PI03 | I can consider shopping through Facebook Live. | |
| PI04 | I think it's a good idea to shop through Facebook Live. | |
| PI05 | It is likely that I will shop via Facebook Live in the near future (eg: 1 month from now). | |

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RESEARCH ON YOUNG CUSTOMERS' USAGE DECISIONS IN VIETNAM FOR FINTECH'S PRODUCTS AND SERVICES

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ABSTRACT

Industrial revolution 4.0 has strongly impacted every industry all over the world and contributed to improving as well as enhancing people's productivity and quality of life. In particular, the financial sector is currently witnessing a change in payment and credit due to the emergence of Fintech - a combination of technology and finance. The research is conducted to examine the factors affecting the intention to use and the attitude of consumers, especially young consumers, toward Fintech's products and services. The data collection was conducted online through Google Forms and received 187 results. Based on a variety of research methods, our results show that user intent mostly comes from the emotion factor. Besides, the influence group and the perceived ease of use have impacted with medium level, and the least impacted one is perceived usefulness. This study helps to explain 74.6% of Vietnamese young consumers' intention to use Fintech and gives some recommendations and suggestions to develop this field in the Vietnamese market in the future.

Keywords: Fintech; Consumers attitude; Technology acceptance model; Financial services; Technology

1. Introduction

Financial technology, or “Fintech” is a connection between “Financial” and “Technology”. This refers to an emerging industry that uses information technology to promote the efficiency of the financial ecosystem. Currently, no official definition of Fintech has been given globally, but it shows us the creative use of technology in the banking and finance sectors. Over the last few years, Fintech has formed an ecosystem of three main factors including The Government, financial institutions, and Fintech companies. Fintech operates mainly in the financial and banking system. One main component of a Fintech system is the Payment sector where customers are supplied with unique and modern online payment solutions, which may function on different software platforms such as mobile applications or web pages.

In recent years, the financial industry in general and Fintech, in particular, have received more and more attention in the context of the 4.0 technology revolution that is the result of many technological advancements in informatics. Since its inception, Fintech has been proving its success in many fields. It creates a strong spillover effect on all aspects of people's daily lives, notably the influence on the global financial market. With the popularity of financial services and the advancement of information technology nowadays, Fintech has become a new opportunity to attract more human resources. In Vietnam, Fintech brings a lot of creative innovations. It facilitates the use of utility payments or non-cash payments as well as the acceptance of payment services on mobile devices. With all these solutions, Fintech industry gradually forms new competitive systems compared to those of the traditional banking-finance industry. Furthermore, Fintech also helps boost access to financial services and supports our country to quickly achieve the goal of financial universalization, thereby socio-economic development. According to a study by Solidiance: “Vietnam's Fintech market reached \$4.4 billion in transaction value in 2017 and reached about \$7.8 billion in 2020, equivalent to an increase of 77% within 3 years” and Asian Banker Research's data mentions that: “In

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2020, in Vietnam, the total number of e-wallet users exceeds 10 million out of 100 million people". This shows that the payment field, or Fintech, has a lot of potential for development in the Vietnamese market.

The rapid development of Fintech and its usefulness in the current society in Vietnam entail the importance to study users' attitudes towards Fintech products and services, especially for commercial banks and large technology companies to have a better understanding of behavior coming from the customers and point out factors that could retain potential ones. Despite the innovativeness of Fintech, in developing countries such as Vietnam, it is still a new phenomenon. In addition, there is an extreme scarcity of studies and research performed on the Fintech industry on consumers' attitudes in our country. Hence, we conducted this study in Vietnam in June 2021, targeting young people and students who live mainly in Ho Chi Minh City and have close access to digital technology. We aim to find out (1) the factors affecting the intention to use Fintech products and services of these users and (2) their attitude towards these products. Finally, from the conclusions of this study, we propose some solutions to improve users' attitudes towards Fintech products in Vietnam. This improvement may lead to a better comprehension of the value of Fintech in the economic development of Vietnam nowadays and in the near future.

The study is organized as follows: Section 2 introduces the theoretical framework; in Section 3 we detail the research method; we report the sample, descriptive statistics, and results in Section 4 and discuss concluding remarks in Section 5.

2. Theoretical framework

2.1. Theory of three-component attitude model

The three-component attitude model of Schiffman and Kanuk (2000) is the most appreciated paradigm including perception, emotion or preference, and behavioral tendency. The perception refers to an individual's level of knowledge, having comprehension, and beliefs about the object, also known as the belief component; the emotional or representative preference is often referred to as a major component of attitude, referring to an individual's general feeling about interesting or avoiding an object. This feeling can be good or bad, friendly or hostile. Finally, the behavioral tendency speaks to the subject's intentions or actual actions towards the object in the perceived direction expressed through their selection tendency. In practice, many studies suggest that these three components can be merged into two components, consisting of emotion and behavioral tendency (Nguyen Dinh Tho et al., 2007).

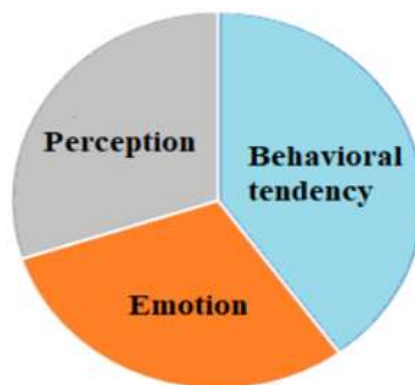


Figure 1. Three-component attitude model

Source: Vo Tuan Thanh (2013)

2.2. Theoretical foundations of the psychosocial model

2.2.1. Theory of Reasoned Action's model (TRA)

The theory of Reasoned Action (TRA) by psychologists Martin Fishbein and Icek Ajzen was developed in 1967 to predict consumer behavior. According to the model, a person's intention to perform a certain behavior strongly influences whether or not that person performs that behavior in practice. Therefore, determining behavioral intention is very important for this model. In this model, the determination of

behavioral intention includes two factors. The first one is the attitude which is the way a customer feels about a particular behavior, including two factors: beliefs about the results of performing the behavior and evaluation of potential outcomes. The second one is the subjective norm which perceives social pressures to perform or not perform the behavior (according to Ajzen). Thereby, behavioral beliefs contribute to shaping a person's perception of the behavior and deciding whether to perform that behavior or not to perform it.

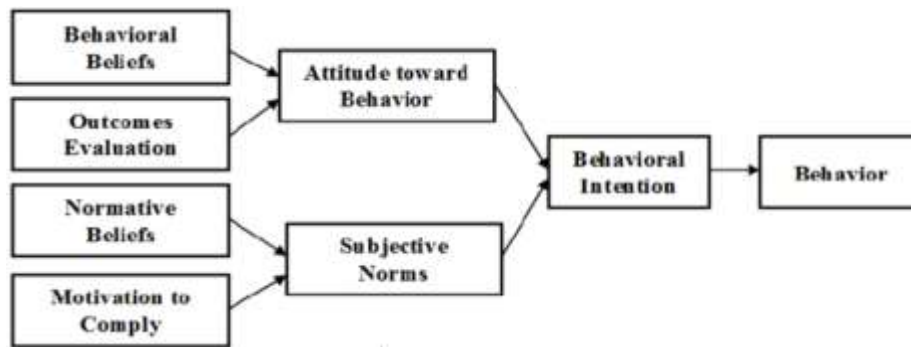


Figure 2. Theory of Reasoned Action's model (TRA)

Source: www.researchgate.net

2.2.2. Theory of Planned Behavior (TPB)

To show the relationship between one's beliefs and behavior, the Theory of Planned Behavior (TPB) is one of the highly regarded theories. This theory was proposed by Icek Ajzen in 1991 to give by adding to the model the cognitive factors that control behavior to increase the persuasiveness of the model, and at the same time bring many advantages in predicting and explaining an individual's behavior. The TPB is given by adding to the model the cognitive factors that control behavior to increase the persuasiveness of the model. The author believes that the intention to perform the behavior will be influenced by three basic determinants: attitude toward the behavior, subjective norm concerning the behavior, and perceived behavioral control. Firstly, the personal factor is the individual's attitude towards positive or negative behavior that leads to the performance of the behavior. Secondly, subjective norms are determined by the perceived social pressure from others for an individual to behave in a certain manner and their motivation to comply with those people's views. And the last, the determinant of self-perception is called cognitive-behavioral control.

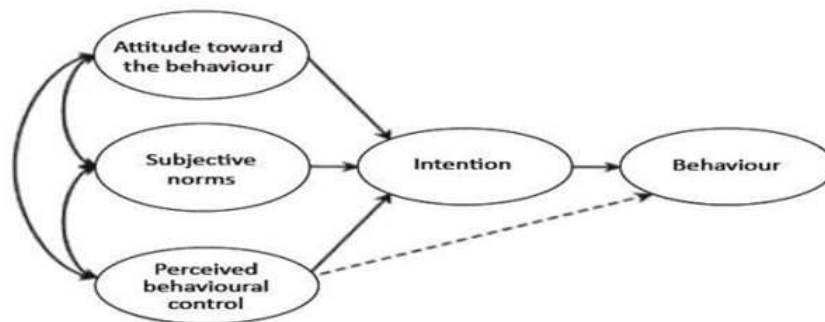


Figure 3. Theoretical model of Planned Behavior (TPB)

Source: www.researchgate.net

2.2.3. Technology Acceptance Model (TAM)

Based on the TRA, Davis et al. (1986) developed the Technology Acceptance Model (TAM) to explain the influence of variables such as perceived usefulness, perceived risk, and intention on the behavior and intention of consumers. The goal of this model helps us to predict the acceptability of one technology system. The TAM model identifies two main factors that affect the acceptability of users for a technology system: perceived ease of use and perceived usefulness. Perceived ease of use explains the degree to which users perceive little or no effort to use a particular system or technology. Perceived usefulness represents the degree to which users think a particular system can have a direct effect on their performance. According to

TRA, the TAM holds that behavioral intentions determine the use of a technology system, but these intentions are influenced by users' perceptions and attitudes towards the convenience of using this system. Therefore, this model explains that perceived ease of use, perceived usefulness, and attitude can influence the user's intention. The TRA also hypothesizes a direct link between perceived ease of use and perceived usefulness. User attitudes are directly influenced by both perceived ease of use and perceived usefulness, which in turn affects users' intention to use and accept the system. Since Fintech is a (financial) product of technology, our research model has been designed based on TAM to explain consumers' decisions of using Fintech products and services.

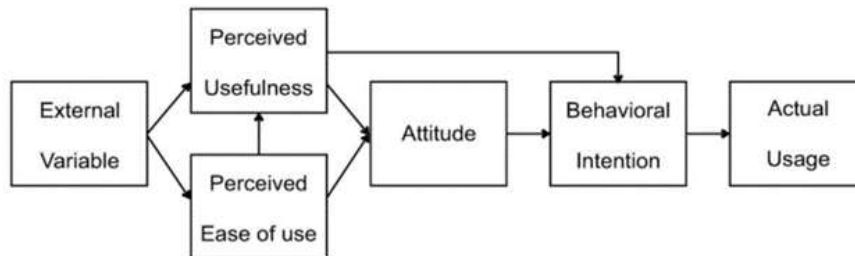


Figure 4. Technology Acceptance Model (TAM)

Source: www.researchgate.net

3. Research method

3.1. Implementation research methodology

3.1.1. Data collection methodology

a) Survey method

An empirical research method will be employed to achieve the objectives of gauging the acceptance, awareness, and attitude of young users toward Fintech in Vietnam (in which university students in Vietnam are the majority group, those who have close access to digital technology and use products and services in Fintech). We collect data through an online survey using Google Forms. The sample size of research (minimum) is $50+8m$, where $m = 26$ is the number of variables, so the minimum expected sample size is 258 observations. The survey questionnaire includes 10 factors and 26 variables with 31 questions. There are 8 multiple choice questions with one answer, one multiple choice question with multiple answers, and 22 questions to assess the level. The five-point Likert scale will be used to check the mean score for each question of degree of agreement/frequently/willingness whereby 1 denotes strong disagreement while 5 denotes strong agreement.

b) Observation selection method

Eliminate observations that have the same answers to the questions. For the answers that know but do not use Fintech, the research team will explore the reasons for not using Fintech products and services of users. For the answers that do not know about Fintech, the research team will provide the survey respondents with some basic information about Fintech as well as information about popular Fintech products and services in Vietnam to exploit the influence of external factors, the intention to learn and use on Fintech products and services in the future.

3.1.2. Analysis and summarization methodology

We used SPSS software to analyze the data obtained through the survey. The statistical techniques that will be used for this study include frequency statistical analysis, descriptive statistics, reliability analysis (Cronbach's Alpha coefficient), exploratory factor analysis (EFA), correlation analysis, regression analysis, and ANOVA analysis.

3.2. Proposed research model

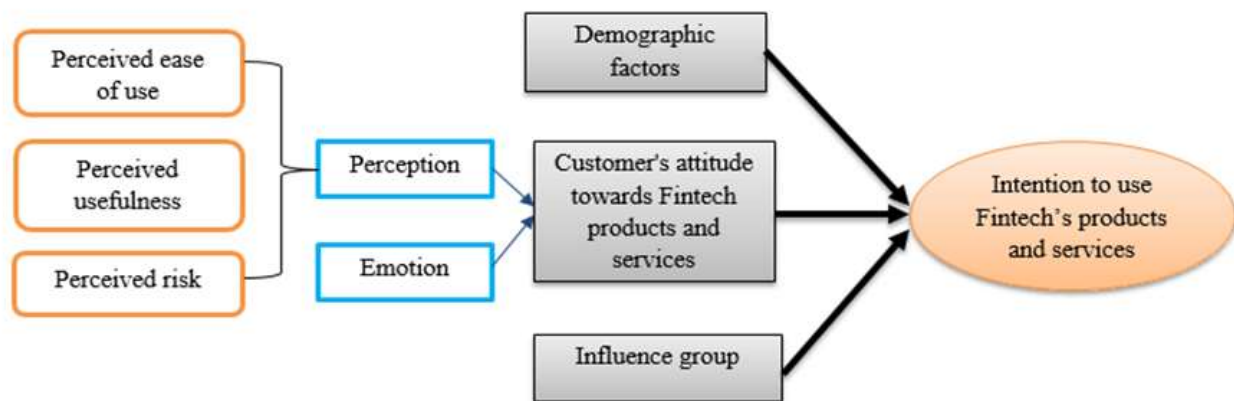


Figure 5. Proposed research model

Hypothesis of the research model:

- H1: Perceived ease of use (PEU) has a significant positive effect on users' attitudes towards Fintech's products and services, thereby positively affecting the intention to use Fintech's products and services.
- H2: Perceived usefulness (PU) has a significant positive effect on users' attitudes toward Fintech's products and services, thereby positively affecting the intention to use Fintech's products and services.
- H3: Perceived risk (PR) has a significant negative effect on users' attitudes towards Fintech's products and services, thereby negatively affecting the intention to use Fintech's products and services.
- H4: Emotions (E) have a significant positive effect on users' attitudes towards Fintech's products and services, thereby positively affecting the intention to use Fintech's products and services.
- H5: The influence group (IG) has a significant positive effect on the intention to use Fintech's products and services.

4. Results and discussion

4.1. Results

The survey: "The attitude of young users in Vietnam towards Fintech products and services" was conducted online through Google Form from 30/6/2021 to 7/7/2021 and received 187 observations with 179 valid observations. In 179 valid answers, up to 150 respondents said they know and use Fintech products and services, 10 observers replied that they know but don't use and 19 respondents answered that they don't know anything about Fintech products and services. The figure below shows the demographic description of respondents who know and use Fintech products and services:

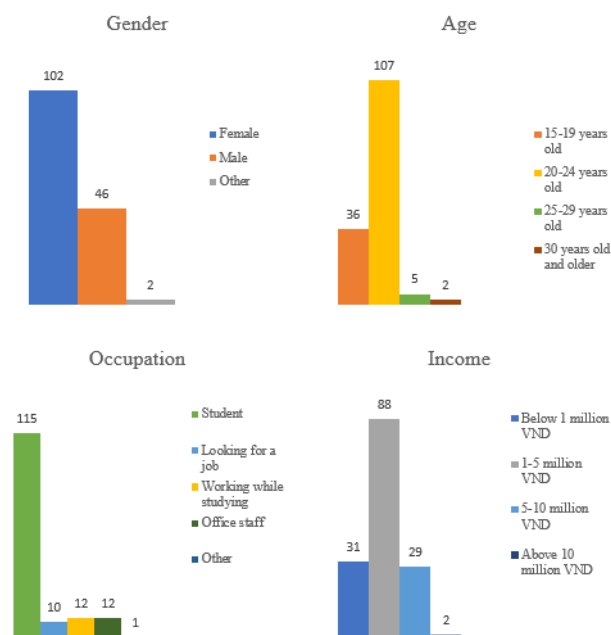


Figure 6. Description of the sample of respondents who know and use Fintech products and services

Source: SPSS processing result

Regarding the reasons why consumers know but do not use Fintech products and services, 60% of the respondents said that they worry that their use may lead to the potential risks of losing money, revealing financial information, and leaking personal information.

According to the results from the observations, the group of people who know but do not use Fintech products and services is mostly students with an income of less than 1 million VND. In our research, we provide examples and information about Fintech products and services for answers that have never been known to Fintech before. Based on these data, 73.68% of respondents will accept to use Fintech products and services if they receive introductions about using Fintech products and services from family, relatives, friends... or due to job requirements.

From the theory of the study, we set up a regression model consisting of 5 independent variables perceived ease of use (PEU), perceived usefulness (PU), perceived risk (PR), emotions (E), and the influence group (IG) along with the main dependent variable is the intention to use Fintech products and services (YD).

Our survey was conducted with many level-rating questions with a Likert scale of 5, with 1 being considered completely disagree to 5 being completely agree. Correspondingly, we divided this scale into three levels from 1 to 2.5: low rating; 2.5 -3.5 is average rating and 3.5 - 5 is a high rating. After statistics on each scale, the average value of each item is drawn, then continue to compare and evaluate. The results obtained from the survey data are as follows: except for PR and IG having the average value of the criteria in the test ranges at the above-neutral level of agreement, the other groups all have the average value of the criteria in the test ranges at the high degree of appreciation. PR has the lowest average index comparing other factors so it demonstrates that users appreciate the perception of the risk of property loss and the lack of a legal system to ensure the safety of users of Fintech products and services. This is also one of the most notable issues regarding the difficulties and limitations in the development of Fintech in Vietnam today.²

With the collected data and data filtering, the paper uses the SPSS method for regression analysis and removes the Perceived risk (PR) variable because there is no correlation with other data.³ The regression

² Appendix B.1. Results of the scale describes the variable group.

³ Appendix B.2. Results of correlation analysis between intention and independent factors.

equation representing the relationship between the factors and the user's intention to use Fintech has the following form:

$$YD = b_0 + b_1PEU + b_2PU + b_3E + b_4IG$$

The results of the regression analysis are shown in the following tables:

Table 1. Model Summary.

| Model Summary ^b | | | | | | |
|----------------------------|-------------------|----------|-------------------|----------------------------|-------------------|---------------|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | Durbin-Watson |
| | | | | | R Square Change | |
| 1 | .868 ^a | .753 | .746 | .50368006 | .753 | 1.907 |

a. Predictors: (Constant), IG, E, PEU, PU

b. Dependent Variable: YD

Source: SPSS processing result

In table 1, the coefficients $R^2 = 0.753$ and adjusted $R^2 = 0.746$, which means 74.6% of the user's intention to use Fintech is affected by 4 factors in the model, the rest are out-of-model variables and random error.

The Durbin-Watson value = 1.907 leads to the conclusion that the serial correlation phenomenon does not occur in the model (between 1.6 - 2.6 according to Hoang Trong and Chu Nguyen Mong Ngoc, 2008).

Table 2. Analysis of ANOVA.

| ANOVA ^a | | | | | | |
|--------------------|------------|----------------|-----|-------------|---------|-------------------|
| Model | | Sum of Squares | Df | Mean Square | F | Sig. |
| 1 | Regression | 112.214 | 4 | 28.054 | 110.581 | .000 ^b |
| | Residual | 36.786 | 145 | .254 | | |
| | Total | 149.000 | 149 | | | |

a. Dependent Variable: YD

b. Predictors: (Constant), IG, E, PEU, PU

Source: SPSS processing result

According to the above table, the Sig value of the F-test is equal to $0.000 < 0.05$, so the independent variables in the model can explain the variation of the dependent variable, which means the regression model exists and can apply to the collective.

Table 3. Multicollinear Measurement.

Coefficients^a

| Model | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Collinearity Statistics | |
|------------|-----------------------------|------------|---------------------------|--------|------|-------------------------|-------|
| | B | Std. Error | Beta | | | Tolerance | VIF |
| (Constant) | -.493 | .242 | | -2.035 | .044 | | |
| 1 PEU | .370 | .041 | .370 | 8.940 | .000 | .993 | 1.007 |
| PU | .129 | .063 | .086 | 2.065 | .041 | .989 | 1.011 |
| E | .628 | .041 | .628 | 15.193 | .000 | .998 | 1.002 |
| IG | .467 | .041 | .467 | 11.314 | .000 | .999 | 1.001 |

Source: SPSS processing result

The sig t-test of the regression coefficient of all independent variables is less than 0.05, leading to the conclusion that no independent variables are excluded from the model because they are all significant for the dependent variable YD.

In addition, the VIF coefficient of the independent variables is all less than 2. This model does not have multicollinearity.

The regression coefficients of the independent variables are all greater than 0. Therefore, all the independent variables included in the regression analysis have a positive effect on the dependent variable. Based on the size of the standardized regression coefficient Beta, the level of the impact from the strongest to the weakest of the independent variables on the dependent variable YD is arranged as follows: E (0.628) > IG (0.467) > PEU (0.370) > PU (0.086)

With the above results, the model has explained 74.6% of consumers' intention to use Fintech in Vietnam with four factors: emotion (E), influence group (IG), perceived ease of use (PEU), and ultimately perceived usefulness (PU). The regression model has form:

➤ Unstandardized regression model

$$YD = -0.493 + 0.370PEU + 0.129PU + 0.628E + 0.467IG$$

➤ Standardized regression model

$$YD = 0.370PEU + 0.086PU + 0.628E + 0.467IG$$

4.2. Discussion

It can be seen that, with its strong development, Fintech is considered to become an indispensable element of life in the future. The study was carried out with the desire to find out the attitudes of young consumers in Vietnam regarding Fintech products and services in June and July 2021 when Vietnam was facing a difficult situation with the spreading Covid-19 epidemic and the increasing demand for contactless transactions. With results found from 150 valid samples of people who know and use Fintech products and services, the paper proves that E, IG, PEU, and PU have a positive relationship with young consumers' attitudes about Fintech products. In that, the emotion factor has the strongest impact (0.628) which implies that the higher the consumers' love, satisfaction, and trust, the higher the tendency to use Fintech products and services. Two factors that have medium impacts are influence group and perceived ease of use (as shown in unstandardized regression model). Finally, the factor with the weakest impact is perceived usefulness (as shown in table 3). The results also explain 74.6% of consumers' intention to use Fintech in Vietnam, the rest are factors outside the model that have not been found. In the beginning of this research, we found that users highly appreciate the perceived ease of use and perceived usefulness with the ratings in the order of perceived ease of use, perceived usefulness, emotion and influence group; but the results from correlation and regression reversed that. More specifically, in this research, we discovered two new factors are emotion and influence group. Cham Tat Huei et al. (2018), and Tran Thi Ha Trang (2019) didn't mention these factors. But in this research, these factors are pointed out to play an important role in human usage behavior

decisions. One possible reason is that humans don't always follow the principle of rational decision-making. It means even if consumers don't know how to get information about Fintech applications, they use those products only through recommendations from friends, relatives, etc. Besides, under the "try it out" movement, they can build themselves awareness through the process of use and the most special thing that can hold them back is emotion - their love or trust. In addition, young users account for more than 90% of our research sample. Hence, it may be one of the reasons why these two factors are highlighted, but this result does not eliminate the role of perceived ease of use and perceived usefulness which are components that affect emotion in order to constitute attitudes of users towards Fintech products and services.

According to the research results, emotion is the most important factor, playing a decisive role in influencing the intention to use Fintech. Therefore, organizations providing Fintech services need to concentrate on promoting positive emotions, and simultaneously, preventing and limiting negative emotions of users through the implementation of communication and advertising campaigns. These strategies contribute to improving customer experience, thereby increasing awareness and stimulating interest when using the service. Besides that, the influence group factor also has a significant impact on users' intention to use Fintech. It refers to the external factors affecting customers including the nature of work, the mass media, the people around... Nowadays, first of all, it is necessary to have a suitable marketing strategy such as increasing advertising about the benefits of using Fintech on social networking sites, Facebook, and promoting preferential policies when using these services to influence users' awareness. Regarding the applications, they should have detailed and instructed particularly for each operation about the way to perform transactions correctly through many methods such as text or video. Finally, although usefulness has the weakest effect on the intention to use, it is still highly valued. Therefore, suppliers have to pay attention to this factor to attract potential customers by improving the quality and diverging the types of services to save time and costs compared to traditional services, because consumers will trust long-term use if they see the real benefits of these applications.

This study still has many limitations that need to be improved. Firstly, because of the complicated situation of the epidemic and limited implementation time, we are only able to carry out quantitative research with a relatively small number of observations (150 observations) using the convenient sampling method to ensure the ease of access and convenience for surveyors. Then, it influences the accuracy, simultaneously the representativeness and the generalizability of the sample research. Secondly, our results are affected by the lack of uniformity in the research target population including both users and non-users. At last, the results have just explained 74.6% of the research needed. It proves that there are still a few factors affecting the intention to use Fintech products and services of young consumers in Vietnam that have not been discovered yet. From these shortcomings, in order to develop better future research papers, the future survey should be conducted on a larger scale to enhance the representativeness of the study.

5. Conclusion

From the research results, we identified four groups of factors affecting the intention to use Fintech of consumers and sorted by the degree of influence respectively: emotion, influence group, perceived ease of use, and ultimately perceived usefulness. The emotion factor has the strongest impact. It means that the higher the consumers' love, satisfaction, and trust, the higher the tendency to use Fintech products and services. The factors that are influence group and perceived ease of use have medium impacts. Finally, the factor with the weakest impact is perceived usefulness. In addition, demographic factors – gender has different effects between groups on the intention to use Fintech products and services. These four groups have explained 74.6% of consumers' intention to use Fintech in Vietnam, the rest are factors outside the model that have not been found. After all (combined with the above regression analysis results), we also conclude that: young users in Vietnam are having positive attitudes toward Fintech products and services.

6. Appendix

Appendix A. Questionnaire survey

Through an online survey on Google Form, mainly focusing on young users who have the ability and opportunity to easily access digital technology in general and Fintech products and services in particular, our team received 187 responses. And here is the link to our group survey:

<https://forms.gle/ExqjouPmq9VsyX7Q8>

Appendix B. SPSS results

B.1. Results of the scale describes the variable group

| | N | Mean |
|------|-----|--------|
| PEU1 | 150 | 4.1333 |
| PEU2 | 150 | 3.9533 |
| PEU3 | 150 | 4.0400 |
| PEU4 | 150 | 4.1067 |
| PU1 | 150 | 4.0200 |
| PU2 | 150 | 3.8600 |
| PU3 | 150 | 3.9600 |
| PU4 | 150 | 3.6467 |
| PR1 | 150 | 3.3667 |
| PR2 | 150 | 3.2733 |
| PR3 | 150 | 3.5267 |
| PR4 | 150 | 3.6800 |
| E1 | 150 | 3.9067 |
| E2 | 150 | 3.9467 |
| E3 | 150 | 3.6000 |
| IG1 | 150 | 3.4667 |
| IG2 | 150 | 3.6267 |
| IG3 | 150 | 3.5000 |
| IG4 | 150 | 3.7000 |

Source: SPSS processing result

B.2. Results of correlation analysis between intention and independent factors

| | | PEU | PU | PR | E | IG | YD |
|----|---------------------|------|------|------|------|------|-----|
| YD | Pearson Correlation | .226 | .198 | .133 | .432 | .301 | 1 |
| | Sig. (2-tailed) | .005 | .015 | .105 | .000 | .000 | |
| | N | 150 | 150 | 150 | 150 | 150 | 150 |

Source: SPSS processing result

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THE IMPACT OF ELECTRONIC WORD OF MOUTH (EWOM) ON THE PURCHASE INTENTION OF NORTHERN VIETNAMESE YOUTH ON E-COMMERCE PLATFORMS

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ABSTRACT

This article's main purpose is to examine the impact of electronic word-of-mouth (eWOM) on young consumers' purchasing intention on e-commerce platforms in Northern Vietnam. For this purpose, a conceptual model was developed based on integrating the Information Adoption Model (IAM), and Theory of Planned Behavior (TPB). The survey was conducted by online questionnaires completed by 357 respondents comprising users of Facebook and Email. Collected data were analyzed by the reliability of test scores (Cronbach's Alpha), exploratory factor analysis (EFA), confirmatory factor analysis (CFA), and model testing structural equation modeling (SEM). The study measures the influence of eWOM on purchasing decisions in the Covid-19 situation through 8 factors: eWOM Quality (QL), eWOM Credibility (CR), eWOM Adoption (AD), Attitudes (AT), Subjective Norms (SN), Perceived Behavioral Control (PC), Covid-19 (CV), Purchase Intention (PI) based on support from statistical and data processing software (Excel, SPSS 20 and AMOS 24). Finally, solutions for consumers and businesses on the eWOM development on e-commerce platforms in Vietnam are also discussed.

Keywords: electronic word-of-mouth (eWOM), e-commerce platforms, Information Adoption Model (IAM), Theory of Planned Behavior (TPB), purchase intention.

1. Introduction

In the context of the COVID-19 pandemic causing many fluctuations to the economy, e-commerce still has a breakthrough growth. Along with that, the development of the 4.0 digital age has created new ways for consumers to share their experiences through electronic word of mouth (eWOM) during their participation in business activities and trading on e-commerce platforms (Pham Duc Chinh, Ngo Thi Dung, 2020).

Electronic word of mouth is an important source of information for consumers. EWOM is realized to be more persuasive and trustworthy than advertising in society today (Md. Khalilur Rahman Khan, 2021). The majority of Vietnamese people tend to believe in the opinions of consumers posted online (Nielsen, 2013). When the electronic word-of-mouth references on social networks are accepted and applied by users, they will have a higher purchase intention, even recommending products/services to other friends (Le Minh Chi, Le Tan Nghiem, 2018). The impact of eWOM on consumer purchase intention on e-commerce platforms during the COVID-19 pandemic was evaluated by several researchers (Pham Kieu Van, 2020; Wannalak Sosanuy, 2021). However, there is not much research on this topic in Vietnam. Realizing the timeliness of the topic, the authors decided to choose and conduct research on the topic "The impact of electronic word of mouth (eWOM) on young consumers' purchasing intention on e-commerce platforms in Northern Vietnam". The study was conducted to find out the impact of eWOM, the degree of influence of factors of eWOM on the adoption of eWOM, and purchase intention, especially emphasizing the effect of the Covid 19 pandemic on purchasing intent, when e-commerce had developed extremely strongly.

To achieve the above goal, a conceptual model was developed based on integrating the Information Adoption Model (IAM) and Theory of Planned Behavior (TPB). The research results aim to contribute to

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further understanding of eWOM and provide scientific evidence necessary to help businesses, consumers, and state management agencies use eWOM when participating in trading activities on e-commerce platforms.

2. Theoretical framework

2.1. eWOM in e-commerce platforms

Consumers nowadays have numerous options for obtaining brand-related information, products, and services. However, as the quantity of adverts grows, the amount of information they receive grows, making it more difficult to make a purchasing decision. As a result, word of mouth (WOM) is regarded as one of the most valuable sources of information for consumers, as it contains views and previous customer experiences about brands, products, and services. One of the most accepted definitions given by Arndt (1967), which has defined WOM as follows: “Direct communication, from one individual to another, between individuals is considered “non-commercial” about a commercial brand, product or service”. The digital technology revolution 4.0 and the advent of mobile devices (phones, personal computers, tablets...) have made the reception of daily information more and more convenient, as they allow people to access the Internet from anywhere and at any time. Therefore, consumers have additional options for gathering information about the items and services they want to buy, including eWOM. According to Hennig-Thurau (2004), eWOM is all positive or negative affirmations made by both past, current, and potential customers about a product or a company. In other words, eWOM is all information that is commented on and evaluated positively or negatively by existing or former customers related to specific products, goods, and services based on mobile devices, the internet... with global connectivity. Thus, eWOM in this study can be understood as customer comments and feedback about products on e-commerce platforms.

WOM in general and eWOM, in particular, has grown strongly in developed countries over the past decade. According to Nielsen's Global Trust in Advertising and Brand Messaging (2012), 92% of consumers trust WOM from people they know. This means that when a person sees a friend or family member getting excited about a particular brand, they are more likely to buy. In Vietnam, according to Q&Me's 2018 Media Effectiveness Measurement Report, friends and family are the most often used and accessed information sources, followed by social networks. This result partly shows the high level of eWOM acceptance in Vietnam. Similarly, in the report on Vietnam's Media Popularity and Reliability in 2021, Q&Me also said that Vietnam is a country with a developed WOM industry. Vietnamese obtain information from diverse sources and tend to continue to spread that information to their surrounding relationships. These days, consumers will no longer rely solely on information generated by marketers. Instead, they search reviews on websites, check customer testimonials on e-commerce sites or platforms, see other people's recommendations, and so on. In other words, they look for eWOM information. EWOM is a thriving market factor because consumers perceive it as an unbiased and reliable source of product information (Kristine De Valck, 2020). Accordingly, information in the form of user comments, ratings, reviews, testimonial videos, or other consumer-generated content (referred to as eWOM) is “one of the most important developments” in the study of consumer behavior. At the same time, Kristine De Valck also emphasized: “eWOM has become popular and accessible, turning consumers into decision-makers thanks to the support of websites”.

2.2. Theoretical background of the research model

This research develops a theoretical model to find the determinants of eWOM information on e-commerce platforms affecting consumers' purchase intentions. To achieve this, the IAM (Sussman & Siegal, 2003) was expanded with relevant factors of TPB (Ajzen, 1991).

2.2.1. Information Acceptance Model (IAM)

EWOM usually contains basic information that is transmitted between senders and receivers (Bansal and Voyer, 2000). However, the impact of information can be changed when it is transmitted from one person to another. The same content may be received differently and lead to different conceptions and ideas between people receiving information (Cheung et al., 2008). The results of the review of previous research

topics show that many scholars have applied the Theory of Reasoned Action (TRA) and the Technology Acceptance Model (TAM) to solve the problem. However, Sussman and Siegal (2003) studied this topic further, considering eWOM in a dual theoretical model named the Information Acceptance Model (IAM).

IAM includes four variables: Argument Quality, Source Credibility, Information Usefulness, and Information Adoption. IAM is highly appreciated by many scholars when applied in eWOM studies. Specifically, Cheung et al. (2008) applied IAM when researching online discussion forum sites. IAM was also reviewed by Shu and Scott (2014) in social media research. Although evaluated as a common variable model, it is still suggested that this model only focuses on considering the quality of information. Erkan and Evan (2016) reckoned that the image of information is limited by not only the special features of information but also customer behavior towards information. Therefore, the Theory of Planned Behavior (TPB) should also be invoked to explain other factors related to behavior.

2.2.2. Theory of Planned Behavior (TPB)

The Theory of Planned Behavior (TPB) is developed from the Theory of Rational Behavior (TRA). The Theory of Reasoned Action shows that intention is influenced by attitudes and subjective norms (Fishbein and Ajzen, 1975). This theory is often used when researching the relationship between eWOM and purchase intention. In particular, the Subjective Norms factor is a concept involving how individuals perceive those around them when they perform a behavior (Fishbein and Ajzen, 1975). Several survey reports by market research companies have shown some differences in consumer sentiment in the North and South of Vietnam. According to research: HCM and HN: Differences of consumers in the two regions (Nielsen, 2009), the main difference between the two regions lies in the orientation of "I" and "We". In the North, the "We" tendency is the majority, showing the homogeneity in consumption patterns and the habit of collecting opinions from many sources in the decision-making process. Therefore, the authors decided to include the variable "Subjective Norms" because the object of this study is young people in the North.

However, the limitation of TRA model is assuming that human behavior completely results from rational control. Hence, Ajzen (1991) decided to consider adding the Perceived Behavioral Control factor. This factor reflects how easy it is to perform only the behavior and whether the performance of such behavior is within the control of the individual. Therefore, this model is considered more optimal than TRA with three variables: Attitudes, Subjective Norms, and Perceived Behavioral Control.

2.3. Hypothesis development

This study argues that the impact of eWOM information on consumers' purchase intentions on e-commerce platforms is not only influenced by the characteristics of eWOM information but is also dominated by factors related to consumer behavior. Therefore, the introduced model in this study was a combination of the Information Adoption Model (IAM) (Sussman and Siegal, 2003) and the Theory of Planned Behavior (TPB) (Ajzen, 1991). In particular, the characteristics of eWOM information are explained through the IAM model, while the relevant components of TPB are used to show consumer behavior towards eWOM information. Besides, this model also adds a Covid-19 variable to consider the direct impact of the pandemic on shopping intentions on e-commerce platforms. With this research model, the team expects to evaluate the following variables: eWOM Quality, eWOM Credibility, eWOM Adoption, Attitudes, Subjective Norms, Perceived Behavioral Control, Covid-19, and Purchase Intention.

EWOM Quality: eWOM quality can be defined as the convincing power of comments attached to a message (Ratchford et al., 2001). The value, clarity, and ease of understanding of information will impact the appraisal of eWOM quality as well as purchasing intentions (Cheung, 2008). If it is assumed that comment or reviews in the online community are valuable, consumers will believe and accept eWOM information (Sussman & Siegal, 2003) and then intends to make higher purchases (Lee & Koo, 2015). Previous research has found that when customers place a high value on eWOM quality, eWOM adoption rises (Cheung et al., 2009; Lin & Lu, 2000).

H1: eWOM Quality has a positive and significant effect on the adoption of eWOM information

EWOM Credibility: eWOM credibility refers to the extent to which one perceives a source's recommendation, whether it be a person or an organization, as credible (Fogg et al., 2002). The receiver's assessment of the information's credibility is a critical component in the early stages of the information persuasion process (Wathen & Burkell, 2002). If customers perceive reviews and comments about the product as a reliable source, they will use them to make their purchasing decisions (Abdallah, 2015). Customers regard interpersonal communication about products and services as a more trustworthy source of information than content created by marketers (Mangold & Faulds, 2009). The more consistent messages there are, the higher the reliability of the information and its ability to accept it and vice versa (Wathen and Burkell, 2002).

H2: eWOM Credibility has a positive and significant effect on the adoption of eWOM information

Purchase Intention: One of the most common outcome variables of eWOM communication is purchase intent (Lee and Lee, 2009). In this study, the purchasing intention can simply be understood as the desire of consumers to buy products on e-commerce platforms through eWOM. According to the TPB model (Ajzen, 1991), three factors influencing purchase intention are (1) attitude toward behavior, (2) subjective norm, and (3) perceived behavioral control. The purchasing intent factor represents the perceived aspect of the willingness to perform the behavior and is the most accurate tool for forecasting actual purchasing behavior (Kalwani and Silk, 1982). The factors affecting consumers' purchasing intentions are divided into two levels: direct impact and indirect impact (Pham Van Tuan, 2020). The research in this direction will help to carry out research more scientifically and clearly while considering many aspects affecting the intention to buy on e-commerce platforms.

EWOM Adoption: eWOM adoption is a psychological action that impacts online consumers through social norms or reviews and comments in an online environment (Fan et al., 2012). In this study, eWOM adoption is the acceptance of using the information provided by prior online shoppers as a reference when making purchasing decisions. Information adoption is one of the main activities users seek to perform in a virtual community (Cheung et al., 2008). Customers with high levels of eWOM information application are also more likely to make purchases (Erkan and Evans, 2016). Many studies, such as Fan et al. (2012), Erkan and Evans (2016)... show that eWOM adoption has a direct impact on consumer purchase intentions.

H3: eWOM Adoption has a positive and significant effect on the purchase intention

Attitudes: Attitudes are generally a constant appreciation of people, objects, and goods. In this study, attitude is an individual's assessment of the over-resulting outcome obtained from performing a behavior (Ajzen, 1991). Attitudes will be determined by beliefs combined with personal judgments of results when performing a behavior. According to the TPB model (Ajzen, 1991), attitudes directly affect consumers' purchasing intentions. Besides, eWOM is also acknowledged to play a significant role in influencing and shaping consumer attitudes and behavioral intentions (Chatterjee, 2001). Thus, through attitudes, the adoption of eWOM has indirectly impacted consumers' purchase intentions.

H4: eWOM Adoption has a positive and significant effect on Attitudes

H5: Attitudes have a positive and significant effect on the purchase intention

Subjective Norms: Ajzen (1991) defines subjective norms, also known as social influence, as an individual's perception of people who are important to them and who think they should engage in such behavior. EWOM has an important role and strong influence on subjective norms (Mohammad et al., 2012). Meanwhile, in the TPB model, customers' online purchasing intentions are influenced directly by subjective norms. In particular, subjective norms are a factor that has a specific influence on a country with a community culture such as Vietnam (Hansen et al., 2004).

H6: eWOM Adoption has a positive and significant effect on Subjective Norms

H7: Subjective Norms have a positive and significant effect on the purchase intention

Perceived Behavioral Control: Ajzen (1991) argues that perceived behavioral control is an individual's perception of the difficulty or ease of performing a behavior. In the TPB model, the emergence of the perceived behavioral control factor has overcome the disadvantages and optimized the TRA model

(Werner, 2004). Ajzen (1991) indicates that perceived behavioral control is based not only on the individual experiences but also on the expected future results. EWOM affects the perceived behavioral control of consumers (Palka et al., 2009) and thus indirectly impacts purchase intention (Pham Van Tuan, 2020).

H8: eWOM Adoption has a positive and significant effect on Perceived Behavioral Control

H9: Perceived Behavioral Control has a positive and significant effect on the purchase intention

Covid-19: The Prime Minister of Vietnam issued social distancing directives (Directive 15, Directive 16, Directive 19) for preventing and controlling the Covid-19 virus. People gradually become aware of the need to stay indoors instead of going out and minimize social interactions (Baker et al., 2020). In particular, when the pandemic explodes and spreads hard to control outside society, traditional shopping activities become chaotic. Because of this, online shopping becomes an optimal option, making it possible for customers to maintain shopping while ensuring to minimize the risk of spreading viruses in the community (Forster & Tang, 2005). Many previous studies indicate that the Covid-19 epidemic has a significant and positive effect on promoting online purchase intentions (Nguyen Viet Hoang et al., 2020; Husain Tariki, 2022).

H10: Covid-19 has a positive and significant effect on the purchase intention

2.4. Research model

Based on the above analyses and hypotheses, the proposed research model is shown as follows:

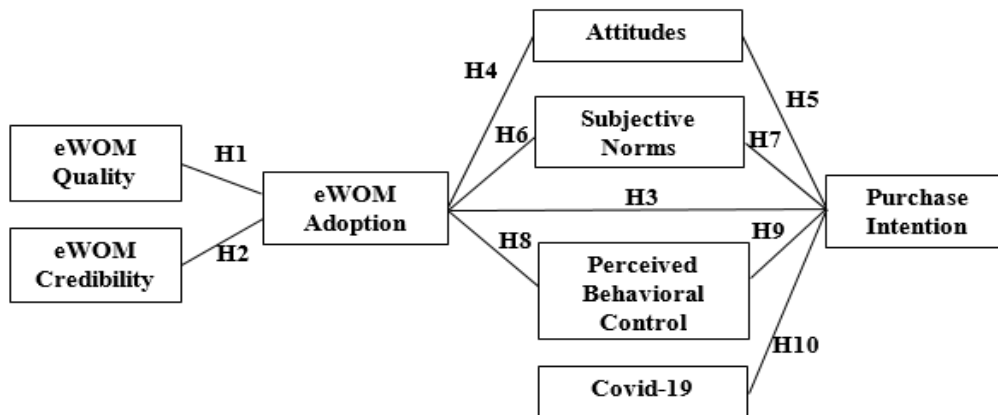


Figure 1: Proposed research model

Source: Synthesized by the authors

3. Research method

3.1. Sampling

This survey subjects were Northern Vietnamese youth aged 18 - 25. This study used Snowball sampling methods and Convenient sampling methods to save time and cost. Hair et al. (2014) and Gorsuch (1983) proposed that the minimum sample size for conducting a factor analysis should be at least five times the number of variables analyzed and if the ratio was raised to 10:1, the better. Therefore, with this research model consisting of 8 factors and 29 observational variables, the minimum sample size that the group needed to collect was 290. After adjusting the scales and questionnaires, the group collected official data, collecting 357 responses, of which the number of valid responses was 324. So in about two weeks of the survey (from April 6 to April 21, 2022), 324 valid responses were collected, achieving an effective response rate of 90.76%.

3.2. Measurements

All scales used for the research variable in the model are designed in the form of a Likert scale with five levels ranging from (1) totally disagree to (5) totally agree. The scale consists of a set of reference questions developed from previously published studies to boost the reliability and value of the scale. Specifically, the scale of "eWOM Quality" and "Attitudes" is based on the study of Park et al. (2007). The

"eWOM Credibility" scale is based on Le Minh Chi and Le Tan Nghiễm's research (2018). "eWOM Adoption" is developed on the Cheung et al. study's scale (2009). "Subjective Norms" is evolved from the scale of Fishbein and Ajzen (1975). The scale of "Perceived Behavioral Control" is rooted in Dao Thi Thu Huong's study (2017), while "Covid" is based on Nguyen Viet Hoang et al. (2020). The dependent variable "purchase intention" is adapted on the scale of Le Minh Chi and Le Tan Nghiễm (2018).

4. Results and discussion

4.1. Results

4.1.1. Factor analysis and reliability

Cronbach's Alpha was used to confirm the reliability of construct. According to Nunnally and Bernstein (1994), it is necessary to remove the items which have Corrected Item-total correlation coefficient of less than 0.3. Besides, Hair et al. (1998) showed that each factor, must have Cronbach's Alpha values of 0.6 and over to be considered acceptable. Using Software SPSS.20, the results of Cronbach's Alpha show that the 3 items CR3, AT4, and PI3 should be excluded because their Corrected Item-total correlation coefficient is less than 0.3. After removing them, all Cronbach's alpha values of the constructs exceeded Nunnally's benchmark (≥ 0.6), and all Corrected Item-total correlation coefficient of remaining items is more than 0.3. Results of Cronbach's α reliability analysis with the remaining items are shown in Table 1.

Table 1. Results of Cronbach's α reliability analysis with the remaining items.

| Factor | Excluded item | Numbers of remaining items | Cronbach's Alpha | Min of Corrected Item-total correlation coefficient (Item) |
|--------|---------------|----------------------------|------------------|------------------------------------------------------------|
| QL | - | 5 | 0.854 | 0.485 (QL2) |
| CR | CR3 | 3 | 0.819 | 0.647 (CR4) |
| AD | - | 3 | 0.829 | 0.647 (AD1) |
| AT | AT4 | 3 | 0.842 | 0.656 (AT2) |
| SN | - | 4 | 0.883 | 0.715 (SN2) |
| PC | - | 2 | 0.643 | 0.479 (PC1. PC2) |
| CV | - | 3 | 0.747 | 0.522 (CV2) |
| PI | PI3 | 3 | 0.750 | 0.575 (PI4) |

Source: Synthesized by the authors in SPSS 20

The remaining model includes 26 variables, 23 independent variables, and 3 dependent variables used in the EFA model. According to Anderson and Gerbing (1988), we use the Exploratory Factor Analysis (EFA) model for scale validation with Principal Axis Factoring, Promax rotation and Factor loading coefficients = 0.500 for scale validation. The KMO value has to be greater than 0.500 to be regarded as appropriate, Bartlett's Test of Sphericity is significant at $\text{sig} < 0.050$, and factors that have eigenvalue < 1.000 should be deleted. The result from SPSS 20 shows that QL2 should be excluded due to factor loading coefficients less than 0,500. We have the resultant KMO coefficient > 0.500 ; Bartlett's Test of Sphericity has a significance level of $0.000 < 0.050$, all remaining factor loading coefficients are greater than 0.500 (after the elimination of QL2) and 8 factors were achieved with eigenvalues from 1.078 to 6.418, which show that the data is perfectly relevant. The result of EFA is shown in Table 2.

Table 2. Result of Exploratory Factor Analysis (EFA).

| Factor | Pattern Matrix | | | | | | | | Eigenvalue | |
|--------------------------------------------------------|----------------|------|------|------|------|------|------|------|--------------------|----------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | | |
| SN4 | .853 | | | | | | | | 6.418 | |
| SN3 | .822 | | | | | | | | | |
| SN1 | .785 | | | | | | | | | |
| SN2 | .743 | | | | | | | | | |
| QL4 | | .852 | | | | | | | 2.402 | |
| QL3 | | .806 | | | | | | | | |
| QL1 | | .745 | | | | | | | | |
| QL5 | | .722 | | | | | | | | |
| CR2 | | | .922 | | | | | | 2.131 | |
| CR1 | | | .731 | | | | | | | |
| CR4 | | | .708 | | | | | | | |
| AT1 | | | | .847 | | | | | 1.941 | |
| AT3 | | | | .837 | | | | | | |
| AT2 | | | | .731 | | | | | | |
| AD2 | | | | | .852 | | | | 1.626 | |
| AD3 | | | | | .839 | | | | | |
| AD1 | | | | | .625 | | | | | |
| CV1 | | | | | | .934 | | | 1.504 | |
| CV2 | | | | | | .605 | | | | |
| CV3 | | | | | | .587 | | | | |
| PI2 | | | | | | | .742 | | 1.298 | |
| PI4 | | | | | | | .717 | | | |
| PI1 | | | | | | | .611 | | | |
| PC1 | | | | | | | | .763 | 1.078 | |
| PC2 | | | | | | | | .618 | | |
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy | | | | | | | | | .834 | |
| Bartlett's Test of Sphericity | | | | | | | | | Approx. Chi-Square | 3633.894 |
| | | | | | | | | | df | 300 |
| | | | | | | | | | Sig. | .000 |

Source: Synthesized by the authors in SPSS 20

4.1.2. Testing measurement model by Confirmatory Factor Analysis (CFA)

Following the EFA procedure, CFA was conducted in software AMOS 24, using Chi-square (CMIN), CMIN adjusted by degrees of freedom (CMIN/df), CFI, GFI, TLI, and RMSEA indices to verify the validity

of research constructs. The results prove that the research model is completely satisfied and suitable with market data with TLI, CFI, GFI ≥ 0.900 ; CMIN/df ≤ 3 ; RMSEA ≤ 0.08 (Bentler & Bonelt, 1980; Carmines & McIver, 1981; Steiger, 1990). The detailed results are displayed in Figure 1.

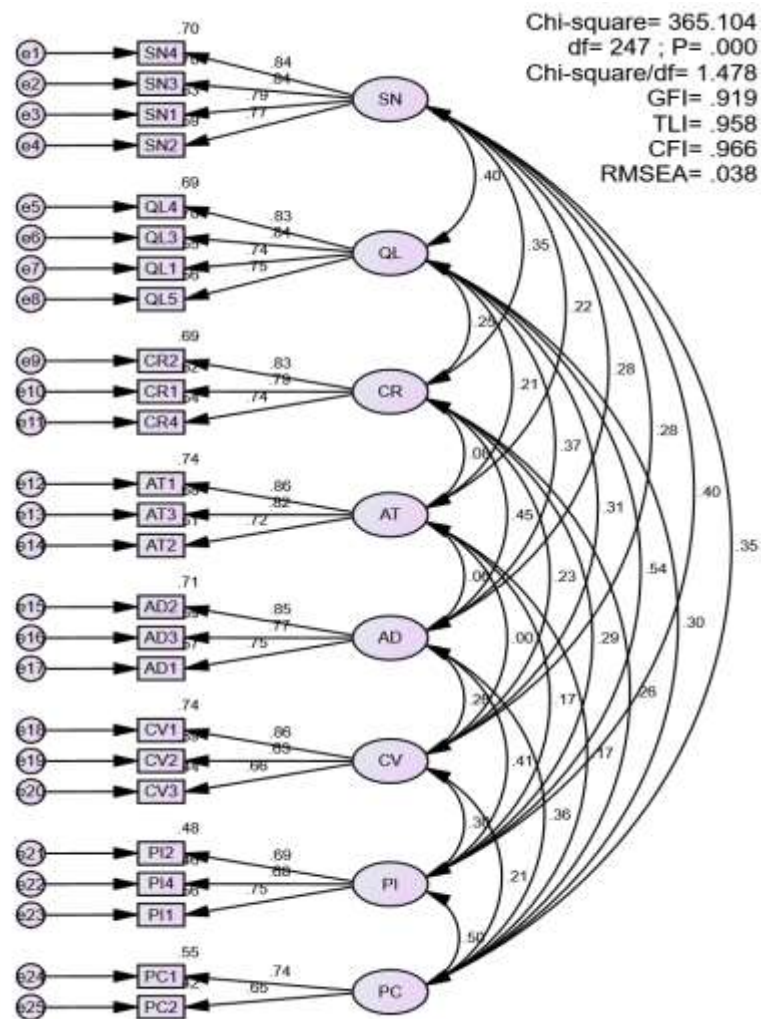


Figure 2: Results of Confirmatory Factor Analysis (CFA)

Source: Synthesized by the authors in AMOS 24

4.1.3. Results of the structural model analysis and test results of the model's hypotheses

Figure 2 and Table 3 show the results of SEM regression. With $P < 0.050$, all hypotheses are accepted except H3 and H7. These findings indicate that eWom Adoption does not have an impact on Attitudes, and Attitudes do not affect Purchase Intention.

EWOM Quality (QL) and eWOM Credibility (CR) are found to have positive impacts on eWOM Adoption (AD), with the impact coefficients β are 0.317 and 0.407 respectively, which shows that eWOM Credibility has a bigger impact on eWOM Adoption than eWOM Quality.

EWOM Adoption have direct and positive impact on Subjective Norms (SN) (with impact coefficient $\beta = 0.350$), Perceived Behavioral Control (PC) (with impact coefficient $\beta = 0.409$) and Purchase Intention (PI) (with impact coefficient $\beta = 0.222$).

Subjective Norms, Perceived Behavioral Control, Covid-19, and eWOM Adoption have a direct and positive impact on Purchase Intention. In particular, the most influential factor is Perceived Behavioral Control (with impact coefficient $\beta = 0.328$), followed by Purchase Intention (PI) (with impact coefficient $\beta = 0.222$) and Subjective Norms (with impact coefficient $\beta = 0.182$) and Covid-19 is the least influential factor (with impact coefficient $\beta = 0.163$).

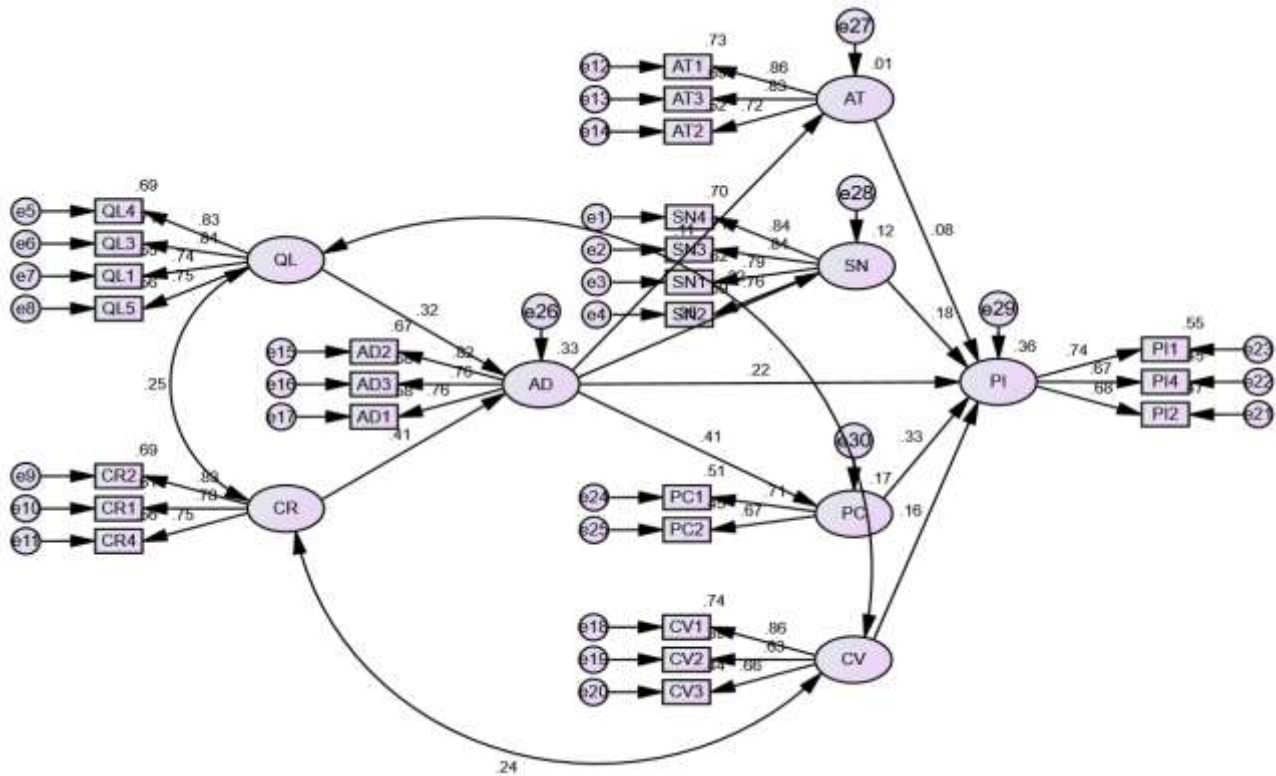


Figure 3: Results of the structural model analysis

Source: Synthesized by the authors in AMOS 24

Table 3: Coefficients of regression model SEM and test results of the model's hypotheses.

| Hypotheses | Path | Estimate | Standardized Estimate | S.E. | C.R. | P | Conclusion |
|------------|------------|----------|-----------------------|------|-------|------|------------|
| H1 | AD <--- QL | .339 | .317 | .066 | 5.157 | *** | Accept |
| H2 | AD <--- CR | .518 | .407 | .083 | 6.277 | *** | Accept |
| H4 | AT <--- AD | .119 | .106 | .073 | 1.622 | .105 | Reject |
| H6 | SN <--- AD | .390 | .350 | .072 | 5.438 | *** | Accept |
| H8 | PC <--- AD | .354 | .409 | .070 | 5.092 | *** | Accept |
| H3 | PI <--- AD | .171 | .222 | .063 | 2.710 | .007 | Accept |
| H5 | PI <--- AT | .053 | .077 | .043 | 1.234 | .217 | Reject |
| H7 | PI <--- SN | .126 | .182 | .046 | 2.720 | .007 | Accept |
| H9 | PI <--- PC | .292 | .328 | .082 | 3.555 | *** | Accept |
| H10 | PI <--- CV | .122 | .163 | .050 | 2.459 | .014 | Accept |

Source: Synthesized by the authors in AMOS 24

In which, SE: Standard error; CR: Critical value; P: Probability value; ***: $p < 0.001$.

4.2. Discussion

Many scholars have evaluated the impact of eWOM on various aspects. However, the number of studies on the impact of eWOM on purchase intentions on e-commerce platforms is still limited. This research has helped close the research gap on eWOM to purchasing intent on e-commerce platforms in Vietnam. The results of the research model have shown that eWOM quality and eWOM credibility have a

significant effect on eWOM adoption. The more complete, clear, relevant, and consistent the information provided, the easier it will be for buyers to use it as a reliable reference source when making purchasing decisions. Meanwhile, eWOM adoption has a positive relationship with consumer buying intentions. Referencing information about the product, whether positive or negative, will also affect the intent to make a purchase.

The research model results also have shown that eWOM adoption has a positive and direct impact on subjective norms and perceived behavioral control; at the same time, through those factors, it also has a strong influence on purchase intentions on e-commerce platforms. When consumers consider eWOM as a useful reference source, they will expect a positive and supportive view from those around them about their eWOM reference action, which leads to increased subjective norms. At the same time, perceived behavioral control also increases. When consumers become aware that their eWOM reference is valuable, they will increase their sense of their actions and be more proactive in finding information. Finally, subjective norms and perceived behavioral control have a positive impact on purchasing intentions. The support of those around and being able to afford to buy will boost consumers' desire to buy.

However, the correlation between eWOM adoption and attitudes and the correlation between attitudes and purchase intention are both refuted within the scope of this study. The result that Attitudes have no effect on purchase intention is consistent with previous literature (Pham Van Tuan, 2020). On the e-commerce platforms besides positive reviews, there are also negative reviews, some are even subjective or intentional. Thus, it can greatly affect the buyer's attitude towards the use of reference information sources from eWOM. In addition, with the increasing amount of reference information, comparing sources with different opinions can make buyers even more confused. Therefore, the adoption of eWOM cannot guarantee that buyers will have a positive attitude, trust completely in eWOM and then make a purchase intention, especially when the eWOM information on e-commerce sites is anonymous.

In particular, the new point of this study is pointing out the positive impact of Covid-19 on purchase intentions. The implementation of social distancing as well as supply chain disruptions due to the epidemic has made consumers more interested in the form of purchases on e-commerce platforms.

Based on the results of the research, the authors proposed solutions for two groups engaged in eWOM activities: the consumer group and the e-commerce businesses group. Consumers need to be proactive in finding information when making a purchase, evaluating reliability, and comparing sources of information to consider their consistency, so as to gain a clear awareness of the eWOM information and to make appropriate purchasing decisions. Meanwhile, e-commerce businesses should take advantage of the development and characteristics of eWOM to implement strategies to get effective marketing strategies, build a good brand image and promote their image to consumers. At the same time, businesses also need to constantly improve the quality of products and services, while listening to and addressing customer opinions reasonably. In particular, the Covid-19 pandemic has a positive impact on the intention to buy online on e-commerce platforms, which is a lever that drives e-commerce platforms to thrive, showing that e-commerce businesses need to make good use of this opportunity to develop their activities even after the pandemic has passed.

Although having achieved some results, the study still has some limitations: 1 - Research results may be limited because the number of data samples is concentrated only in Hanoi and a few large cities around Hanoi (Hai Duong, Hung Yen, Thai Binh). Follow-up studies can expand the scope by performing a combination of online and face-to-face surveys and diversifying the observed samples in other provinces in Northern Vietnam to increase the accuracy of the research. 2 - The purchase intention variable is also highly dependent on the brand image variable, which the scope of this study cannot mention. Therefore, future research could develop our research model and add the brand image variable. With the above limitations, the authors hope that follow-up studies will try to overcome the shortcomings existing in this study.

5. Conclusion

The research examines the effects of electronic word-of-mouth (eWOM) on young customers' purchasing intentions on e-commerce platforms in North Vietnam. The study presents quantitative experimental results from April 6th to April 21st, 2022, to confirm the proposed theoretical model and research hypotheses. The results of the research model have shown that eWOM Quality and eWOM Credibility have a significant effect on eWOM Adoption. Meanwhile, eWOM Adoption has a positive and direct impact on Subjective Norms and Perceived Behavioral Control; at the same time, through those factors, it also has a strong influence on purchase intentions on e-commerce platforms. Besides, the Covid-19 situation is found to have a positive influence on Purchase Intention. In the meantime, Attitudes are proven to have no direct link with Purchase Intention in the research model.

6. Appendix

Appendix A. Sample characteristics.

| Factor | Options | Percentage (%) |
|-------------------------------------------------------------------------------------------------------------------|--------------------------------------------|-----------------------|
| Gender | Female | 72.84% |
| | Male | 27.16% |
| Age | 18-25 | 100% |
| Living places | Hà Nội | 52.78% |
| | Hải Dương | 10.80% |
| | Hung Yên | 9.88% |
| | Thái Bình | 9.88% |
| | Others | 16.66% |
| E-commerce platforms have been used | Shopee | 97.22% |
| | Tiki | 61.42% |
| | Lazada | 57.41% |
| | Sendo | 12.96% |
| | Others (VNAMall, Chợ tốt, Alibaba, Amazon) | 1.23% |
| Frequency of purchases on e-commerce platforms (5-point Likert scale from 1 (rarely) to 5 (very often)) | 1 | 4.63% |
| | 2 | 11.11% |
| | 3 | 23.77% |
| | 4 | 30.56% |
| | 5 | 29.94% |
| Factors to consider when deciding to purchase on e-commerce platforms | Price | 94.75% |
| | Start Rating | 75.62% |
| | Reviews of previous buyers | 88.27% |
| | After sales service | 37.65% |

| | | |
|--|------------------------------------------------|--------|
| | Discount, promotion | 84.88% |
| | Transport fee | 81.17% |
| | Geographic distance between buyers and sellers | 29.94% |
| | Verified sellers | 31.17% |
| | Others | 0.31% |

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THE IMPACTS OF SOCIO-CULTURAL FACTORS ON INTENTION TO USE AIRBNB IN HANOI

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ABSTRACT

The overall objective of this study is to analyze the impacts of social and cultural factors on the intention to use Airbnb as a form of accommodation sharing in Hanoi, Vietnam. In the scope of this paper, to measure intention to use Airbnb, the analyzed culture factors consist of Collectivism, Femininity, Low Uncertainty Avoidance, Long-term Orientation and Restraint. Meanwhile, eWOM (electronic Word-of-Mouth) represents social factors. Implementing two quantitative approaches including Exploratory Factors Analysis (EFA) and Structural Equation Modeling (SEM) approach, eight research hypotheses are tested and the degree of influences of each factor is clarified. The key findings are: (i) Collectivism has the strongest positive effects on consumers' Attitude and Behavioral intention to use Airbnb, followed by Low Uncertainty Avoidance, Femininity and Long-term Orientation; (ii) only Restraint has negative effects on consumer's Attitude and Behavioral Intention to use Airbnb; (iii) eWOM has positive effects on Subjective norms and Behavioral Intention to use Airbnb; (iv) Attitude and Subjective norms both have positive effects on consumer's Intention to use Airbnb. From the findings, to promote the future use of Airbnb in Hanoi, Vietnam; some recommendations for businesses and consumers are provided.

Keywords: Airbnb; Hanoi; peer-to-peer accommodation; socio-cultural factors.

1. Introduction

In recent years, the growth of the new peer-to-peer sharing model has started to exert noticeable impacts on Vietnam tourism. In the first International Conference on Economics, Business and Tourism, Vietnam was listed in the top fifteen growing destinations for both regional and global travelers on Airbnb in the first half 2018. Particularly, in the upcoming years, the growth of this housing services is even more promising when the Generation Z plays the role of main consumers in Vietnam. Their characteristics such as internet savvy, adventurous, environmental conscious and price-sensitive are especially fitted to the offerings of P2P accommodation services namely Airbnb. Although peer-to-peer accommodation sharing is still in its infancy in Vietnam, the predicted impacts of this form of sharing are considered to be significant.

The sharing economy is a new concept that involves maintaining consumers' access to goods and services without ownership, which is equivalent to individuals renting out or otherwise offering access to their underused assets (Belk, 2014; Botsman & Rogers 2010). The sharing economy model has influenced many business practices of the tourism sector, most significantly in the form of peer-to-peer (P2P) accommodation. Generally, P2P accommodation happens when a person rents an apartment or a room they own to another person, and this is typically enabled by digital platforms such as Airbnb (Tussyadiah & Pesonen, 2016).

Numerous studies have investigated common factors for consumers' participation in P2P accommodation such as economic appeal, social appeal, authentic local experiences, sustainability, home benefits and enjoyment. However, only a handful of researchers have taken cultural factors into consideration. The necessity to examine cultural factors was first revealed by Gupta, Esmailzadeh, Uz, & Tennant (2019). The findings illustrate that while both Collectivism and Masculinism positively affect

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individuals' intention to rent out and rent products; Uncertainty Avoidance significantly discourages individuals from renting out their products to others. On the other hand, Power Distance shows insignificant impact on both peer consumer and provider propensity. One limitation of this study is the exclusion of Long-term Orientation and Indulgence cultural dimension. Understanding the prior study limitation, Wallace (2020) continues to explore how individual cultural values influences attitudes and participation in sharing economy services by adding two cultural factors: Long-term Orientation and Indulgence. The study chooses Airbnb sharing accommodation service as a representative. Regards to its results, Long-term Orientation and Indulgence have a positive effect on both attitude and participation. One unique finding of Wallace (2020) is Low Power Distance has a positive effect on attitudes. In addition, high Uncertainty Avoidance positively affected both attitudes and participation. However, Collectivism and Masculinity showed insignificant effects on consumer's attitudes and participation in sharing economy services. Most recently, the influence of cultural and social factors on a consumer's participation in a sharing economy is examined by Lee, Erdogan, & Hong (2021). Findings provide evidence that all the cultural dimensions, excluding Masculinity, have a significant relationship with attitude towards booking on Airbnb. More specifically, Uncertainty Avoidance and Individualism had a negative effect on attitude, while Long-term Orientation and Indulgence showed an opposite association. On the other hand, Subjective norms have no significant effect on booking intention on Airbnb. Thus, the intention to use Airbnb to book accommodation, rather than being influenced by the acceptance or support of others, is more of an individual decision based on their own needs.

Based on the literature review, it could be summarized that only a handful of researchers have taken cultural into considerations while investigating factors for consumers' participation in P2P accommodation, in which our research attempts to fill up this gap. Secondly, additional cultural factors namely Long-term Orientation and Indulgence need to be included. Thirdly, by inheriting the similar approach yet focusing on Hanoi consumers, this research closes the gap of previous research by understanding how Eastern cultural characteristics deter or encourage the acceptance of sharing accommodation. Finally, to overcome the limitation of findings with insignificant influences of subjective norms on behavioral intention to use Airbnb or other forms of accommodation sharing, the research would include additional measurement items to clarify the connection.

This research highlights its fundamental purpose as: examine socio-cultural factors and its impacts on consumer behavioral intention to predict the prospect of peer-to-peer accommodation in Hanoi, Vietnam. To achieve this primary objective, this paper aims to clarify the relationship between cultural factors and attitude towards using Airbnb and future intentions. In addition, social factors and its relationship with behavioral intention to use Airbnb would also be examined. Finally, recommendations on how to further develop peer-to-peer accommodation sharing is provided based on analysis results.

2. Theoretical framework

This study is based on two theoretical concepts. First, the Theory of Planned Behavior is utilized to anticipate the customer's intention to participate in an Airbnb service. Second, the Hofstede cultural dimensions' theory will be used to determine how customers' cultural values affect their attitude about using an accommodation sharing service – peer-to-peer accommodation.

2.1. Ajzen Icek's Theory of Planned Behavior

The theory of planned behavior is a follow-up model of the Theory of Reasoned Action (Ajzen & Fishbein, 1975) proposed to predict an individual's inclination to engage in a behavior over which people have incomplete volitional control. In the original Theory of Reasoned Action, individual intentions are influenced by two factors (attitude and subjective norms) and Ajzen continued to approve these two factors in TPB, simultaneously, adding the factor "perceived behavioral control". Perceived behavioral control is defined as "The resources and opportunities available to a person must to some extent dictate the likelihood of behavioral achievement." (Ajzen, 1991). Generally, the indicators of intention show personal attitude (the answer to the question: Do I want to do that?), subjective norms (the answer to the question: Do other people want me to do that?) and perceived behavioral control (the answer to the question: Do I have the necessary

ability to do that?). Moreover, the more attitudes and subjective norms tend to favor the behavior, the stronger the perception of behavioral control. In addition, Ajzen also asserts that "perceived behavioral control" along with "behavioral intention" can be used directly in predicting actual behavior while attitudes and subjective norms only have an indirect effect on behavior through intention.

Researchers in related fields have been particularly interested in the relationship between attitude and behavioral intention. Attitude is a critical antecedent of behavioral intention, according to influential theories like the technology acceptance model (Davis, Bagozzi, & Warshaw, 1989). In particular, it can be illustrated that an individual's evaluation, even good or bad, of a behavior is likely to determine a customer's intention to participate in an action. This relationship between attitude and behavioral intention was also found in other research such as "Predicting the intention to use consumer-generated media for travel planning" (Ayeh, Au, & Law, 2013) or "Explaining the Continuous Use of Social Virtual Worlds: An Applied Theory of Planned Behavior Approach" (Merikivi & Mäntymäki, 2009).

According to Ajzen, the definition of subjective norm is conceptually related to social influence, which can be considered "the process by which an individual's attitudes, beliefs or behavior are modified by the presence or action of others". When social influence is prevalent, one's beliefs about performing an activity, as well as one's actual behavior, are likely to be influenced in a way that is consistent with the expectations of one's individuals involved. In previous research, they pointed out precisely the very weak relationship between subjective norms and intentions when compared with two other factors.

2.2. Hofstede's cultural dimension theory

There have been quite a few sophisticated models developed to analyze cultural differences. Among them, Hofstede's model of cultural indexes is the most widely used, given the fact that it has topped the Social Science Citation Index for years. Hofstede (2001) in a seminal empirical study of International Business Machine employees in 40 countries during the 1960s and 1970s, identified four cultural dimensions: power distance, uncertainty avoidance, individualism versus collectivism and masculinity versus femininity. A fifth dimension – long-term versus short-term orientation – was added following the research by Michael Bond and colleagues among students in 23 countries in 1991 (Hofstede, 2001). Most recently, a sixth dimension – indulgence versus restraint which was based on Minkov's World Values Survey data analysis for 93 countries, has been added (Hofstede, 2010). The following provides a brief outline of the six dimensions of national cultures (Hofstede, 2001; Hofstede, 2010): (1) Power distance refers to the extent to which a society accepts the fact that power in institutions and organizations is distributed unequally; (2) Uncertainty avoidance refers to the extent to which members of a society feel uncomfortable in ambiguous and uncertain situations and take actions to avoid them; (3) Individualism versus collectivism refers to the extent to which individuals are supposed to look after themselves or remain integrated into groups; (4) Masculinity versus femininity refers to the distribution of emotional roles between the genders. It contrasts 'tough' masculine with 'tender' feminine societies; (5) Long-term versus short-term orientation refers to the extent to which a culture programs its members to accept delayed satisfaction of their material, social and emotional needs. Long-term orientation is future-focused and has long-term goals whereas short-term orientations focus on respect for tradition and are oriented towards the past and the present; (6) Indulgence versus restraint refers to the extent to which a society allows relatively free gratification of basic and natural human drives related to enjoying life and having fun.

3. Research method

3.1. EFA and SEM methods

The research uses a quantitative approach with the combination of Exploratory Factor Analysis (EFA) and Structural Modeling Equation (SEM). The study uses both EFA and SEM to compensate for the disadvantage of each method to produce the best possible results. EFA is a data-driven approach which is generally used as an investigative technique to identify relationships among variables. SEM is an a priori theory approach which is most often used to determine the extent to which an already established theory about relationships among variables is supported by empirical data. SEM approach is separated into two

phases including the evaluation of the measurement model and the evaluation of the structural model. This addition phase of SEM surpasses EFA and traditional regression models by including multiple independent and dependent variables to test associated hypotheses about relationships among observed and latent variables. Thus, it is more suitable to re-examine the model by using SEM as this approach works better for complex models with interrelated relationships between latent variables. The results indicate that both methods share somewhat similar results, in which SEM is particularly useful in demonstrating path relationships of the proposed framework that EFA method is unable to identify.

3.2. Proposed research framework and hypotheses

In order to achieve the research objectives, the study based its framework on two commonly used theories in analyzing the social and cultural factors influencing consumers' behavioral intentions towards using Airbnb namely Theory of Planned Behavior by Ajzen Icek and Theory of Cultural Dimensions by Hofstede. On the one hand, to achieve the goal of examining the impacts of cultural factors on the prospect of using Airbnb in the future, Hofstede's cultural dimensions are taken into consideration. This approach is supported by previous study of Sommestad (2015) and Wallace (2020), that culture affects attitude. As the research focuses on the Vietnamese consumers only, the cultural values are denoted as: Collectivism, Femininity, Low Uncertainty Avoidance, Long-term Orientation, Restraint. Notably, the high-low Power Distance dimension is omitted due to its insignificant effect on the attitude and future intention of consumers. In addition to cultural factors, social factors are also examined, represented by eWOM. eWOM is regarded as all Internet-based communications directed at consumers about the usage or characteristics of products and services and their sellers (Litvin, Goldsmith, & Pan, 2008). Importantly, Schepers & Wetzels (2007) found that eWOM is an antecedent of subjective norms in consumer behavior research. Thus, including eWOM as a determinant of subjective norms could help us understand the relationship between subjective norms and behavioral intention in the case of using Airbnb.

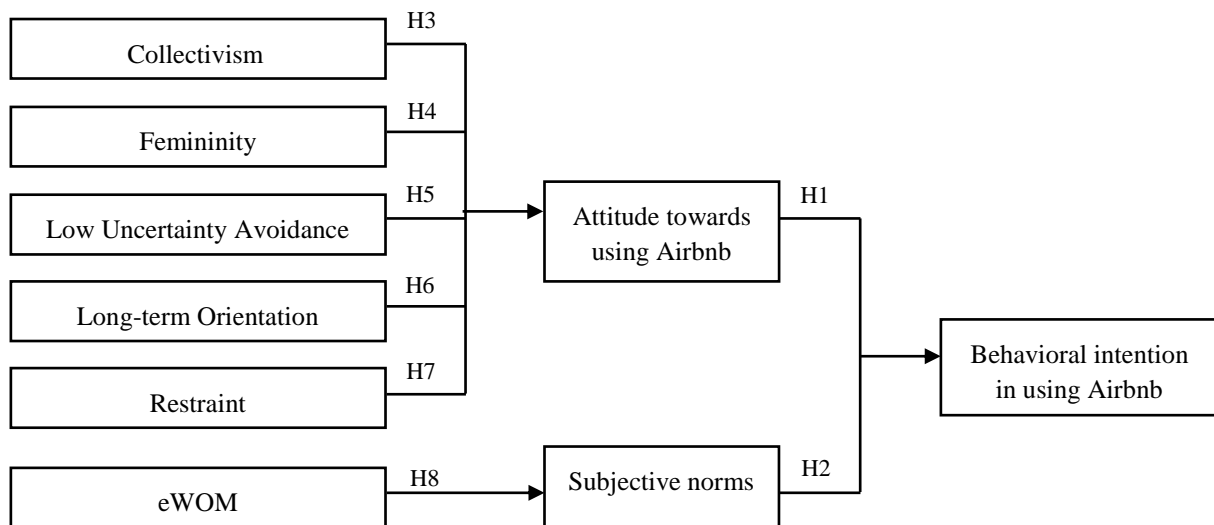


Figure 1. Research Framework (proposed)

Source: Authors' own work

The research hypotheses are based on reviewed literature and the research framework, which are presented as follows:

Hypothesis 1 (H1): Attitude has a positive effect on behavioral intention in using Airbnb.

Hypothesis 2 (H2): Subjective norm has a positive effect on behavioral intention in using Airbnb.

Hypothesis 3 (H3): Collectivism has a positive effect on attitude towards using Airbnb.

Hypothesis 4 (H4): Femininity has a positive effect on attitude towards using Airbnb.

Hypothesis 5 (H5): Low uncertainty avoidance has a positive effect on attitude towards using Airbnb.

Hypothesis 6 (H6): Long-term orientation has a positive effect on attitude towards using Airbnb.

Hypothesis 7 (H7): Restraint has a negative effect on attitude towards using Airbnb.

Hypothesis 8 (H8): eWOM has a positive effect on subjective norms.

3.3. Data collection and measurements

The data was collected through the method of convenience sample by using online questionnaires on Google Form. The total number of received responses was 401. Invalid replies, which are defined with more than 10% of information absence or 100% homogeneous answers, are removed. As a result, the number of eligible questionnaires was 328.

Table 1 lists nine constructs that have been developed to test the research hypotheses. Measurement items are adapted from the related studies then modified to be more suitable with the current research. The measurement is based on five-point Likert, which ranges from one to five corresponding to these options: Strongly Disagree, Disagree, Neutral, Agree, and Strongly Agree. The survey is designed based on the proposed framework. All the factors own at least two measurement items.

Table 1. Measures and scales

| Constructs | Items | Sources |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| Collectivism | Choosing Airbnb is a way for me to catch the experience tourism trend. | Lee, Erdogan, & Hong, 2021; Authors' own work |
| | If people in my social circle know and use Airbnb, I would be eager to try out this service. | |
| | If I choose to use Airbnb, I want to experience the service with my friends and family. | |
| Femininity | I choose Airbnb because it partially supports the economic life of the locals. | Lee, Erdogan, & Hong, 2021; Authors' own work |
| | When traveling, I want to stay in an accommodation that supports me to experience the life of the locals as much as possible. | |
| | Being able to understand and sympathize more about the livelihood of the locals creates a more memorable traveling experience. | |
| | If choosing to stay at an Airbnb, I would be more responsible towards the (housing) facilities than when staying at a hotel. | |
| Low Uncertainty Avoidance | I still choose Airbnb despite the risk that the housing facilities might differ from what I have expected. | Lee, Erdogan, & Hong, 2021; Authors' own work |
| | I am willing to try out Airbnb even though I am much more familiar with traditional booking methods and hotels' services. | |
| | I choose Airbnb since its booking procedures are more flexible and convenient than conventional ones. | |
| | I choose Airbnb despite miscellaneous comments about its services. | |
| | I tend to choose Airbnb based on positive feedback from KOLs or the general public, even without verification. | |
| Long Term Orientation | I choose Airbnb because I think it's much more cost-saving than other types of accommodation (e.g., hotels, resorts, etc). | Lee, Erdogan, & Hong, 2021; Authors' own work |
| | I choose Airbnb because it helps me to form relationships with new people (e.g., host, local people, etc). | |
| | I choose Airbnb because I think it's more environmentally friendly. | |
| Restraint | I don't choose Airbnb because I have high control over my desires to experience new accommodation alternatives. | Lee, Erdogan, & Hong, 2021; Authors' own work |
| | I don't choose Airbnb because it does not fit with Vietnamese's social norms. | |
| | The unique experiences with the locals that Airbnb offers are less important than the economical aspect of Airbnb. | |
| EWOM | Social media website was the first place that introduced me to information about Airbnb. | Lee, Erdogan, & Hong, 2021; Authors' own work |
| | If Airbnb information appears on my social media sites frequently, I would want to learn more about the service. | |
| | Reading positive reviews online will motivate me to try out Airbnb. | |

| | | |
|-----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|
| | I am more eager to try out Airbnb when a KOL talks about it. | |
| Attitude | Using Airbnb is a wise idea. Using Airbnb is an idea that I like. | Lee, Erdogan, & Hong, 2021 |
| Subjective norms | People who influence my behavior would approve of my choice of using Airbnb. People who are important to me would think that I should use Airbnb. | Lee, Erdogan, & Hong, 2021 |
| Behavioral Intention | I am very likely to use Airbnb in the future. I would recommend that others use Airbnb. | Lee, Erdogan, & Hong, 2021 |

Source: Summarized and modified by authors

4. Results and discussion

4.1. Results

4.1.1. Exploratory Factor Analysis (EFA)

Firstly, Cronbach's alpha and Corrected Item – Total correlation were measured to test if there is any internal consistency issue. After removing LTO1 to improve Cronbach's alpha of Long-term Orientation from 0.677 to 0.755, all remaining observable variables were eligible, with Cronbach's alpha ranging from 0.71 to 0.795 and Corrected Item – Total being greater than 0.3. For detail results, please contact the authors.

Variables with weight (factor loading) less than 0.5 are be excluded. The method of extraction is the Principal Components Method with Varimax rotation and the stopping point when extracting factors with an Eigenvalue of 1.

In addition, the scale is accepted when the Total Variance Explained is equal to or greater than 50% and the Factor Loading from 0.5 and above (Hair, Babin, Anderson, & Black, 2018). The validity of the scale was tested based on Factor analysis by analyzing KMO. According to Garson (2004), KMO must be in the range between 0.5 and 1 ($0.5 < KMO < 1$). The results of KMO and Bartlett's Test for both independent and independent variables lay in the acceptable range.

Based on the results, with the Initial Eigenvalues criterion greater than one, 21 independent observable variables were grouped into five factors: Femininity (X01), Collectivism (X02), Low Uncertainty Avoidance (X03), Restraint (X04) and eWOM (X05). In addition, six items were grouped into one factor namely Behavioral Intention. The regression results of factors affecting Behavioral Intention in consuming Airbnb services are summarized in Table 2.

Table 2. EFA Regression Analysis Results

| Variable | Coefficients | | | t | Sig. |
|---------------------------|-----------------------------|------------|---------------------------|--------|------|
| | Unstandardized Coefficients | | Standardized Coefficients | | |
| | B | Std. Error | Beta | | |
| Femininity | .260 | .038 | .260 | 6.797 | .000 |
| Collectivism | .501 | .038 | .501 | 13.105 | .000 |
| Low Uncertainty Avoidance | .390 | .038 | .390 | 10.205 | .000 |
| Restraint | -.027 | .038 | -.027 | -.718 | .473 |
| eWOM | .238 | .038 | .238 | 6.214 | .000 |

Source: Estimation results based on EFA

The regression result shows that the adjusted R square coefficient was 0.521, which means that the built linear regression model fitted the data set at 52.1%. The analysis results showed that the Sig value of the F-test is very small (= 0.000) which meant that the hypothesis that the regression coefficients are 0 can be rejected. Thus, the linear regression model had been built which was consistent with the population. In summary, there are four groups of factors that have significant influences on consumers' behavioral intentions in using Airbnb. The degree of effects on intention to use Airbnb in descending order are (1) Collectivism, (2) Low Uncertainty Avoidance, (3) Femininity, (4) eWOM.

4.1.2. Structural Equation Model (SEM)

a) Measurement model evaluation

Cronbach’s alpha of all variables fell within the range of 0.715 to 0.795 which is higher than the proposed value of 0.6 by Robinson, Shaver, & Wrightsman (1991). All variables’ Composite reliability except for RES3 was greater than the proposed value of 0.7 by Chin (2010). The trajectory is measured when all factor’s outer loadings are greater than 0.5 (Wong, 2013) and AVE must also be greater than 0.5. The study eliminates indicators RES3 since its AVE and Composite reliability did not satisfy the proposed value.

Table 3 illustrates the results of Heterotrait-Monotrait (HTMT) ratio. HTMT ratio is a widely known method for measuring discriminant validity. Henseler, Ringel, & Sarstede (2015) proposed that if this ratio is smaller than 0.9, the discriminant value is assured. HTMT ratios between all latent variables were smaller than 0.9, therefore, all variables satisfied the condition.

Table 3. Heterotrait - Monotrait (HTMT) ratios

| | ATT | COL | EWOM | FEM | IN | LTO | LUA | RES | SN |
|------|-------|-------|-------|-------|-------|-------|-------|-------|----|
| ATT | | | | | | | | | |
| COL | 0.636 | | | | | | | | |
| EWOM | 0.523 | 0.754 | | | | | | | |
| FEM | 0.43 | 0.613 | 0.571 | | | | | | |
| IN | 0.884 | 0.707 | 0.618 | 0.62 | | | | | |
| LTO | 0.416 | 0.552 | 0.493 | 0.872 | 0.423 | | | | |
| LUA | 0.676 | 0.658 | 0.637 | 0.64 | 0.704 | 0.564 | | | |
| RES | 0.122 | 0.11 | 0.176 | 0.207 | 0.215 | 0.39 | 0.237 | | |
| SN | 0.759 | 0.609 | 0.659 | 0.485 | 0.719 | 0.592 | 0.717 | 0.201 | |

Source: Authors’ calculation based on survey data

b) Structural model evaluation

Firstly, all Variance Inflation Factor (VIF) ranging between 1.252 and 1.975, suitable with the range proposed by Hair Jr, Sarstedt, Hopkins, & Kuppelwieser (2014). This indicates that the collinearity among the predictor constructs is not an issue in the structural model.

Secondly, to assess the significance of path coefficients and test the research hypotheses, the study implements the PLS-SEM “bootstrapping” technique to generate t-values and p-values. The results confirm Attitude and Subjective norm have significant positive effects on Behavioral Intention. Additionally, Collectivism, Low Uncertainty Avoidance, Long-term Orientation exert positive effects on Attitude; and Restraint has a negative impact on Attitude. However, hypothesis testing results of H4 to evaluate the effect of Femininity on Attitude is rejected due to unsatisfied t-value and p-value. Furthermore, eWOM has a positive effect on Subjective norms.

Thirdly, based on the R² value, Attitude and Subjective norms explain up to 48.1% of the variability in Behavioral Intention. Additionally, 39.2% of the variability in Attitude is explained by cultural factors namely Collectivism, Low Uncertainty Avoidance and Restraint. Moreover, 24.5% of the variability in Subjective Norms is explained by eWOM.

Fourthly, all the Q² values were considerably greater than zero, which provided support for the model’s predictive relevance concerning the reflective endogenous latent variables.

Table 4. Structural model examination

| Hypothesis | Relation | Path coefficients | Std. dev | T – value | P – value | Status | R ² | Q ² | F ² |
|------------|---------------------------------|-------------------|----------|-----------|-----------|--------|----------------|----------------|----------------|
| H1 | Attitude → Behavioral intention | 0.544 | 0.056 | 9.640 | 0.000 | Yes | 0.481 | 0.369 | 0.370 |
| H2 | Subjective norm → Behavioral | 0.215 | 0.056 | 3.875 | 0.000 | Yes | | | 0.058 |

| | intention | | | | | | | | |
|----|--------------------------------------|---------|-------|--------|-------|-----|-------|-------|-------|
| H3 | Collectivism → Attitude | 0.227 | 0.064 | 3.556 | 0.000 | Yes | 0.392 | 0.306 | 0.055 |
| H4 | Femininity → Attitude | - 0.043 | 0.065 | 0.665 | 0.506 | No | | | 0.002 |
| H5 | Low uncertainty avoidance → Attitude | 0.425 | 0.049 | 8.618 | 0.000 | Yes | | | 0.187 |
| H6 | Long term orientation → Attitude | 0.132 | 0.063 | 2.102 | 0.000 | Yes | | | 0.014 |
| H7 | Restraint → Attitude | - 0.174 | 0.060 | 2.920 | 0.000 | Yes | | | 0.043 |
| H8 | EWOM → Subjective norm | 0.490 | 0.040 | 12.190 | 0.000 | Yes | 0.240 | 0.187 | 0.315 |

Source: Authors' calculation based on survey data

4.2. Discussion

4.2.1. Interpretation

- Attitude has a positive effect on behavioral intention in using Airbnb

Attitude has been tested and proven to have a fairly significant and positive effect on behavioral intention. Comparing the results with previous studies, this conclusion is consistent with the theory of TPB, TRA which has been proposed and proven (Ajzen, 1991). In the extensive study of Wu & Chen (2014) based on TPB, a huge impact of perceived benefits, through the mediating variable as attitude affecting consumption intention was similarly demonstrated.

- Subjective norm has a positive effect on behavioral intention in using Airbnb

Subjective norms have a beneficial effect, contributing positively to behavioral intention. The influence of subjective norms on behavioral intention, however, is quite marginal compared to that of attitude. This conclusion is completely consistent with the TPB model researched and proven by Ajzen. However, the influence of subjective norm on the intention and behavior of consumption is not considerable when different types of products and services are scrutinized (Son, 2007).

- Collectivism has a positive effect on attitude towards using Airbnb

Both EFA and SEM approach results indicate that collectivism has a strong positive influence on intention. Collectivism is considered as the most powerful cultural driving force for friendly attitudes towards Airbnb as the development of collaborative services springs from a network of communalists rather than individualists. In comparison with previous research, this outcome is in agreement with Gupta, Esmaeilzadeh, Uz, & Tennant (2019) as regards the positive influence of collectivism on the tendency of sharing economy services providers and users.

- Femininity has a positive effect on attitude towards using Airbnb

Comparing the results of two methods, the relationship between Femininity and Behavioral Intention is only found via EFA. The results that Femininity has a beneficial impact on attitude is a notable difference, even with previous studies. As other research scope was mainly in Western countries, they focused on the relationship the opposite dimension of femininity known as “masculinity”, which is one of the major Western culture characteristics. Instead of femininity, masculinity in the research of Gupta, Esmaeilzadeh, Uz, & Tennant (2019) was recorded as one of the most positively correlated factors to renting propensity. Other previous findings showed insignificant impacts of masculinity traits and consumers intention to use Airbnb (Wallace, 2020; Lee, Erdogan, & Hong, 2021;). Thus, the newly discovered positive impacts of

femininity towards attitude and intention to use Airbnb would be valuable for businesses conducting in Vietnam.

- Low uncertainty avoidance has a positive effect on attitude towards using Airbnb

The research can conclude that low uncertainty avoidance has a positive effect on attitude towards using Airbnb based on both EFA and SEM approaches. Even though the impact level of low uncertainty avoidance is less than that of collectivism, its influence on attitude and intention to use Airbnb surpasses all of the remaining cultural factors. The major driver for participants to choose Airbnb is trust. This is a precondition for participants in the sharing economy (Botsman & Rogers, 2010). When compared to other researches, this result is similar to Gupta, Esmaeilzadeh, Uz, & Tennant (2019). However, this contradicts the finding of Wallace (2020) that high uncertainty avoidance positively affected both attitudes and participation. Nevertheless, it is more meaningful to conclude that lower uncertainty avoidance would exert a positive effect on the intention to try out new services such as Airbnb.

- Long-term orientation has a positive effect on attitude towards using Airbnb

Only the results of the SEM approach shows that long term orientation has a positive effect on attitude, however, its impact is the most negligible of all favorable factors. Compared to previous research, this conclusion is similar to Wallace (2020). Since cultures being high in long-term orientation focus on future rewards over immediate costs (Hofstede, 2001), they may prioritize consumption practices where environmental efforts are apparent, which is a driver of the sharing economy (Botsman & Rogers, 2010; Hamari, Sjöklint, & Ukkonen, 2016).

- Restraint has a negative effect on attitude towards using Airbnb

Only restraint shows a negative impact on attitude, which is proved more strongly by SEM than EFA approach. Restraint societies may be more unreceptive to sharing activities. Cultures high in this dimension tend to limit their wants and desires, not focusing consumption practices on hedonic leisure activity (Hofstede, 2001). Regarding Western countries culture traits, previous study by Wallace (2020) and Lee, Erdogan & Hong (2021) all concluded that indulgence, which is the opposite dimension of restraint, had positive impacts on attitude. Regarding the dimension of restraint – indulgence, the lower extreme negatively affects the propensity to use Airbnb while the upper extreme has favorable impacts. Therefore, this highlights another fundamental difference between the Eastern and Western culture.

- eWOM has a positive effect on subjective norms

According to the results of both methods, eWOM has a strong positive effect on subjective norms, which is also the strongest determinants factor according to EFA approach. This finding is a new discovery since there is no previous research that has come to the same conclusion. According to Schepers & Wetzels (2007), eWOM is an antecedent of subjective norms in consumer behavior research. With the collectivist characteristics, Vietnamese consumers' behavioral intention and actual consumption behaviors would rely significantly on the influences of other people's opinions and recommendations. eWOM, which measures the appearance frequency of Airbnb information on social media sites, will encourage individuals to try out the platform.

4.2.2. Implications

a) Theoretical implications

First, this paper systematized the rationale for the consumer behavioral intention to use the P2P accommodation services.

Second, through providing a review of related literature and theoretical framework, the research proposed the framework to analyze the impacts of socio-cultural factors on consumers' behavioral intention to use Airbnb. To be specific, the framework is based on the combination of Hofstede's Cultural Dimension Theory and Ajzen's Theory of Planned Behavior (TPB). Thus, this supports the formation of eight fundamental hypotheses to examine five cultural factors (collectivism, femininity, low uncertainty avoidance, long-term orientation, restraint) and eWOM representing social factor.

Third, eight research hypotheses are successfully tested via the combination of EFA and SEM approach. In summary, the key findings are: (i) Collectivism has the strongest positive effects on consumers' Attitude and Behavioral intention to use Airbnb, followed by Low Uncertainty Avoidance, Femininity and Long-term Orientation; (ii) only Restraint has negative effects on consumer's Attitude and Behavioral Intention to use Airbnb; (iii) eWOM has positive effects on Subjective norms and Behavioral Intention to use Airbnb; (iv) Attitude and Subjective norms both have positive effects on consumer's Intention to use Airbnb. In general, both cultural and social factors influences on intention to use Airbnb are successfully clarified.

Finally, the research also filled previous research gaps by taking two additional cultural factors long-term orientation and restraint. Besides, the research also suggested a new variable (eWOM) related to subjective norms and tested its influence on the consumer's intention for using the P2P accommodation services.

b) Practical implications

Recommendations for businesses

Research results show that, although most consumers are willing to experience the new sharing accommodation services, there is still a gap between intention and actual behavior to use Airbnb. This could be directly connected to the "restrain" culture dimension of Vietnamese people. On top of that, consumers are particularly concern about the transparent of the services offerings. For instance, this could be results from the differences between one's expectation and the actual condition of the housing facilities. For consumers, besides the low cost, they also want to receive good service quality and positive feedback from previous users.

Therefore, to develop the competitive advantages of the new tourism services like Airbnb and to gain the trust of customers, the small firms which run the sharing economy platform and households that supply the sharing accommodations should focus more on increasing the quality infrastructure, promoting more discounts or enhancing after-sales services. Besides, they should need to put the word "credibility" as a prerequisite. To operate in the sharing accommodation in Vietnam, it is necessary to be transparent about the offerings to gain customer trusts.

Recommendations for consumers

Each individual and collective, especially Gen Z consumers, should be more conscious in changing their consumption habits to meet their own needs for the demand of experience while contributing to the green consumption trend and spontaneously joining hands to help tourism localities who face enormous difficulty during Covid-19 pandemic. Changing consumer behavior to cheaper services, such as that of P2P accommodation sharing, will help consumers save a part of costs in the long run. In addition, choosing to use sharing accommodations when traveling also contributes to sustainable and environmental-friendly consumption.

- Consumers should suggest acquaintances, friends and others together experience the P2P accommodation services as an efficient way to improve green consumption in Vietnam.
- Consumers, especially young people, need to update official information from the Government's mainstream mass media so as not to misunderstand terms related to sharing economy in general and the P2P accommodation in particular. It is necessary to choose this sharing services from official websites to avoid any risks or scams.
- Consciousness in maintaining general hygiene during the service experience.

4.2.3. Limitations

The first limitation of this research is the sample size. To be specific, even though the sample owns diversity in age, educational status, income with different attitudes and intention to use Airbnb; it was mainly focused on residents of Hanoi, Vietnam. Therefore, in order to improve the generalizability of the findings, future research should seriously consider using a larger sample size with diverse geographical backgrounds.

Secondly, the participants with experience with Airbnb were not questioned in detail to separate their usage intentions from participants that have not tried Airbnb before. Future research could separate the two groups of participants as the adoption intention might be greater for those who have a favorable experience beforehand.

Finally, this research focused on only five out of six cultural dimensions by Hofstede, which excluded the power distance dimension. Collecting answers in only five cultural criteria makes it possible to reduce the length of the survey and minimize participant fatigue considerably. Nevertheless, future research could include the power distance dimension to gain more comprehensive and insightful results.

5. Conclusion

This research successfully analyzed the influences of socio-cultural factors on the customer's behavioral intention to use P2P accommodation services on Airbnb. The research has achieved the following results.

First, through providing a review of related literature and theoretical basis, the research proposed the framework to analyze the impacts of socio-cultural factors on consumers' behavioral intention to use Airbnb. To be specific, the framework is based on the combination of Hofstede's Cultural Dimension Theory and Ajzen's Theory of Planned Behavior (TPB). Thus, this supports the formation of eight fundamental hypotheses to examine five cultural factors (collectivism, femininity, low uncertainty avoidance, long-term orientation, restraint) and eWOM representing social factor.

Secondly, the influences of cultural and social factors are then analyzed based on EFA and SEM approaches. In summary, the key findings are: (i) Collectivism has the strongest positive effects on consumers' Attitude and Behavioral intention to use Airbnb, followed by Low Uncertainty Avoidance, Femininity and Long-term Orientation; (ii) only Restraint has negative effects on consumer's Attitude and Behavioral Intention to use Airbnb; (iii) eWOM has positive effects on Subjective norms and Behavioral Intention to use Airbnb; (iv) Attitude and Subjective norms both have positive effects on consumer's Intention to use Airbnb. In general, both cultural and social factors influences on intention to use Airbnb are successfully clarified.

Thirdly, the research also filled previous research gaps by taking two additional cultural factors long-term orientation and restraint. Besides, the research also suggested a new variable (eWOM) related to subjective norms and tested its influence on the consumer's intention for using the P2P accommodation services.

Practically, derived from the research results and the current situation and goal of promoting consumption behavior of Airbnb among Vietnamese people, the research has proposed a group of specific recommendations for business and consumers. For the small firms which run the sharing economy platform and households that supply the sharing accommodations, they should focus more on increasing the quality infrastructure, promoting more discounts or enhancing after-sales services. Besides, they should need to put the word "credibility" as a prerequisite. To operate in the sharing accommodation in Vietnam, it is necessary to be transparent about the offerings to gain customer trusts. On the other hand, alternating accommodation choice to cheaper services, such as that of P2P accommodation sharing, will help consumers save a part of costs in the long run and contributes to sustainable and environmental-friendly consumption. They should update official information from the Government's mainstream mass media so as not to misunderstand terms related to sharing economy in general and the P2P accommodation in particular. It is necessary to choose this sharing services from official websites to avoid any risks or scams. Lastly, Consumers should suggest acquaintances, friends and others together experience the P2P accommodation services as an efficient way to improve green consumption in Vietnam.

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FACTORS AFFECTING VIETNAMESE YOUTH'S INTENTION TO USE CHATBOTS IN ONLINE SHOPPING

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ABSTRACT

Based on accepted factors from pioneer research (UTAUT2), the paper investigates factors driving the intention to use chatbots in online shopping of Vietnamese youth. For sample collection, primary data was collected from February 2021 to January 2022, by online survey with questionnaire via social networks, using Google Forms. With data of 576 accepted individuals, regression models were used in this research. The results show that 7 factors including performance expectancy, social influence, facilitating conditions, hedonic motivation, habit, perceived accuracy and perceived risk have an impact on chatbots intentions of customers; of which performance expectancy is the strongest factor, followed by perceived accuracy and social influence. On the other hand, facilitating conditions have the most minimal impact compared to the rest. In addition, this study identified that the intention differs among sectors of area and gender. We contribute some recommendations for consumers and corporations such as continuously improving the benefit, knowledge and security of chatbots to encourage the frequent use of chatbots applications in the digital commerce platforms.

Keywords: chatbots, consumption behavior, online shopping, UTAUT2.

1. Introduction

1.1. Background

The emergence of technology development has altered consumers' behaviors for decades. Customers have changed their shopping behaviors, as well as the way they interact with business. Simultaneously, customer service, which is traditionally performed by humans, has gradually evolved to be more automatic, thanks to the rapid technological enhancement of social agents and message apps (Pantano & Pizzi, 2020). Furthermore, due to the Coronavirus disease (COVID-19) pandemic, consumer behaviors have changed, with consumer satisfaction influencing purchasing initiatives and decision-making online (Tran et al., 2021). The use of these applications, particularly the use of chatbots, has become topics of interest to many businesses and academics.

1.2. The rationale of the study

Prior studies pay more attention to chatbots' technological progress or human-like concepts. Wang et al. (2020) conducted a systematic review showing that the majority of the 100 most influential publications devote attention to the strategic way of communicating between chatbots and humans and compare proposals to show some of the most effective methods.

This study, on the other hand, particularly considers the Vietnam e-commerce context, in which Vietnamese consumers have shifted their shopping habits from traditional to online purchases due to the pandemic (Deloitte, 2020 & 2021). The shift in consumers' shopping habits brings an unprecedented opportunity for the transformation of the trade sector, especially the digital retail segment.

Moreover, this paper focuses on Vietnamese youth, since they have become a potent influence on people of all ages and incomes, as well as on the way those people consume and relate to brands. They belong to the age group that accounts for a significant number (23.8%) in the population structure (GSO, 2019). Besides, like any people of their generation worldwide, they are the digital natives who are exposed to

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technology, namely the internet, social networks and mobile systems at an early age (McKinsey, 2018). Specifically, according to Deloitte's market research results, consumers under the age of 29 spend 74% of the total time using the Internet in the total time using the media. Therefore, this segment is a promising land for many businesses, with a great potential for online sales. This study will show and measure the influence of factors on the intention to use chatbots in online shopping, thereby making meaningful suggestions to customers as well as businesses.

2. Literature Reviews

2.1. Overview of chatbots

Chatbots are human-like interactive computer programs based on natural language (Abu Shawar & Atwell, 2007; Følstad & Brandtzaeg, 2017; Okonkwo & Ade-Ibijola, 2020).

Chatbots work by receiving input, switching thanks to the programming language, processing requests, and returning the output to the user. In some cases, people may intervene in conjunction with chatbots. They can provide information, dialogue, and perform demanding tasks... based on purely written, visual, or vocal means or more than one of them (Kucherbaev et al., 2018; Følstad, 2022).

In the era of the 4.0 industrial revolution, chatbots are now applied in various industries such as education, finance, health, etc. (Shawar & Atwell, 2007; AbuShanab & Pearson, 2007; Sang, 2019). Chatbot has become a pioneering tool for developing customer service thanks to its ability to provide regular resources and support a number of common tasks (Cecilie et al., 2019).

In business, research by Przegalinska et al. (2019), Cecilie et al. (2019), Eleni et al. (2020) all show that chatbots can be applied in many processes. Especially with high accessibility, low cost, ease to use for users, chatbots have the ability to breakthrough in the field of customer service and data personalization. Nuruzzaman and Hussain (2018) refer to the interruption and lack of continuity in the conversation process between retailers and customers that can be overcome using chatbots. A chatbot assistant is available 24/7, ready to serve customers' requests at any time they need.

2.2. Concepts and characteristics of online shopping

Online shopping is a form of shopping that allows customers to purchase goods or services directly from sellers over the Internet. According to research by Li & Zang (2002), online shopping is the process in which consumers buy products or services over the Internet. Research by the author group Monuwe et al. (2004) also defines online shopping as the behavior of consumers in shopping through Internet stores or websites using online shopping transactions.

There are five main characteristics that differentiate online shopping from traditional shopping.

Firstly, consumers can browse and consider a range of products in the sales category quickly and conveniently. Online shopping offers convenience to those whose time costs are thought to be too high to spend on regular shopping (Grewal, R. Yler, Levy, 2002). Secondly, consumers can easily access specific information about products, brands, and stores, thereby improving their ability to make shopping decisions. Thirdly, consumers can get easier comparisons of prices, availability, parameters, and features than in traditional stores. Fourth, online shopping offers a certain degree of anonymity, especially when consumers shop for sensitive products (Monuwe, Dellaert, B. G. C., & de Ruyter, J. C., 2004). Along with that, online shopping also has diverse options for payment and delivery, tailored to the needs of consumers. However, according to a comparison in the study by Lohse and Spiller (1999), online shopping consumers do not have the opportunity to experience seeing and touching as shopping in physical stores that can only be limited by image and sound.

2.3. Chatbots and consumer behaviors

With the increasing popularity of chatbots in recent years, there has been more studies on the experience and behavior of customers in general; however, the understanding of what motivates customers to use chatbots is still limited (Brandtzaeg & Følstad, 2017).

Regarding the user experience with chatbots, Holtgraves et al. (2007) study on how users feel about the ‘personality’ of chatbots (Holtgraves, Ross, Weywadt, & Han, 2007). Meanwhile, a study by De Angeli et al. shows that chatbots’ implied personification can be malignant to users (De Angeli, Johnson, & Coventry, 2001). Also, different demographic groups tend to evaluate the conversational quality of chatbots differently; particularly, conversations with chatbots are perceived more favorably by young users and female users (Shah, Warwick, Vallverdú, & Wu, 2016).

Additionally, the quality of experience with chatbots depends on their capability of emotional expression (Brandtzaeg & Følstad, 2017). Research by Xu et al (2017) on chatbots customer care indicates that about 40% of requests sent to the customer care system are about needs related to feelings, emotions, rather than looking for specific information (Xu, Liu, Guo, Sinha, & Akkiraju, 2017). Many other studies, such as those by Qiu and Benbasat (2009), Rafaeli and Noy (2005), and most recently Adam et al. (2021), have shown that chatbots’ Anthropomorphic design is closely related to the rate of sales closing as well as online buying behavior in general. When chatbots seem to be more ‘human’, customers find it easier to get more useful information, and feel more comfortable giving feedbacks on the quality of service through chatbots, which thereby increases the effectiveness of interactions between businesses and customers (Adam, Wessel, & Benlian, 2021) (Rafaeli & Noy, 2005) (Qiu & Benbasat, 2009).

On the other hand, Luo et al (2019) made a discovery about the influence of prejudice on the experience of using chatbots. The team carried out an experiment with more than 6.200 customers receiving random calls from chatbots or staff, with the same calling process. The results show that, when not disclosed to customers, chatbots’ ability to close sales is equivalent to that of a skilled employee, and four times higher than that of a low-qualified employee. However, when customers know the service is done by smart chatbots instead of a human, the rate falls to 79.7% due to subjective perception of lack of empathy and accuracy of chatbots (Luo, Tong, Fang, & Qu, 2019).

Regarding the factors affecting the intention to use chatbots, one of the most representative and generalized studies is that of Brandtzaeg & Følstad (2017). According to this study, there are four main factors affecting the intention to use chatbots by customers: productivity, entertainment, social and relational factors, and curiosity. Particularly, 68% of respondents think that effectiveness is the main driver for using chatbots; effectiveness consists of three factors: quickness, convenience and ease of use.

Specifically, using chatbots helps customers not to waste time calling, waiting for the right salesperson, and trying to express the problem to the salesperson to understand; chatbots also helps customers search for information more quickly, instead of having to spend time reading a series of long texts and terms. With chatbots, customers can get basic information whenever they need it. Meanwhile, 5% of respondents also said that they prefer to receive support from chatbots rather than from salespeople, because with chatbots, they do not “feel stupid to ask important questions” (Brandtzaeg & Følstad, 2017). Moreover, 41% of those surveyed think the ease of use is the main driving force behind their use of chatbots.

Curiosity and entertainment are also two factors that motivate customers to use chatbots. The customer interaction with chatbots, which is partly derived from the sense of curiosity, is how authentic chatbots can be. Interaction with chatbots also helps users simulate external conversations, which helps them entertain, as well as improve communication skills. This finding is also inherited, and developed in the field of psychology and psychiatry, such as the study by Fitzpatrick et al. (2017) on the therapy of depression and anxiety in adults by chatbots (Fitzpatrick, Darcy, & Vierhile, 2017), or the study by Huang et al. (2015) on the chatbots system for detecting and relieving stress in adolescents (Huang, et al., 2015).

In addition, Malik et al. (2020) provided three more factors, namely: reliability, empathy, and tangibility. Customers expect chatbots to provide absolutely accurate and timely information. Customers also enjoy interacting with chatbots who are able to understand the problem, thereby providing answers tailored to the unique circumstances of each customer. Meanwhile, tangibility is reflected in the quality of equipment and Internet lines used by customers. The quality of equipment is not guaranteed, or the Internet connection is not stable, all affect the experience of using chatbots by customers (Malik, Gautam, & Srivastava, 2020).

Ng et al. (2020) point out the positive impact of Trust and Customer Effort Expectations on chatbots. The results of online experiments with 410 users using chatbots Emma show that sensitive personal financial information is willing to be shared by customers with chatbots (Ng, et al., 2020). Prior to this, Nordheim et al. (2019) studied and determined that accuracy had a positive influence on customer trust using chatbots in addition to contextual factors (use risk and brand awareness) as well as user factors (tendency to trust technology) (Nordheim, Følstad, & Bjørkli, 2019).

Identification of research gaps

In previous research, including Vietnamese and international ones, there is no common framework for customers to evaluate chatbots. Although some indicators are widely used to measure chatbots' performance, there is no specific metric or set of metrics commonly referred to as the Guendalina Caldarini et al. 2021. The lack of a common frame of reference in relation to chatbots' assessment will limit the examination of the accuracy or adequacy of important aspects of dialogue quality, such as sentence coherence, coherence, and aspects related to chatbots' text. Therefore, many models rely on human judgment, but human judgment is costly, time-consuming, not easily scalable, misleading, and lacks coherence. Participants will typically rate different aspects of the interaction based on a scale that can be used to draw the average and measure the quality of the activity in terms of effectiveness, efficiency and user satisfaction according to Radziwill et al. (2017).

Furthermore, previous studies on the relationship between the intention to use chatbots and online shopping behavior of customers have not been consistent with the research results. One of the causes of differences between the results of previous studies is the cultural differences between countries according to Chau et al. (2002), Ko et al. (2004), Park and Jun (2003), Zhou et al. 2007). According to Delafrooz et al. (2010), online shopping still needs to be more researched in specific contexts in different countries. On the other hand, the rapid development of science and technology has changed online shopping habits of consumers according to Wen et al. (2011). Therefore, studies on consumers' intention to continue using chatbots when shopping online will have practical research implications under specific conditions and circumstances instead of theoretical contributions that can explain most of the differences in the results of the predecessor studies. Besides, most of the research focuses only on the factors affecting the intention to shop online without focusing on the cognitive and decision-making process through the process of processing customer information according to Le Kim Dung (2020).

Moreover, there are few studies on the intention of young people aged 16-24 to continue using chatbots when shopping online in countries that researchers often approach from a technological perspective - studying the effects of design and usability on the intentions and behavior of consumers (Zhou et al. 2007).

3. Theoretical Framework (Model and hypothesis)

3.1. The Extended Unified Theory of Acceptance and Use of Technology (UTAUT2)

In 2003, Venkatesh et al. first introduced the Unified Theory of Acceptance and Use of Technology - UTAUT (Venkatesh et al., 2003). The goal of the UTAUT model is to explain user behavioral intentions and usage behavior for information technology. The UTAUT model was developed through models such as Fishbein and Ajzen's theory of rational action (TRA) (1975; 1980), Ajzen's theory of intended behavior (TPB) (1985; 1991; 2002), Technology Acceptance Model (TAM) by Davis et al (1989; 1993), the integration of the theory of intended behavior (TPB) and the technology acceptance model (TAM) of Taylor and Todd (1995), the extended Dissemination of Innovation Theory (IDT) by Moore and Benbasat (1991), Motivational Model (MM) by Davis et al. (1992), Model of PC Utilization (MPCU) by Thompson et al (1991), and Social Cognitive Theory (SCT) của Compeau và Higgins (1995). In particular, UTAUT is most influenced by the theoretical foundation of three models including TRA, TPB, and TAM. UTAUT has four main factors affecting behavioral intention and behavior in the context of consumers using information technology: performance expectancy (PE), effort expectancy (EE), social influence (SI), and facilitating conditions (FC).

Based on the theoretical foundation of UTAUT, in 2012, Venkatesh et al. continued to develop the Extended Unified Theory of Acceptance and Use of technology (UTAUT2). This is a complementary approach to the original UTAUT model. Compared to UTAUT, the new UTAUT2 model adds three factors including Hedonic motivation (HM), Price value (PV), and Habit (HB). The UTAUT2 model has overcome the incomprehension of the TRA model (Ajzen & Fishbein, 1975), TAM (Davis, 1989), TPB (Ajzen, 1991), and UTAUT (Venkatesh et al., 2003). Chang (2012) indicated that the extensions proposed in UTAUT2 produced a substantial improvement. With the UTAUT2 model, researchers can apply the original model or add some new variables to suit the cultural characteristics and technological development level of each country.

UTAUT2 is a prominent theory that has been used as an approach and the original model in studies about the acceptance and use of technology by many researchers including The Consumer's Trust and Continuous Usage Intention of Food Delivery Mobile Apps (Thao and Long, 2020), User Acceptance of Lifestyle and Therapy Mobile Health Apps (Schomakers et al., 2022), Assessing the Effects of the COVID-19 Pandemic on M-Commerce Adoption (Vinerean et al., 2022), Determinants of Digital Banking Services in Vietnam (Tam et al., 2020), etc.

3.2. Proposal research model and hypothesis

Based on the theoretical framework and summary of previous research, we prepared our research model of factors affecting the intention to use chatbots in online shopping of Vietnamese youth (Figure 1). Our model comprises six factors from the available UTAUT2 model including performance expectancy (PE), effort expectancy (EE), social influence (SI), facilitating condition (FC), hedonic motivation (HM), and habit (HB). Besides, we added three more factors: trust (TR), perceived accuracy (PA), and perceived risk (PR). We removed the factor price value (PV) because the cost of using chatbots in online shopping is trivial. Control variables include gender, age, level of education, living area, frequency of online shopping, and major.

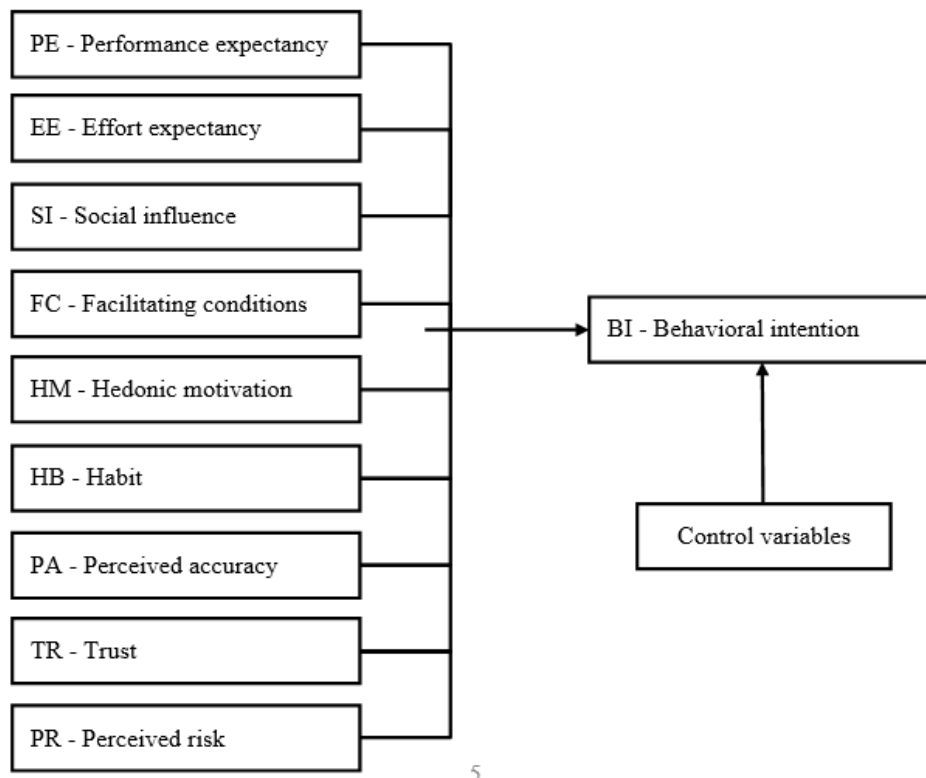


Figure 1: Proposal research model

Along with the defined factors, nine hypotheses (as stated below) were constructed to examine the impact of independent variables.

Performance Expectancy

Performance expectancy is defined as the extent to which an individual believes that using the system will enable them to gain benefits in performance (Venkatesh et al., 2003). Performance expectancy originated from Perceived Usefulness of Technology Acceptance model - TAM (Davis, 1989). Consumers expect usability, time savings, and productivity gains. The level of performance and efficiency positively affect the confidence of customers when using online food delivery services (Kang & Namkung, 2018). In this study, users who are aware of the effective value of chatbots may tend to go towards the intention of using chatbots in online shopping.

H1: Performance expectancy has a positive impact on the intention to use chatbots in online shopping of Vietnamese youth.

Effort Expectancy

According to Venkatesh et al. (2003), effort expectancy is the degree of ease of using the system. According to Zhou (2012), ease of use is an attribute of trust-building in mobile systems. When an individual is aware of the ease of using an app, acceptance is higher. Customers who find the ease of use with chatbots tend to come to the intention of using chatbots in online shopping.

H2: Effort expectancy has a positive impact on the intention to use chatbots in online shopping of Vietnamese youth.

Social Influence

Social influence is the extent to which an individual thinks others believe they should use the new system (Venkatesh et al., 2003). A study by Verkijika (2018) indicated that social influence has a significant role in predicting customers' intention to use commercial mobile apps. With the huge amount of information coming from many diverse sources for consumers to consider in the shopping process, consumers will prioritize trusting products and services that are used and recommended by family and friends, as well as the people whose advice they value. Mass media and celebrities also have influence on consumers' behavioral intentions. Therefore, consumers who are encouraged to use chatbots by relatives, friends, and surrounding relationships tend to have an intention to use chatbots in online shopping.

H3: Social influence has a positive impact on the intention to use chatbots in online shopping of Vietnamese youth.

Facilitating Condition

Facilitating condition is the degree to which an individual believes an organization or technical infrastructure supports the use of the system (Venkatesh et al., 2003). Consumers will tend to trust an e-commerce system if there is a technological infrastructure such as the Internet and the availability of Internet-connected devices (Singh et al., 2017). Technically, a computer program is designed to simulate conversation with human users, especially over the internet. In online shopping, a chatbot serves as a tool to interact and gather information, and support and facilitate consumers' shopping decisions. The chatbot will not be able to operate effectively without the Internet, the lack of Internet-connected devices, and necessary resources.

H4: Facilitating Condition has a positive impact on the intention to use chatbots in online shopping of Vietnamese youth.

Hedonic Motivation

Hedonic motivation is the joy, pleasure, or satisfaction gained from the use of new technology, which has been shown to play an important role in the acceptance and use of technology (Brown & Venkatesh, 2005). According to Alalwan (2019), consumers feel excited about the experience of the apps and are willing to continue using them in the future if they bring a sense of pleasure, comfort, and enjoyment. A study by Hill et al. (2015), chatbots can bring entertainment to users, provide immediate feedback and enhance peer communication skills.

H5: Hedonic motivation has a positive impact on the intention to use chatbots in online shopping of Vietnamese youth.

Habit

According to Venkatesh et al. (2012), habit is defined as tendencies that are performed automatically through actions repeated many times in the past. Prior experience is a prerequisite for technology habits and such habits are key factors in the acceptance of such technology in the future (Venkatesh et al., 2012).

H6: Habit has a positive impact on the intention to use chatbots in online shopping of Vietnamese youth.

Trust

Trust is consumers' perception of the trustworthiness of a brand, product, or service (Flavian et al., 2006). According to Chai and Kim (2010), trust is the willingness of a risky party to expect that another party will perform a specific action similar to the requirements or commitments made without needing supervision or checking. The level of trust of customers in the seller increases when they can receive a commensurate benefit from the seller (Lee, D. Y., & Dawes, P. L., 2005).

H7: Trust has a positive impact on the intention to use chatbots in online shopping of Vietnamese youth.

Perceived Accuracy

According to Huang & Chueh (2020), perceived accuracy is the consumer's belief in the correct acquisition and exchange of information through chatbots. Huang & Chueh (2020) also point out that users believe that they will receive accurate advice on the condition of pets through communication with chatbots, which will enhance chatbots' intention to use in veterinary consultation. Therefore, customers, who are aware of the accuracy of interactions between themselves and chatbots, tend to go towards the intention of using chatbots in online shopping.

H8: Perceived accuracy has a positive impact on the intention to use chatbots in online shopping of Vietnamese youth.

Perceived Risk

Perceived risk is the customer's expectation of unattainable results and possible losses when making online shopping decisions (Forsythe and Shi, 2003). Lim (2003) proposes three sources of perceived risk, including technology, suppliers, and products in e-commerce. chatbots is a part of the division of technology in e-commerce and online shopping. According to Yang et al. (2015), the perceived risk of privacy is a part of the perceived risk from users when making online purchases and payments, which has a negative impact on the intention to use.

H9: Perceived risk has a negative impact on the intention to use chatbots in online shopping of Vietnamese youth.

4. Research method

4.1. Sample and Data collection

For sample collection, we used the convenience sampling methodology due to limitations of time and resources. Primary data was collected by online survey with questionnaire via social networks, using Google Forms. According to Bollen (1989), the minimum number of survey answers suitable for factor analysis is 5 times the total number of observed variables. In this study, we planned to collect 600 answers, this number based on the group's ability and time. In the official survey, we collected 614 answers in total. The answers then were selected to eliminate invalid, missing important data as well as to test logicity. After the filtering process was conducted, the number of answers used for analysis was 576 (about 93,81% compared to the total collected sample).

4.2. Measures and Questionnaire Development

The questionnaire was constructed based on mentioned literature and developed hypotheses. There are 4 parts of the questionnaire. Part 1: Screening questions for survey respondents' awareness and use of chatbots; Part 2: Information of the respondents; Part 3: questions for evaluating the influence of nine independent variables on dependent variables (Venkatesh et al., 2003, 2012; Lee & Dawes, 2005; Huang & Chueh, 2020; Magdalene Ng et al., 2020). Part 4: Evaluating intention to use chatbots in online shopping of Vietnamese youth.

The questions are built on a 5-point Likert scale, rating the statements with levels from (1) Strongly disagree; (2) Disagree; (3) Normal/Neutral; (4) Agree; (5) Strongly agree.

5. Results and discussion

5.1. Results

5.1.1. Reliability and validity of the scales

a) Reliability Test with Cronbach's Alpha

In this research, SPSS 20.0 was used to observe the reliability and validity of the model factors affecting the intention to use chatbots in online shopping of Vietnamese youth. If Cronbach's alpha is larger than 0.60, a variable is considered reliable. We have all the model's variables scale that Cronbach's Alpha valued between 0.639 to 0.891 > 0.6 met the requirement. No variables that corrected item-total correlation were smaller than 0.3. Thus, these variables can totally be used in the next analysis.

b) Exploratory Factor Analysis (EFA) result

The authors put 9 independent variables into exploratory factor analysis by using principal components analysis method with Varimax rotation. Hair et al. offered value for factor loading based on sample size that we choose 0.4 in this paper.

In the first phase, we removed three variables EE1, EE2, and EE2 due to violation of discriminability in the rotation matrix with factor loading of 0.56 - 0.42, respectively; 0.462 - 0.533; 0.505- 0.442 and the factor loading difference is less than 0.3.

In the second phase, the EFA results met the requirement in all criteria. The KMO value was 0.937, Bartlett's Test of Sphericity with Sig. = 0.0000 < 0.05 and the Eigenvalue of the factor was greater than 1 is statically significant. The Cumulative % value shows that these 8 factors explain 76.701% of the variability of the data, in accordance with the necessary. We identified 8 independent variables to be used in the factor affecting model instead of 9 independent variables as the initial theoretical model, specifically as follows: performance expectancy, social influence, facilitating conditions, hedonic motivation, habit, trust, perceived accuracy and perceived risk.

The dependent variable was also included in the exploratory factor analysis. Since only one variable was included in the analysis, there was no appearance of a rotation matrix. As a result, the KMO coefficient is 0.847, Sig Barlett is 0.0000 which is a perfect match.

Summarizing the results of the EFA exploratory factor analysis shows that the load factor of the observed factors satisfies the condition > 0.5, the total variance of the dependent variables and independent variables is > 50%, explaining 80.044% of dependent variables and 76.701% of independent variables.

c) Correlation analysis

The authors used Pearson correlation analysis to test the correlation relationship between the dependent variable and the independent variables. It demonstrates that the two variables are positively correlated, meaning that the larger one variable's value, the larger the other variable's value. Through the data table above, Sig. (2-tailed) of the independent variables with dependent variable BI (behavioral intention) both have values less than 0.05. The Pearson correlation test results are shown that all the independent variables have a positive correlation coefficient with the dependent variable BI (behavioral intention)

The correlation coefficient of the PE variable (performance expectancy) and the dependent variable BI (behavioral intention) have the largest correlation coefficient with $r = 0.639$, showing a strong correlation.

The correlation coefficients of the remaining variables include SI (social influence), FC (facilitating condition), HM (hedonic motivation), HB (habit), TR (trust), PA (perceived accuracy) and PR (perceived risk). have values of 0.541, 0.495, 0.570, 0.565, 0.594, 0.573 and 0.423, respectively, at 1% significance level, showing positive correlations between these independent variables and the dependent variable BI (Behavioral Intention).

Through Pearson correlation analysis, these factors are all preserved that no factors were excluded for further regression analysis.

5.1.2. Regression Analysis

The hypothetical model evaluates the influence of independent variables of PE, SI, FC, HM, HB, TR, PA, PR on young people's intention using chatbots in online shopping:

$$Y = \alpha + \beta_1 (PE) + \beta_2 (SI) + \beta_3 (FC) + \beta_4 (HM) + \beta_5 (HB) + \beta_6 (TR) + \beta_7 (PA) + \beta_8 (PR)$$

At the first analysis, the research found that the variable TR (Trust) has the highest VIF coefficient of $2.112 > 2$, causing model multi-collinearity that should be removed from the model linear regression. The second regression results have met the expectations of statistical significance: the Sig < 0.05 , VIF < 2 .

Table 1: Model Summary

| Model Summary | | | | | |
|----------------------------------------------------------|-------|----------|-------------------|----------------------------|---------------|
| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Durbin-Watson |
| 1 | .779a | 0.607 | 0.602 | 0.462 | 1.682 |
| a Predictors: (Constant), PR, SI, PA, PE, FC, TR, HB, HM | | | | | |
| b Dependent Variable: BI | | | | | |

Source: Authors' compilation result (2022)

Based on the Beta coefficient, the study determines the coefficient of impact on the dependent variable with 95% confidence according to the equation. A new regression model result is presented as below:

$$BI = 0.292PE + 0.177PA + 0.151SI + 0.130HM + 0.126HB + 0.105PR + 0.068FC$$

The Adjusted R Square coefficient is 0.602 which means the factors explains 60.2% of the variation of chatbots usage intention in online shopping of Vietnamese youth.

Table 2: Regression Result

| Coefficients | | | | | | | | |
|--------------|------------|-----------------------------|------------|---------------------------|--------|-------|-------------------------|-------|
| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Collinearity Statistics | |
| | | B | Std. Error | Beta | | | Tolerance | VIF |
| 1 | (Constant) | -0.339 | 0.168 | | -2.022 | 0.044 | | |
| | PE | 0.355 | 0.042 | 0.292 | 8.366 | 0 | 0.59 | 1.694 |
| | SI | 0.13 | 0.029 | 0.151 | 4.539 | 0 | 0.647 | 1.546 |
| | FC | 0.081 | 0.04 | 0.068 | 2.015 | 0.044 | 0.622 | 1.607 |

| | | | | | | | | |
|--------------------------|----|-------|-------|-------|-------|-------|-------|-------|
| | HM | 0.131 | 0.036 | 0.13 | 3.669 | 0 | 0.568 | 1.76 |
| | HB | 0.103 | 0.029 | 0.126 | 3.585 | 0 | 0.583 | 1.715 |
| | PA | 0.165 | 0.032 | 0.177 | 5.116 | 0 | 0.601 | 1.665 |
| | PR | 0.109 | 0.032 | 0.105 | 3.399 | 0.001 | 0.75 | 1.333 |
| a Dependent Variable: BI | | | | | | | | |

Source: Authors' compilation result (2022)

From the above analysis, the results of hypotheses testing can be summarized in the following table:

Table 3: The results of research hypotheses testing

| Hypothesis | Expected signal | Actual result |
|------------|-------------------------------------------------------------------------------------------------------------------------|---------------|
| H1 | Performance expectancy has a positive impact on the intention to use chatbots in online shopping of Vietnamese youth. | Accept |
| H2 | Effort expectancy has a positive impact on the intention to use chatbots in online shopping of Vietnamese youth. | Reject |
| H3 | Social influence has a positive impact on the intention to use chatbots in online shopping of Vietnamese youth. | Accept |
| H4 | Facilitating conditions have a positive impact on the intention to use chatbots in online shopping of Vietnamese youth. | Accept |
| H5 | Hedonic motivation has a positive impact on the intention to use chatbots in online shopping of Vietnamese youth. | Accept |
| H6 | Habit has a positive impact on the intention to use chatbots in online shopping of Vietnamese youth. | Accept |
| H7 | Trust has a positive impact on the intention to use chatbots in online shopping of Vietnamese youth. | Reject |
| H8 | Perceived accuracy has a positive impact on the intention to use chatbots in online shopping of Vietnamese youth. | Accept |
| H9 | Perceived risk has a negative impact on the intention to use chatbots in online shopping of Vietnamese youth. | Reject |

Source: Authors' compilation result (2022)

5.1.3. Comparison the differences among demographics

The results of difference analysis of gender, area, age, level of education, major and online shopping frequency are shown in Table 4:

Table 4: Analysis of difference testing results

| | Expected signal | Sig. Levene | Sig. ANOVA | Actual Result |
|----------------------------------|--------------------------------------------------------------------------------------------------------------------------|--------------------|-------------------|----------------------|
| Gender | There is a difference in the intention to use chatbots in online shopping in different gender groups. | 0.236 > 0,05 | 0.025 < 0,05 | Accept |
| Age | There is a difference in the intention to use chatbots in online shopping in different age groups. | 0.295 > 0,05 | 0.619 > 0,05 | Reject |
| Level of education | There is a difference in the intention to use chatbots in online shopping in different levels of education groups. | 0.455 > 0,05 | 0.340 > 0,05 | Reject |
| Major | There is a difference in the intention to use chatbots in online shopping in different major groups. | 0.372 > 0,05 | 0.076 > 0,05 | Reject |
| Online shopping frequency | There is a difference in the intention to use chatbots in online shopping in different online shopping frequency groups. | 0.364 > 0,05 | 0.283 > 0,05 | Reject |

Source: Authors' compilation result (2022)

Table 5: Analysis of difference testing results

| | Expected signal | Sig. Levene | Sig. Welch | Actual Result |
|-------------|-----------------------------------------------------------------------------------------------------|--------------------|-------------------|----------------------|
| Area | There is a difference in the intention to use chatbots in online shopping in different area groups. | 0.010 < 0,05 | 0.000 < 0,05 | Accept |

Source: Authors' compilation result (2022)

5.2. Discussion

5.2.1. Interpretations

The regression analysis illustrates that out of 9 independent variables, there are 7 factors confirmed to have direct impacts on Vietnamese youth's intention to use chatbots in online shopping. In particular, 6 hypotheses including H1, H8, H3, H5, H6 and H4 are accepted, showing that performance expectancy, perceived accuracy, social influence, hedonic motivation, habit and facilitating conditions have positive impacts on the intention to use chatbots in online shopping of Vietnamese youth. H9, however, is rejected, since perceived risk is proven to have a positive relationship, instead of a negative one, with the intention to use chatbots.

The 2 out of 9 factors, including the effort expectation and trust, despite having good reliability, have to be excluded from the model.

Regarding *effort expectation*, this factor's result in Cronbach's Alpha coefficient testing is 0.854, which represents a high level of confidence, but after the first checking of the validity of the scale, this factor was no longer under consideration in this research. The study group eliminated three observational variables belonging to the factor effort expectations including EE1, EE2, EE2 due to the range of differentiation in the rotation matrix with load factor of 0.56 - 0.42; 0.462 - 0.533; 0.505 - 0.442 and load factor difference of less than 0.3, respectively. According to research by Brandtzaeg & Følstad (2017), 41% of those surveyed think ease of use is the main driving force behind their use of chatbots. However, in this study, the factor of effort expectation is not really compatible with the model.

Turning to *trust*, a large number of respondents (83.85%) noted that they have faith in chatbots' ability to provide information and confidentiality, as well as credibility for stores that use chatbots. In addition, the

Trust factor has a very good reliability testing result, which is $\alpha = 0.903$. Despite these, the VIF factor > 2.0 causes poly-linearity, resulting in the factor to be excluded from the linear model.

Considering the 7 remaining factors, the three factors having the most significant impacts on Vietnamese youth's intention to use chatbots in online shopping are performance expectancy, perceived accuracy, and social influence, respectively.

First, it is confirmed in the hypothesis testing that *performance expectancy* has a positive impact on the intention to use chatbots in online shopping of Vietnamese youth (H1). In fact, this factor has the strongest impact on Vietnamese youth's intention to use chatbots in online shopping. The more the consumers perceive chatbots as efficient, productive, and convenient, the more likely that they continue to use chatbots in their online shopping process.

Second, *perceived accuracy* is proven to have a positive impact on the customer's intention to use chatbots when shopping online (H8). It is by far the second biggest factor affecting the chatbots usage intention, as well. According to statistics from the survey group, online shoppers believe that they can know exactly what they intend to buy through the use of chatbots, understand exactly what they intend to consume by exploring through chatbots, and can learn how to use chatbots to get accurate information about products/services.

Third, there is a positive relationship between *social influence* and the intention to use chatbots in online shopping (H3). The encouragement from surrounding people as well as the popularity of chatbots positively affect the intention to use chatbots in online shopping. When the use of chatbots in online shopping is frequently recommended or mentioned by people who are considered by the customers to be closed, or trustworthy, customers will pay more attention to chatbots, which eventually may lead to the increasing use of chatbots when shopping online. In addition to the impacts from important people like family and friends, young online shoppers are also heavily influenced by social media. The rising coverage of information on chatbots in social media such as newspapers, magazines, televisions and social networks can make more consumers become familiar with the use of chatbots in online shopping, resulting in a higher number of people choosing chatbots as a part of their virtual shopping journey.

In addition, *hedonic motivation* also has a positive impact on the intention to use chatbots in online shopping, which has been confirmed in the hypothesis testing (H5). The data suggested that when customers use chatbots to shop on e-commerce platforms, they feel the novelty, fascination and entertainment. The result can be explained by the age of respondents, who were mostly young people between the ages of 16 and 24. For this age group, prior interesting experiences with chatbots in online shopping can make people become less worried about their purchasing decisions, and more motivated to use chatbots in their future online shopping (Dey & Srivastava, 2017) (Basaran & Buyukyilmaz, 2015).

Another factor having a direct and positive impact on the young customer's intention to use chatbots in online shopping is *habit* (H6). This result is similar to the results of Arenas et al. (2015), Kim et al. (2005), Limayem et al. (2007), and Pham et al. (2020). However, the relative difference can be seen in the research results of Jia, Hall, and Sun (2014) when it is assumed that online shoppers are not in the habit of using chatbots to shop when this service has recently appeared. On the other hand, through the study of the author's survey group, the use of chatbots when shopping online has gradually become a habit of customers and they are also used to using chatbots to shop online. In addition, after purchasing or contacting stores with chatbots apps to support shopping, customers become increasingly interested in automated advertising messages, new product information, as well as promotions from chatbots' recommendations.

The *facilitating conditions* also have been proven to positively affect the intention to use chatbots in online shopping (H4), yet the level of impact is the lowest, compared to other factors discussed in this research. It can be inferred that facilitating conditions, such as the acquisition of necessary knowledge to use chatbots when interacting with online stores, the availability of various data sources on chatbots, as well as the compatibility of chatbots with all devices and e-commerce platforms, barely affect the intention of online shoppers to use chatbots. Nonetheless, the facilitating conditions, having a direct relationship with the

behavioral intention, is still one of the important factors affecting the customer's intention to use chatbots. This is similar to the results of research by Alalwan et al. (2015), which proved that facilitating conditions can directly impact the actual use of computers and systems. In addition, the research of Im et al. (2011) showed that when there are many supporting factors associated with the use of a specific technology system, people will be more likely to apply that technology.

Meanwhile, it is rejected that the *perceived risk* has a negative impact on the intention to use chatbots in online shopping of Vietnamese youth. Contrary to the initial hypothesis (H9), perceived risk has a positive relationship with the intention to use chatbots in online shopping. Various predecessor studies have shown that perceived risk has a negative impact on behavioral intent. Forsythe and Shi (2003), for example, proved that the high perceived risk leads to a negative attitude towards chatbots, and, as a result, negatively affects the customer's intention to use chatbots, as well as creates a bad impression about the businesses that use chatbots. Candela (2018) also demonstrated that there is a negative relationship between Perceived risk and consumer attitudes towards chatbots. Compared with the definition of Perceived Risk, the results from the predecessor research are reasonable in terms of reasoning; however, these studies have not focused on a specific age range.

The positive influence of perceived risk on the intention to use chatbots can be explained from the respondents of the study, who were customers between the ages of 16 and 24. As defined by the World Health Organization (WHO), this group of clients includes the youth and the adolescents. In this target group, risk taking and the search for novelty are striking signs of typical behavior (Kelley, 2004). According to Kelley's (2004) study, adolescents seek new experiences and higher levels of arousal, and often engage in risky behaviors without, or with little consideration for, future outcomes or consequences. Dayan et al. (2010), in addition, proved that young consumers generally have shown a higher appetite to take risks.

The use of chatbots itself is a potential source of risks, including personal information leaks, scams, or wasted time (Forsythe and Shi, 2003). These risks bring stimulation, and arouse curiosity to a certain extent, enough to positively influence the customer's intention to use chatbots (Brandtzaeg and Følstad, 2017); however, the impact on the surveyed audience is not too great, since they have become familiar with the use of technology and platforms on the Internet in general (Thomas, 2011).

5.2.2. Theoretical and managerial implications

Regarding theoretical aspects, this study has proposed a modified version of Venkatesh's UTAUT 2 to investigate factors affecting the Vietnamese youth's intention to use chatbots in online shopping of customers on different technology platforms such as websites, mobile applications, social networks and e-commerce platforms. In addition to the original factors from Venkatesh's UTAUT2 model, including performance expectancy, effort expectancy, social influence, facilitating condition, hedonic motivation, and habit (HB), the current study has also added Trust, Perceived Accuracy and Perceived Risk to study their influence on the youth's intention to use chatbots in online shopping. Moreover, the research specifically focuses on Vietnamese consumers who are under the age of 29. This segment is potentially a powerful consumer groups, yet has not been paid enough attention in previous researches on the use of chatbots.

Besides the theoretical implications, this research also has made practical suggestions for businesses in enhancing the customer experience with chatbots in online shopping. Moreover, it is expected to contribute in raising awareness of the safe access and use of technology, as well as a sense of security of personal information for young customers.

a) For businesses

Firstly, it is necessary to continuously improve the effectiveness and benefits of using chatbots in online shopping, as results show that Performance Expectancy has a very positive impact on the intention to use chatbots when young consumers do online shopping

Online businesses should upgrade their chatbot and optimize the information exchange steps taking place between customers and chatbots.

Online businesses also need to continuously consolidate the chatbots' database, enabling chatbots to provide accurate information and to give better recommendations that are tailored to customers' needs. The automation of tasks via chatbots to speed up the customer shopping process also needs to be developed.

Secondly, chatbots need to be better compatible with a wide range of customer platforms and devices. Online businesses may also consider using chatbot solutions on popular social media platforms to effectively reach a group of young people. A friendly and easy-to-understand chatbot script needs to be built with instructions to help users get to know chatbots quickly.

Thirdly, chatbot's presence through media and marketing campaigns should be increased to make chatbots widely popular.

Fourthly, businesses should invest in building a personality for chatbots, which proactively chat with customers and quickly provide flexible answers along with icons, animations, challenges, and games.

Finally, businesses should be transparent about the privacy policy and purpose of collecting customer information and provide verification steps that give customers peace of mind when sharing personal information.

b) For customers

Firstly, customers need to improve their knowledge and be proactive in learning chatbot-related trends to easily access and use chatbots in online shopping, thereby increasing efficiency and experience in online shopping.

Facilitating conditions such as devices and Internet connection should also be ensured to be able to use chatbots effectively.

Secondly, customers who use chatbots in online shopping need to pay attention to the privacy and information-gathering policies, transparency, and reputation of the business, as well as the chatbots service provider.

Customers should also be vigilant and consider carefully before providing personal information, ensuring a secure Internet connection.

5.2.3. Limitations and future research directions

While this study has successfully addressed factors affecting the intention to use chatbots in online shopping of Vietnamese youth, there were several limitations that have to be taken into account.

The first limitation lies in the research sample. The scope of the study is only in Hanoi with most of the study sample coming from the urban area. People living in this area have a higher income and living standard. The level of education of the research subjects is mainly in the group of university level. More than 85% of respondents are in the age group from 18 to 22 years old, about 78% of respondents are women, and the major industries/fields of the research subjects belong to the economic/business group, accounting for 41.8% of the research sample.

Therefore, to enhance the representativeness and generalizability of the study, future researchers need to increase the size of the survey sample. The scope of research should be expanded to many cities and provinces across Vietnam. At the same time, it is necessary to balance the proportion of research samples between urban and rural areas. Further studies also need a wider coverage of the sample in terms of gender, age, education level, and industry.

Secondly, the result indicated that the independent variables only explained 60.2% of the impact on intention to use chatbots of young customers in online shopping, while the remaining 39.8% is due to factors beyond the model.

Future studies can consider other factors such as Technological anxiety, Perceived intelligence, and Anthropomorphism to achieve further understanding and discoveries on this topic.

Moreover, the relationship between perceived risk and the behavioral intention should also be further clarified, concerning the specific situations and research backgrounds.

6. Conclusion

The research shows 7 factors affecting the intention to use chatbots in online shopping of Vietnamese young people, of which three variables including Performance expectancy, Perceived accuracy and Social influence are the three strongest factors respectively, followed by Hedonic motivation, Habit, Perceived of risk, and Facilitating conditions. It can be seen that young customer's mindset about the use of chatbots in online shopping has been quite elevated during the dramatic rise of digital shopping platforms, especially since the Covid-19 pandemic.

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FACTORS EFFECT ON THE PRO-ENVIRONMENTAL BEHAVIOR IN THE WORKPLACE IN HA NOI, VIETNAM

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ABSTRACT

Pro-environmental behavior in the workplace has been a topic of interest in recent years. Based on theoretical overview and in-depth interview method, the authors propose a research model on factors affecting pro-environmental behavior in the workplace in Hanoi, Vietnam. Research results show that the impact of factors such as environmental concern, habits, attitudes, personal norms, social norms, injunctive norms, descriptive norms, intrinsic motivation, extrinsic motivation and work satisfaction. Besides, after in-depth interviews, the authors have found out a new factor suitable for the Vietnamese context such as perceived behavioral control that also affects pro-environmental behavior in the workplace.

Keywords: pro-environmental behavior in the workplace; intrapersonal factors; interpersonal/social factors, motivational factors, perceived behavioral control, Hanoi city.

1. Introduction

In recent years, pollution and climate change are the main concern in every organization and every country. According to data of Ministry of natural resources & environment, common industrial solid waste is emitted into environment about 25 million ton and 800.000 ton of hazardous solid waste is discharged every year in Vietnam. With global warming on the increase and species and their habitats on the decrease, chances for ecosystems to adapt naturally are diminishing thus causing many to agree that climate change is one of the greatest threats facing the planet. Human conduct is responsible for most of this environmental damage, as the Intergovernmental Panel of Climate Change (IPCC) has revealed. Climate change, according to the IPCC, is produced by internal processes, external influences, or persistent human alterations. While natural reasons such as continental drift influence the flow of ocean currents, external causes include cosmic radiation, solar flares, and changes in the earth's orbit. However, the most crucial point is that anthropogenic (human) behavior has a considerable impact on climate change. In addition, governments, communities, and academics have recognized the critical role that businesses and their employees play in tackling climate change. Understanding pro-environmental behaviors (PEB) in the workplace, such as recycling, waste management, energy consumption reduction, or any other behavior that consciously seeks to minimize the negative impact of one's actions on the environment, is one way to reduce the impact of organizations on the environment.

From now, there are many studies on pro-environmental behaviors in the workplace in countries around the world. These studies have been conducted to investigate the factors affecting pro-environmental behaviors in Asian countries such as: Thailand (Afsar et al., 2016), Pakistan (Afsar and Umrani, 2019) or European country like: The Netherlands (Blok et al, 2015); and the Americas: USA (Azhar, 2012), etc... These studies show the factors affecting behavior for the environment and provide some solutions related to the context in countries around the world. However, in the context of developing countries with transitional economies such as Vietnam, there are no studies that focus on pro-environmental behavior in the workplace in Vietnam. Therefore, this study plays a crucial role in determining the causes, consequences and providing solutions to encourage pro-environmental behaviors in the workplace with the context in Vietnam.

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This study aims to investigate pro-environmental behavior in the workplace in Hanoi, Vietnam. Therefore, three main points will be investigated as (i) review the theoretical pro-environmental behavior in the workplace; (ii) develop a research framework for pro-environmental behavior; (iii) determine the impact of factors that affect pro-environmental behavior in the workplace.

2. Theoretical framework

2.1. Pro-environmental behavior in the workplace

Pro-environmental behavior refers to behaviors that contribute to the sustainability of the natural environment (Schultz and Kaiser, 2012). Furthermore, pro-environmental behavior can be defined as a set of actions used consciously and altruistically to protect the environment by taking measures to minimize negative impacts on the environment or by taking steps to improve the environment (Stern, 2000; Kollmuss and Agyeman, 2002; Steg and Vlek, 2009; Onel and Mukherjee, 2016).

In an organization context, pro-environmental behavior is defined as “the behavior of an employee to reduce the negative impact on the built environment through his or her actions at the workplace” (Kollmuss and Agyeman, 2002).

Examples of pro-environmental behavior in the workplace were mentioned by Saifulina et al. (2020) such as recycling paper, printing on both sides when possible, helping colleagues when environmental issues arise, raising environmental awareness among colleagues, participating in projects or events that address environmental issues, suggesting practices to improve environmental performance of the organization, conserving everyday used resources such as water and electricity and turning off lights when not in use.

2.2. Behavioral intention

The theory of reasoned action (TRA) holds that a person's behavior is determined by their intention to perform the behavior and that this intention is a function of their attitude towards the behavior.

According to Theory of Reasoned Action (TRA), the stronger the intention, the greater the motivation to perform the behavior, leading to a higher likelihood of the behavior being performed. Based on the “Theory of Planned Behavior” (Ajzen, 1991), successor of TRA, behavioral intention is the most influential predictor of behavior, advocated by Armitage and Conner (2001). Currently, the intention hypothesis to positively influence behavior has been demonstrated in many research fields, such as education, health, marketing, and communication. It is also used in the analysis of pro-environmental behaviors, for example, renewable energy use (Bang et al., 2000), recycling (Davies et al., 2002), intention to purchase electricity (Bang et al., 2000; Nosi et al., 2017), and buying organic food (Yazdanpanah and Forouzani, 2015). Therefore, the authors propose the following hypothesis:

H1: Intention has a positive influence on pro-environmental behavior in the workplace.

2.3. Intrapersonal factors

2.3.1. Environmental concern

According to Dunlap and Jones (2002), environmental concern can be defined as the awareness or insight that the natural state of the environment is threatened through resource overuse and pollution by humans. It is sometimes expressed in terms of the new environmental (or ecological) paradigm (NEP), which also expresses people's pro-environmental orientation (Sanchez and Lafuente, 2010). At the low end of environmental concern, people may not be concerned at all about the environment, and at the high end, people may be totally concerned about the environment (Mostafa, 2007).

Dietz and Stern (2002) suggest that previous interventions improve people's knowledge and reinforce their concern with energy issues to encourage energy-saving behavior. Environmental concern (EC) refers to the willingness of people to recognize and assist in solving ecological problems. This is an important factor influencing people's decision-making about environmental protection (Li et al., 2020).

According to the study of Abrahamse et al. (2020), people with higher environmental concerns are more likely to engage in energy-saving behaviors. Another study by Ek and Soderholm (2010) in Sweden

also supports the idea that concern for the environment is an important motivating factor for people to adopt energy-saving behavior. With the above arguments, the authors propose the following hypothesis:

H2: Environmental concern has a positive influence pro-environmental behavior on the intention in the workplace.

2.3.2. Attitude

According to the theory of reasoned action, attitude is one of the important factors that determines behavior and refers to a person's feelings towards a particular behavior (Ajzen et al., 2007). For various social behaviors, attitudes play a role in the individual's moral evaluation of the behavior (Lo et al., 2012).

Tudor et al. (2008) indicated that attitude is the main factor at the individual level that affects pro-environmental behavioral intention in the workplace. Employees form environmental attitudes in their private lives (Temminck et al., 2013), as well as in their work (Anderson et al., 2012). This result is also supported and agreed by many other authors (Bamberg, 2003; Muster and Schrader, 2011). The authors propose the following hypothesis to confirm the relationship between these two factors:

H3: Attitude has a positive influence on the pro-environmental behavioral intention in the workplace.

2.3.3. Habit

According to Matthies and Klockner (2012), habit describes how actions are repeated, have become relatively stable and accepted, and manifest as a pattern of choosing behavior.

Habit refers to both behavioral routines and behavioral automaticity. Therefore, they are the key predictors of pro-environmental behavior in the workplace. Habitual behavior is better addressed through strategies such as implementation intention, a strategy that regularly reminds employees to reflect consciously on their behavior that they generally do automatically (McDonald, 2014). Research by Steg and Vlek (2009), Stern (2000) on pro-environmental behavior in the workplace all suggest that positive habits can significantly promote environmental behaviors. With the above arguments, the authors propose the following hypothesis:

H4: Habit has a positive influence on the pro-environmental behavioral intention in the workplace.

2.3.4. Awareness

According to Madsen and Ulhoi (2001), environmental awareness refers to the employee's level of understanding, concern about the environment, and the ability to bring about positive change in the environment by changing behavior and awareness of environmental problems.

Saricam and Sahin (2015) found that environmental awareness directly affects environmental attitudes. Employees who are aware of their organization's waste management practices have more positive attitudes toward pro-environmental behavior in their organization (Tudor et al., 2008). Therefore, the authors would like to propose the following hypothesis:

H5: Awareness has a positive influence on the pro-environmental behavioral attitude in the workplace.

2.3.5. Personal norms

According to Blok et al. (2015), personal norms represent one's own beliefs on how to act. TPB shows that personal norms play an important role in shaping an individual's actual behavior (Ajzen, 1991).

With regard to pro-environmental behavior, Borgstede and Biel (2002) found that personal norms are related to the expectations people have with regard to pro-environmental behavior. Similarly, Nordlund and Garvill (2002) found that personal norms could be viewed as an important general predisposition to act pro-environmentally. Various studies have shown a positive correlation between pro-environmental behavior and personal norms (Bamberg and Schmidt, 2003; Bratt, 1999; Fornara et al., 2011; Harland et al., 2007;

Matthies et al., 2012; Ramayah et al., 2012; Stern et al., 1999; Thøgersen 1999). Therefore, the authors propose the following hypothesis:

H6: Personal norms have a positive influence on the pro-environmental behavioral intention in the workplace.

2.4. Interpersonal/Social factors

2.4.1. Social norms

Social norms represent the group-shared beliefs about how members of the group should act and behave. They are perceived to be enforceable through reward or punishment (Thøgersen, 1999). Social norms can regulate and govern behaviors through an individual's perceived probability of punishment for noncompliance and reward for compliance (Schwartz and Howard, 1981). This factor stimulates pro-environmental actions "in some contexts, for some behaviors, and for some individuals" (Schultz, 2014).

In research by Zhang et al., (2018), social norms are considered to reflect perceived social pressures about performing or not performing a particular behavior. Accordingly, these norms play an important role as a strong motivator for employees in the work environment to choose whether to litter and to recycle (Hartley et al., 2018). Therefore, the authors would like to propose the following hypothesis:

H7: Social norms have a positive influence on the pro-environmental behavioral intention in the workplace.

2.4.2. Descriptive norms

Descriptive norms are defined by Bamberg and Moser (2007) as an individual's perceptions of the most appropriate behaviors displayed by others.

Motivation to engage in pro-environmental behavior should be heightened when people perceive more positive pro-environmental descriptive norms compared to when people perceive less positive pro-environmental descriptive norms. If this is the case, then pride about prior good environmental behavior or guilt about prior poor environmental behavior will be more strongly associated with subsequent pro-environmental behavior because pro-environmental descriptive norms will motivate people to want to conform to the norms (Bissing et al., 2016).

Manning (2009) and Thøgersen (2006) also found that descriptive norms were stronger predictors of pro-environmental behaviors. From the above analysis, the research hypothesis proposed by the authors is:

H8: Descriptive norms have a positive influence on the pro-environmental behavioral intention in the workplace.

2.4.3. Injunctive norms

Injunctive norms reflect an individual's beliefs about what behaviors others morally approve or disapprove of (Cialdini et al., 1990). According to Rubel et al., (2021), pro-environmental behavior affects employees with a strong message through injunctive norms, and guides the organization's commitment to environmental activities without any ambiguity. Furthermore, employees who observe others in valuing and practicing green behavior would find them working amidst green colleagues following descriptive norms of influencing behaviors. Even when individuals care little about the consequences of violating the norm, they can still act for the environment because they care about the consent or disagreement of others. Thus, injunctive norms are more influential in the presence of others (i.e. the public context) and behavior can be observed (Nettle et al., 2013; Raihani and Bshary, 2012). Therefore, to clarify this issue, the authors propose the following hypothesis:

H9: Injunctive norms have a positive influence on the pro-environmental behavioral intention in the workplace.

2.5. Motivational factors

2.5.1. Intrinsic motivation

According to Deci and Ryan (2000), intrinsic motivation is the self-desire for a certain behavior, or “to seek out new things and new challenges, to analyze one's capacity, to observe, and to gain knowledge” with enjoyment.

In addition, intrinsic motivation has a positive impact on pro-environmental behaviors at work and even not at work (Azhar, 2012). It mediates the relationship between environmental self-recognition and environmentally friendly behavior (Van et al., 2013). Accordingly, the authors propose the following hypothesis:

H10: Intrinsic motivation has a positive influence on the pro-environmental behavioral intention in the workplace.

2.5.2. Extrinsic motivation

Extrinsic motivation refers to the result of environmental incentives (or punishments) apart from an activity itself (Deci and Ryan, 2000). Extrinsic motivation is when we are motivated to perform a behavior or engage in an activity because we want to earn a reward or avoid punishment (Tranquillo and Stecker, 2016).

This perspective on extrinsic motivation is especially relevant here, as firms wish to indicate that they respect employee contributions in the environmental arena and want employees to engage in a quest for innovative solutions to environmental problems on their own (Kim et al., 2016). From the above analysis, the research hypothesis proposed by the authors is:

H11: Extrinsic motivation has a positive influence on the pro-environmental behavioral intention in the workplace.

2.5.3. Work satisfaction

When employees are satisfied with their job, they are more likely to engage in pro-environmental behavior at work (Biga et al., 2012). Paillé and Boiral (2013) confirmed that job satisfaction indirectly influences environmental behavior at work in the unique setting of the organization. According to Paillé and Mejía-Morelos (2014), there is a positive association between job satisfaction and environmental behaviors. Accordingly, the authors propose the following hypothesis:

H12: Work satisfaction has a positive influence on the pro-environmental behavioral intention in the workplace.

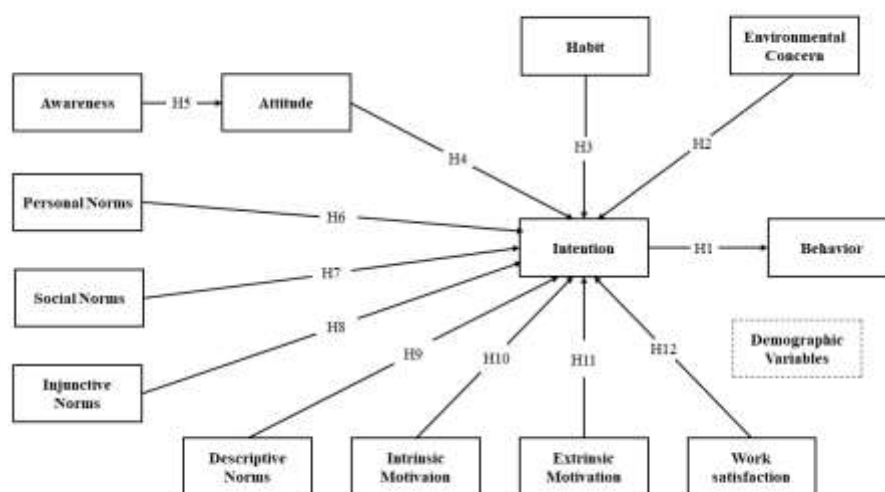


Figure 1. Pro-environmental behavior in the workplace research modal

Source: Authors complied

3. Research method

The authors used the qualitative method - in-depth interviews to check the suitability of the factors in the proposed research model in the Vietnamese context. The participants in the in-depth interviews are those who are working at organizations, companies and enterprises in Hanoi city - Vietnam, meeting the diverse requirements of demographics in order to achieve the target research.

Firstly, understanding the actual situation, and identifying the factors that affect pro-environmental behavior in the workplace.

Secondly, testing the adaptability of the proposed factors after reviewing the research works to screen out the factors that do not meet the requirements. In addition, discovering new factors if possible based on the opinion of survey participants.

The authors conducted in-depth interviews with 12 people with different demographic characteristics (age, gender, education level, monthly income).

Qualitative research by in-depth interview method was conducted over a period of about one week from April 1, 2022 to April 8, 2022 through face-to-face meetings and online media with an average duration of one interview 35 minutes. The interview questions were designed by the authors with the interview content focusing on the factors affecting pro-environmental behavior in the workplace.

Table 1. Characteristics of participants interviewed (n=12).

| Demographics Variables | | Frequency | Percent (%) |
|------------------------------|------------------------|-----------|-------------|
| Age | Old (56 and older) | 3 | 25 |
| | Middle-aged (35 - 55) | 4 | 33,3 |
| | Young (18 - 35) | 5 | 41,7 |
| Gender | Male | 5 | 41,7 |
| | Female | 7 | 58,3 |
| Education level | High school graduation | 3 | 25 |
| | University | 7 | 58,3 |
| | Above university | 2 | 16,7 |
| Monthly income (million VND) | <6 | 2 | 16,7 |
| | 6 - 10 | 3 | 25 |
| | 11 - 15 | 3 | 25 |
| | 16 - 20 | 2 | 16,7 |
| | 21 - 30 | 1 | 8,3 |
| | >30 | 1 | 8,3 |

Source: Authors complied

4. Results and discussion

4.1. Results

In our research, the authors did qualitative research as well as collected information from twelve employees at enterprises in Hanoi through an in-depth interview. When asked about environmental behavior at work, ten out of twelve participants believe that they have pro-environmental behaviors in the workplace.

The employees who joined in the in-depth interviews indicated that there are several factors affecting their pro-environmental behavior in the workplace.

4.1.1. Intrapersonal factors

The interview results illustrate that those who agree that pro-environmental behavior in the workplace is necessary have a habit of protecting the environment at work and this is considered a behavior and this is considered a conditional behavior. Beside that, the interviewees also think that most of their colleagues have attitude as well as habits related to pro-environmental behavior in the workplace. Some of the responses collected are as follows:

- *I am in favor of behaving pro-environmentally in the workplace. (Female, 28 years old)*
- *I consider waste a major issue at work. (Male, 26 years old)*
- *In the workplace, I usually reuse items such as water bottles, paper, plastic, office supplies, etc. (Female, 59 years old)*

However, besides the idea that habits have a positive effect on intentions and behaviors, there are some people who have opposite perspectives. They think that their habits like saving electricity, using recycled utensils, ... are not pro-environmental behaviors as they believe that these will affect comfort and quality of their life.

In addition, regarding in-depth interview results, when asked about the influence of personal norms on the intention to perform pro-behavior in the workplace, the interviewees all share that personal norms have a significant effect on the intention to carry out the behavior. A response is collected as follows:

- *I personally feel it is important that I behave in environmentally responsible ways. (Female, 20 years old)*

4.1.2. Interpersonal/Social factors

In this study, it has also shown that social norms and injunctive norms also affect intention and behavior. About ten participants agreed that they have pro-environmental behavior in the workplace because of social norms and injunctive norms while others do not agree with these opinions. Meanwhile, the respondents totally believed that descriptive norms influence pro-environmental behavior in the workplace. Some of the responses collected are as follows:

- *I am influenced by the environmental behavior of my colleagues. For example, when I see them plant trees or use reusable eating utensils, I also learn. (Male, 57 years old)*
- *Some colleagues around me do recycle but sometimes I find it quite inconvenient. (Female, 19 years old)*

4.1.3. Motivational factors

When it comes to motivational factors including intrinsic motivation, extrinsic motivation and work satisfaction, most perspectives believed that these had a positive impact on pro-environmental behaviors in the workplace, however, the others said that these factors had not been popularized and significant. Therefore, it could not have a remarkable impact on a part of the citizens. These opinions only came from personal knowledge. The reason for this may be that in Vietnam, motivational factors have been paid much attention to or managers in enterprises have not been able to create more motivations for employees to act for the environment. Some of the responses collected are as follows:

- *A clean and green working environment helps me to have a good spirit to be creative and work more effectively, that's why I choose to get actively involved in environmental protection at work. (Female, 45 years old)*
- *My family and colleagues encourage me to protect the environment. (Female, 19 years old)*

- *My current job is my previous orientation. Satisfaction with my current job makes me joyful and motivated to carry out pro-environmental behaviors in the workplace. (Male, 32 years old)*
- *I hope the company has policies or action plans to encourage all employees to engage in environmentally friendly behaviors. (Female, 60 years old)*

4.1.4. A new factor discovered

A new factor discovered by the authors during the research process was perceived behavioral control. The respondents believe that perceived behavioral control is one of the factors that affect pro-environmental intention in the workplace. Some of the responses collected are as follows:

- *I could easily do pro-environmental behavior in the workplace if I want. (Male, 24 years old)*
- *For me, doing pro-environmental behavior in the workplace is extremely difficult. (Female, 50 years old)*

Perceived behavioral control is defined as a person's perception of how easy or difficult it is to perform a behavior and how much control that person has over the achievement of goals from a particular behavior (Ajzen, 1991). Perceived behavioral control was found to be the most important factor in influencing environmental workplace intention behavior among employees (Razak et al., 2019).

The findings from Blok et al. (2015) support that perceived behavioral control has a significant and positive effect on pro-environmental intention behavior. The review was done by Hasan, Harun and Hock (2015) and Mahmud and Osman (2010) concerning various behavioral criteria that had mentioned similar findings. Moreover, many studies (Albayrak, Aksoy, & Caber, 2013; Mahmud & Osman, 2010) have shown that perceived behavioral control is positively linked with pro-environmental behavior.

Based on the results of in-depth interviews and the above theories, the authors decided to add the perceived behavioral control factor to the research model with the following hypothesis:

H13: Perceived behavioral control positively affects the pro-environmental behavior intention in the workplace.

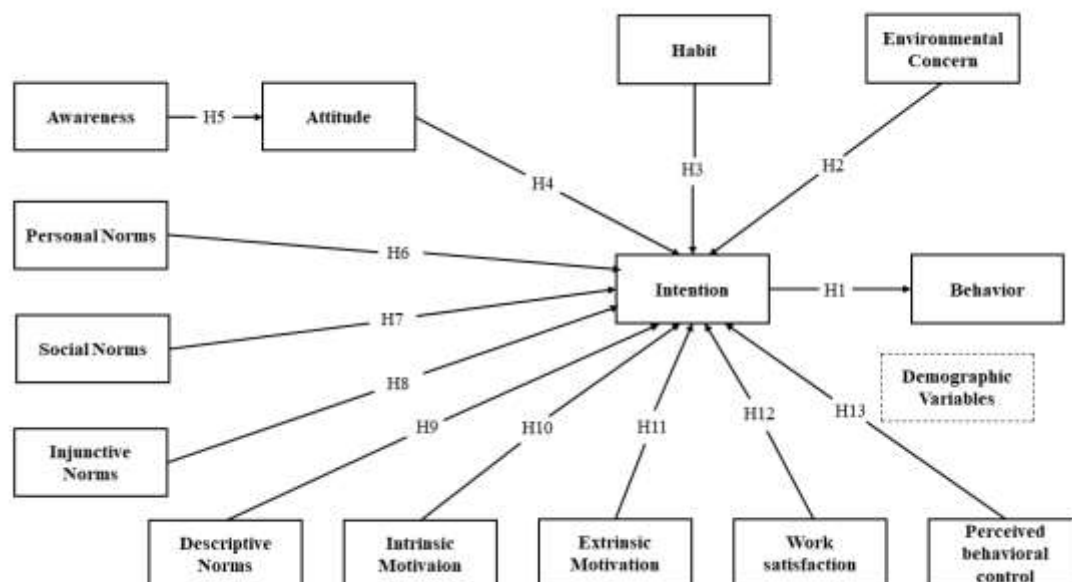


Figure 2. Pro-environmental behavior in the workplace official research modal

Source: Authors complied

4.2. Discussion

Based on the research overview and in-depth interview results, the authors propose a model to study the factors affecting the intention and behavior for the environment in the workplace of workers in Vietnam. After the qualitative research process, the research results shown that the impact of factors such as environmental concerns, habits, attitudes, personal norm, social norm, injunctive norm, descriptive norm, intrinsic motivation, extrinsic motivation, work satisfaction all have a positive influence on pro-environmental intention and behavior in the workplace. In addition, the authors have found a new factor that is relevant to the Vietnamese context, which is perceived behavioral control, which also affects employees' behavior. The authors believe that future researchers should apply the official research model and combine it with quantitative methods to accurately determine the degree of impact of each factor on pro-environmental intention and behavior in the workplace of employees at enterprises in Vietnam, thereby proposing appropriate solutions for decision-makers to promote pro-environmental intentions and behaviors in the workplace.

5. Conclusion

The main contribution of this research is to synthesize the factors that directly affect pro-environmental behavior in the workplace. From there, the authors propose a research model on pro-environmental behavior in the workplace in Hanoi, Vietnam. The study highlights the findings as well as proposes new factors that affect the environmental behavior in the workplace of workers in Hanoi. The findings include distinctions between intrapersonal factors, interpersonal/social factors and motivational factors. Finally, this study was conducted with the desire to improve environmental behavior in the workplace in Hanoi, thereby improving the quality of the environment in Hanoi in particular as well as in Vietnam in general.

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EXAMINE THE IMPACT OF FINANCIAL CONSTRAINTS ON FIRM PERFORMANCE OF ENTERPRISES LISTED ON THE HO CHI MINH STOCK EXCHANGE IN THE CONTEXT OF THE COVID – 19

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ABSTRACT

Covid – 19 epidemic happens complicatedly not only in Viet Nam but also in every single corner of the world. This pandemic has derived negative impacts on domestic and foreign economies as well as different market participants including firms, especially the firms' financial accessibility. There exist many studies researching financial constraints, yet no prior study addresses financial constraints and firm performance with Covid - 19 in Viet Nam until now, leaving room for further research. Regarding this, our study aims to investigate the impact of financial constraints on the performance of the firms listed on the Ho Chi Minh Stock Exchange in the context of the Covid-19. To examine the impact of the financial constraints on firm performance, we analyzed 298 enterprises listed on the Ho Chi Minh Stock Exchange from the first quarter of 2019 to the last quarter of 2021 with the KZ Index being used as a measure of financial constraints. The research findings reveal a negative relationship between financial constraints and firm performance after the emergence of Covid – 19 happened. Additionally, by grouping enterprises into three main groups by size, the paper discovers that the performance of small and medium-sized enterprises is more affected by financial constraints than large enterprises during Covid – 19. These interesting results are eventually utilized to produce some useful suggestions to improve the performance of the listed firms in Vietnam.

Keywords: financial constraints, firm performance, firm size, Covid – 19, pandemic

1. Introduction

The unprecedented economic crisis stemming from the Covid – 19 has been seriously affecting all aspects of life, causing extremely heavy damage to global economic activity. According to Gita Gopinath, chief economist of the IMF, "The cumulative loss of Covid-19 to global GDP in 2020 and 2021 could be around US\$9 trillion, larger than the size of the German and Japanese economies combined" (IMFBlog, 2020). From a company's perspective, the outbreak of the Covid-19 pandemic has caused global stock market indices to plunge at an unprecedented rate (Baker et al., 2020), erasing nearly a third of its value in just a few weeks, and affecting industries across a broad scale, this reflects the expected losses in the business sector of the companies (Didier et al., 2020). The efficiency of operations, revenues, and investment scale of companies also showed a significant decrease, especially for companies operating in the region and industries that are seriously affected such as tourism, transportation, restaurants, hotels, and construction, ... (Shen et al., 2020).

Although there have been empirical studies on the factors affecting the financial stress of economic crises for businesses in the past. However, empirical studies on the factors affecting the financial stress of the economic crisis caused by the Covid-19 pandemic are still limited and especially there are no experimental studies in Vietnam. Meanwhile, in the face of the impact of the economic crisis stemming from the Covid-19 wave in Vietnam, only in the first 10 months of 2020, the number of companies suspending business activities with a term increased by nearly 58.7% compared to the same period in 2019. Especially companies

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operating in industries such as transportation, real estate, construction and consumer services (restaurants, hotels, amusement parks), education, and training (General Statistics Office, 2020). Dao and Christopher's research (2020) shows that the daily increase in the number of Covid-19 cases in Vietnam will reduce stock returns on the Ho Chi Minh Stock Exchange and the Ha Noi Stock Exchange can see that Vietnam is one of the countries that has been well controlling the epidemic situation, however, the epidemic control policies set by the Government inadvertently create great pressures and barriers to the operation of companies and this can lead to a serious decrease in revenue, The scale of the investment, ... especially during the period of border closure, social isolation in April 2020. Meanwhile, companies still have to pay the necessary costs to maintain production and business operations, meeting the financial obligations due.

Therefore, assessing the impact of financial restrictions on businesses listed on the Ho Chi Minh Stock Exchange, especially during difficult time like the Covid – 19 is really necessary, to help businesses find clear linkage between their financial restrictions and performance. This then could help them to make financial decisions that are reasonable to the actual situation of the business in the future – What is the impact of financial constraints on firm performance?

The research paper is divided into 4 parts: The introduction, showing the rationale of the research; The theoretical framework provides background theories and discussion on past literature to clearly the research gap of this study; the method, model, and research data sections, the authors offered theoretical model tests, using statistical tools to test hypotheses, conducting data-driven analysis of 298 companies from Q1/2019 to Q4/2021. In conclusion, the authors will draw conclusions to improve the performance of enterprises.

2. Theoretical framework

2.1. The definition of financial constraints

Although there has been quite a lot of research since the 20th century on the theory of financial constraint, there has not been a consensus on giving a clear definition of this term. However, most views are that financial constraints occur when the company is difficult to accept with outside sources of funding.

Kaplan and Zingales (1997) argued that a firm is financially constrained if the available costs of external funding prevent firms from making investment decisions and force firms to choose to do available internal capital.

An enterprise is considered financially constrained when there is a gap between the internal and external costs of capital. Firms are more financially constrained when the gap between the cost of internal capital and the cost of external capital is larger. An enterprise has little or no financial constraint when it has many liquid assets and a large net worth.

Thus, it can be seen that financial constraints are financial difficulties, affected by factors inside or outside the company, affecting important decisions and business performance of that enterprise.

2.2. The measure of financial constraints

In previous studies, financial constraints were identified through different quantities. The research team would like to present some common criteria for determining financial constraints as follows:

Enterprise size

Firm size is one of the most commonly used tools to measure financial constraints (Devereux and Schiantarelli (1990), Oliner and Rudebusch (1992), Gayane Hovakimian (2009)). Small companies tend to be financially constrained by the company's vision or strategy, which can be more affected by information asymmetries, low collateral, and higher bankruptcy risk. Large companies are less affected by the problem of asymmetric information, and have little difficulty in increasing debt due to high collateral value and low risk of bankruptcy, thereby minimizing the impact of financial constraints.

Cash flow

Fazzari and coworkers (1988) showed that firms that are not financially constrained can easily mobilize external sources to finance their investments. In contrast, for financially constrained firms, there is a sensitivity between free cash flow and operating activity.

Dividend

Steven M. Fazzari, R. Glenn Hubbard, and Bruce C. Petersen (1988) defined financially constrained firms based on their dividend-to-earnings ratios. The lower this ratio, the lower the liquidity, which is a feature of financial constraints, these businesses pay low dividends to retain a large enough internal fund to refinance the investment.

Credit rating of bonds, commercial paper

Most bonds and commercial papers of financially constrained enterprises are not rated as the criterion for classifying financially constrained enterprises, selected by Whited (1992), Gilchrist and Himmelberg (1995)

Liquidity

Almeida, Campello and Weisbach (2004) used a model of solvency. A business that holds less cash is likely to have more financial constraints. They explain that a company's cash policy can be used to classify financial constraints. When internal funds are not sufficient to finance all investment opportunities, the company must forgo some projects to be able to finance the opportunities and hedge against future risks.

Several indicators are used to measure financial constraints

Z - Score

Z - Score was introduced in 1968 by Edward I. Altman. In early tests, this index correctly predicted 72% of a company's bankruptcy. In the years that followed, a series of follow-up tests were tested and by 1999, 80-90% of bankruptcies were predicted thanks to the Z - score one year before bankruptcy and fraudulent reporting. Finance is also forecasted thanks to this indicator.

Cleary (1999) grouped the research data based on Altman's Z - Score and concluded that the investment sensitivity to cash flow is higher for less financially constrained firms than for firms. financial constraints.

Formula: $Z - Score = 0.012X1 + 0.014X2 + 0.033X3 + 0.006X4 + 0.999X5$

where,

X1 = ratio of net working capital to total assets with:

networking capital = current assets - current liabilities

X2 = ratio of retained earnings to total assets

X3 = ratio of earnings before interest and taxes (EBIT) to total assets

X4 = ratio of the market value of equity (market capitalization) to total liabilities

X5 = ratio of net sales to total assets

Accordingly:

Z - Score < 1: businesses with many financial constraints

Z - Score > 1: businesses with little financial constraints

WW - index:

Formula: $WW = -0.091CFit - 0.062DIVPOSit + 0.021TLTDit - 0.044 LNTAit + 0.102ISGit - 0.35Git$

where,

DIVPOS = 1 if the company pays cash dividends

DIVPOS = 0 for the rest of the cases

TLTD = ratio of long-term debt and total assets

LNTA = log (total assets)

ISG = industry revenue growth of over 100%

Whited and Wu (2006) identified financial constraints through the WW index, in which the higher the WW, the more likely the business is to be financially constrained.

KZ index:

Formula: $KZ \text{ index} = -1.001909 \times \text{Cash Flows} / K + 0.2826389 \times Q + 3.139193 \times \text{Debt} / \text{Total Capital} - 39.3678 \times \text{Dividends} / K - 1.314759 \times \text{Cash} / K$

where,

K = Net tangible asset value

Q = (Market capitalization + Equity) / Equity

Debt = Total debt

Cash = Money and short-term investment

The KZ index is the most common measure of the financial constraints of businesses. Kaplan and Zingales (1997) determined the financial constraints of enterprises through the KZ index, based on the comparison of investment capital needs with the available internal capital of enterprises. This group of authors provided a model to calculate the KZ index based on Tobin's Q variables, the higher the debt ratio, the dividend payout ratio, and the higher the number of cash holdings KZ, the more financially constrained the firm is. and vice versa.

In the scope of research data collected on companies listed on the Ho Chi Minh Stock Exchange, we use the KZ index to determine the degree of the financial constraint of the business.

2.3. The factors affecting the financial constraints of enterprises

Laeven (2002) pointed out that information asymmetry caused serious financial constraints for Korean businesses in the period 1991 to 1997. Government policies contributed to facilitating or making it difficult for Korean enterprises in raising investment capital.

John R. Graham, Solani Hazarika, and Narasimhan (2011) studied the factors affecting insolvency and leading to financial constraints during the period from 1926 to 1938 (the period of crisis) and from 2008 to 2009 (the normal period). With data from 443 non-financial companies, by logistic regression method, the author determined that the factors affecting this stress probability are concentrated at the micro-level and the financial ratios of enterprises including market value to book value, return on equity, price volatility, operating profit, firm size, debt-to-total assets ratio, corporate credit rating, business investment, liquidity through financing ratio, corporate life expectancy.

Pham Thi Hong Van (2015) studied and measured the financial constraints of companies listed on the stock market using the Binary Logistic Regression model to measure the likelihood of financial constraints of joint-stock companies listed on the stock market of Vietnam through a panel dataset with 606 enterprises in the period 2010-2015. The study identified the factors affecting corporate financial constraints including current ratio, debt ratio, and firm size, and proposed a financial distress forecasting model with an overall correct prediction rate of 92.74%.

Writing about Factors affecting the likelihood of financial constraints in companies listed on Vietnam's stock market, Dinh Khanh Nam (2022) found the factors that affect the probability of financial constraints occurring. Financial restrictions on companies listed on the Ho Chi Minh City Stock Exchange and Hanoi Stock Exchange in the period from 2013 to 2020. The author used secondary data from 623 listed companies. The research results showed that the model had three factors affecting the likelihood of financial constraints in enterprises, including LEV (Financial Leverage), SIZE (Company Size), and WC (the ratio of networking capital to short-term assets). On that basis, the author makes some recommendations for listed companies when they are "falling into financial constraints" and "can avoid the possibility of financial constraints" [22].

2.4. The impact of financial constraints on business operations

Most of the previous empirical studies showed that financial constraints have a significant effect on the sensitivity of firms' investment decisions. Meyer and Kuh (1958), in the article "The Investment Decision - An Empirical Study", studied the factors affecting the firm's decision when buying fixed assets with 600

companies in the US during the period 1946 to 1950, showed the importance of financial factors to the company's investment decisions, prioritizing the use of internal cash flow for investment decisions and timing. The point of making investment decisions is influenced by the availability of internal capital. Barran and Peeters (1998) showed that investment decisions are influenced by the financial position of firms in Belgium. Kadapakkam and coworkers (1998) found a relationship between investment and internal fund availability through a survey of 6 OECD countries (USA, Canada, Germany, UK, France, and Japan).

Fazzari and coworkers (1988) showed that investments in financially constrained firms are more sensitive to cash flow than in less constrained firms. Meanwhile, research by Kaplan and Zingales (1997) suggests that firms with less financial constraints are more sensitive to cash flow investments than firms with more financial constraints.

Bougheas and coworkers (2003) found that R&D investment decisions are significantly influenced by financial constraints in Ireland.

Campello and coworkers (2010) surveyed CFOs around the world and pointed out that financially constrained businesses often limit their spending on high technology as much as possible.

Table 1.1. Measures of financial constraints used in the literature

| Paper | Measure of Financial Constraints |
|------------------------------------------------------------------|------------------------------------------|
| Foreign Research | |
| Cleary (1999) | Z – Score |
| Steven M. Fazzari, R. Glenn Hubbard, và Bruce C. Petersen (1988) | Dividends over capital stock |
| Fazzari et al. (1988) | Cash flow |
| Devereux và Schiantarelli (1990) | Size |
| Oliner và Rudebusch (1992) | Size |
| Whited (1992) | Credit rating of bonds, commercial paper |
| Gilchrist và Himmelberg (1995) | Credit rating of bonds, commercial paper |
| Kaplan and Zingales (1997) | KZ Index |
| Almeida, Campello và Weisbach (2004) | Liquidity |
| Whited và Wu (2006) | WW – Index |
| Gayane Hovakimian (2009) | Size |
| Domestic Research | |
| Phạm Thị Hồng Vân (2015) | Model Binary Logistic Regression |
| Đinh Khánh Nam (2022) | Model Binary Logistic Regression |

Source: Authors' estimations

2.5. The research gap

Previous domestic and foreign studies have analyzed and given general theoretical generalizations about financial constraints, the relationship between financial constraints, and factors such as investment, bank debt... However, there are not many studies using KZ to measure how financial constraints affect the business activities of enterprises in Vietnam. In particular, in unforeseen changes that seriously affect the economy such as the Covid – 19, businesses face many difficulties in accessing new capital.

Therefore, during the research process, we found a gap in research on the impact of financial constraints on the business performance of companies listed on the Ho Chi Minh Stock Exchange is huge. Therefore, we hope that this will be a practical study on how financial constraints affect businesses, aiming to deepen the theory of financial constraints, which provides specific solutions to improve the business performance of enterprises in the epidemic.

3. Research methodology

3.1. Research Procedure

We used a quantitative research to analyze the influence of factors in enterprises that affect the financial constraints in the Covid – 19 from Q1/2019 to Q4/2021.

First, we limited the effects of outlier observations by using Winsor. Because the first Covid – 19's case appeared in Vietnam in Q1/2020, we chose Q1/2020 as the original (= 0). The periods before Q1/2020 receive the value 0 and after Q1/2020 receive the value 1. We divided the study sample into two groups including the period before Covid – 19 and after Covid – 19 so we examined the change in financial constraints and firm performance of the period before and after Covid – 19.

Next, to test the change before and after Covid – 19 in firm performance and financial constraints, the authors use the Univariate test, namely T - test. Then, to test the change in financial constraints and firm performance carefully, we use the Friedman test. In which, we set Q1/2020 receive the value 0, the quarters before Q1/2020 receive a negative value, and the quarters after Q1/2020 receive a positive value (For example: Q3/2019, Q4/2019 receive respectively the value -2 and -1; Q3/2020, Q2/2021 receive respectively the value 2 and 1). Next, the team uses the Wilcoxon rank - sum test to check the change at the time points obtained from the upper interval.

After testing the change before and after the change in firm performance and the level of financial constraints of enterprises in the context of the epidemic, we used the FEM regression method (Fixed Effects Model) and REM (Random Effects Model) regression method and finally use the Hausman test to select the regression model.

Then, we regressed on two groups mentioned above to assess the impact of financial constraints on firm performance of enterprises in the period before and after Covid – 19. Moreover, we also regressed on the full sample to analyze better when assessing the impact of financial constraints on the firm performance of enterprises in the period before and after the epidemic.

In addition, we divided the studied companies into three groups according to the size of the enterprise's assets to be able to investigate more specifically the impact of financial constraints on enterprises of different sizes.

Next, we tested the suitability of the models and compliance with the assumptions of regression: consider whether the model violates the assumption of regression (error variance change, the remainder independent, no autocorrelation). We corrected model defects using Standard Errors or Robust Standard Errors.

3.2. Data

The study includes data from 298 companies listed on Ho Chi Minh Stock Exchange during 12 quarters from Q1/2019 to Q4/2021. Moreover, we exclude all businesses in the financial sector and investment funds, because this is the industry group with its own characteristics. Descriptive statistics of the research data are presented in Table 4.1.

3.3. Research Models

Adopting research models developed by Kaplan (1997) and Fatmatuz Ahamed (2021), we examine the impact of financial constraints on the firm performance of enterprises listed on the Ho Chi Minh Stock Exchange in Covid – 19 with following regression models. In detail:

(H1) Hypothesis 1: Financial constraints have an impact on firm performance

To test the impact of financial constraints on firm performance of enterprises through PER measured by ROA and ROE before, after, and during the Covid – 19.

$$PER_{i,t} = \beta_0 + \beta_1 * KZ_{i,t} + \beta_2 * GROWTH_{i,t} + \beta_3 * TANG_{i,t} + \beta_4 * LIQ_{i,t} + \beta_5 * LEV_{i,t} + \beta_6 * SIZE_{i,t} + u_{i,t}$$

where,

Table 3.1. Variable definition

| Variable | Description | Definition | Data source/ Reference |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| KZ | KZ Index | $KZ\ Index = -1.001909 \times Cash\ Flows / K + 0.2826389 \times Q + 3.139193 \times Debt / Total\ Capital - 39.3678 \times Dividends / K - 1.314759 \times Cash / K$ | Research of Kaplan – 1997 |
| ROA | The measure of how efficiently a company uses the assets it owns to generate profits | $ROA = \frac{Net\ Profit}{Total\ Assets} \times 100$ | Financial Statements |
| ROE | The measure of a company's net income divided by its shareholders' equity | $ROE = \frac{Net\ Income}{Average\ Shareholders'\ Equity}$ | Financial Statements |
| SR | The percentage of increase in stocks value, it is represented as the current value of stocks in addition to any dividends already paid compared to the original value at which stocks were purchased | $SR = \frac{R_t - R(t-1)}{R(t-1)}$ Where, R _t = Price at the end of the quarter R(t-1) = Price at the beginning of the quarter | Fiinpro |
| GROWTH | The percentage change of profit after tax | $GROWTH = \frac{P_t - P(t-1)}{P(t-1)}$ Where, P _t = Profit after tax at the end of the quarter P(t-1) = Profit after tax at the beginning of the quarter | Financial Statements |
| TANGI | The ratio of company's fixed assets to the value of its assets | $TANGI = \frac{Fixed\ Assets}{Total\ Assets}$ | Financial Statements |
| LIQ | The ratio of current assets to the value of its current debt | $LIQ = \frac{Current\ Assets}{Current\ Debt}$ | Financial Statements |
| LEV | The ratio of a company's loan capital (debt) to the value of its assets | $LEV = \frac{Total\ debt}{Total\ assets}$ | Financial Statements |
| SIZE | Company's total assets | SIZE = Log (Total Assets) | Financial Statements |

Source: Authors' estimations

(H2) Hypothesis 2: Financial constraints have a significant impact on firm performance because of Covid - 19

(H2.1) Hypothesis 2.1: Firm size has a significant effect on the relationship between financial constraints and firm performance.

To test the impact of financial constraints on firm performance of enterprises through PER measured by ROA and ROE during the Covid – 19 when adding interaction and POST variables.

$$PER_{i,t} = \beta_0 + \beta_1 * POST_{i,t} + \beta_2 * POST * KZ_{i,t} + \beta_3 * KZ_{i,t} + \beta_4 * GROWTH_{i,t} + \beta_5 * TANGI_{i,t} + \beta_6 * LIQ_{i,t} + \beta_7 * LEV_{i,t} + \beta_8 * SIZE_{i,t} + u_{i,t}$$

Where, POST receives the value 0 for the period before Covid – 19 and 1 for the period after the Covid-19 epidemic in Vietnam. The variables were mentioned and explained in Model 1.

4. Results and discussion

4.1. Descriptive Statistics and Correlation Analysis

Table 4.1. Summary statistics

| Variable | N | Mean | Median | SD | Min | Max |
|----------|------|--------|--------|-------|---------|--------|
| KZ | 4148 | -2.019 | 1.150 | 8.174 | -29.363 | 9.9864 |
| ROA | 4137 | 0.014 | 0.010 | 0.021 | -0.049 | 0.103 |
| ROE | 4146 | 0.029 | 0.023 | 0.034 | -0.019 | 0.166 |
| SR | 3819 | 0.056 | 0.019 | 0.228 | -0.298 | 0.889 |
| GROWTH | 3716 | 0.017 | 0.039 | 1.360 | -7.721 | 7.562 |
| TANGI | 4224 | 0.225 | 0.163 | 0.215 | 0.000 | 0.971 |
| LIQ | 4225 | 2.089 | 1.526 | 1.455 | 0.683 | 6.378 |
| LEV | 4225 | 0.478 | 0.494 | 0.210 | 0.003 | 1.277 |
| SIZE | 4225 | 28.405 | 28.192 | 1.435 | 25.058 | 33.703 |

Source: Authors' estimations

Table 4.2. Correlation matrix

| | KZ | ROA | ROE | SR | GROWTH | TANGI | LIQ | LEV | SIZE |
|--------|----------|----------|----------|----------|---------|----------|----------|---------|------|
| KZ | 1.00 | | | | | | | | |
| ROA | -0.14*** | 1.00 | | | | | | | |
| ROE | -0.12*** | 0.87*** | 1.00 | | | | | | |
| SR | 0.03 | 0.02 | 0.03* | 1.00 | | | | | |
| GROWTH | -0.03 | 0.19*** | 0.21*** | 0.06*** | 1.00 | | | | |
| TANGI | 0.32*** | -0.03* | -0.04*** | -0.04*** | -0.01 | 1.00 | | | |
| LIQ | -0.24*** | 0.16*** | 0.02 | 0.00 | 0.01 | -0.21*** | 1.00 | | |
| LEV | 0.12*** | -0.20*** | 0.00 | -0.01 | -0.02 | -0.07*** | -0.70*** | 1.00 | |
| SIZE | 0.04*** | 0.00 | 0.07*** | -0.01 | -0.03** | -0.02 | -0.29*** | 0.37*** | 1.00 |

t statistics in parentheses

* p<0.1, ** p<0.05, *** p<0.01

Source: Authors' estimations

From table 4.1 and 4.2, this study has 4225 observations in the sample. There are some missing observations because of the difference of companies. Moreover, the variables included in the model have a low correlation.

4.2. Examine the change in financial constraints and firm performance before and after Covid – 19

Table 4.3. Univariate test for firm groups

| | Post = 0 | Post = 1 | Difference | T – test |
|-----------|----------|----------|------------|----------|
| All firms | | | | |
| ROA | 0.0144 | 0.0144 | 0.0000 | 0.9536 |
| ROE | 0.0284 | 0.0297 | 0.0013 | 0.2054 |
| KZ | -2.0497 | -1.9989 | 0.0508 | 0.8438 |

t statistics in parentheses

* p<0.1, ** p<0.05, *** p<0.01

Source: Authors' estimations

From the results of Table 4.3, when dividing the research sample into two-time points before and after the epidemic, the results have no statistical significant change. This can be explained by the fact that we study the data on quarters, so there may not be too much difference between quarters over a long period. Therefore, the group continues to use Friedman's test to determine the period in which changes in firm performance and financial constraints of enterprises can occur.

Table 4.4. The result of Friedman – test

| Variables | Mean | | | | | Friedman test | |
|-----------|---------|---------|---------|---------|---------|---------------|------------------|
| | t = -2 | t = -1 | t = 0 | t = 1 | t = 2 | Q – statistic | F – value |
| ROA | 0.0152 | 0.0166 | 0.0096 | 0.0115 | 0.0130 | 43.5944 | 0.0000*** |
| ROE | 0.0300 | 0.0352 | 0.0190 | 0.0236 | 0.0267 | 50.0322 | 0.0000*** |
| KZ | -2.6540 | -2.6737 | -0.6728 | -1.6915 | -2.5866 | 53.8563 | 0.0000*** |

t statistics in parentheses

* p<0.1, ** p<0.05, *** p<0.01

Source: Authors' estimations

From the results of Table 4.4, we determine the period of change in firm performance and financial constraints from Q3/2019 to Q3/2020. When Q1/2020 gets the value 0, the quarters before Q1/2020 get a negative value, and after Q1/2020 get a positive value, respectively. Especially in this section, we set the value of Q3/2020 and Q3/2019 to be 2 and -2 respectively. This change can be partly explained by the impact of the epidemic, but 2019 is also not a favorable year for businesses. Furthermore, the team wants to identify specific times when firm performance and financial constraints change due to the epidemic. Therefore, the team continued to perform the Wilcoxon test to determine when the change occurred.

Table 4.5. The result of Wilcoxon rank – sum test

| Two – sample Wilcoxon rank – sum (mean – Whitney) test | | | | | |
|--------------------------------------------------------|------------------|-----------------|------------------|------------------|---------------|
| | t = -1, t = 0 | t = 0, t = 1 | t = -1, t = 1 | t = 0, t = 2 | t = -1, t = 2 |
| ROA | | | | | |
| Z – statistic | 4.908 | -1.563 | 3.301 | -2.910 | 2.256 |
| P – value | 0.0000*** | 0.1180 | 0.0010*** | 0.0036** | 0.0241* |
| ROE | | | | | |
| Z – statistic | 5.669 | -2.134 | 3.592 | -3.658 | 2.389 |
| P – value | 0.0000*** | 0.0328* | 0.0003*** | 0.0003*** | 0.0169* |
| KZ | | | | | |
| Z – statistic | -4.316 | 2.645 | -1.786 | 4.435 | 0.033 |
| P – value | 0.0000*** | 0.0082** | 0.0742* | 0.0000*** | 0.9735 |

t statistics in parentheses

* p<0.1, ** p<0.05, *** p<0.01

Source: Authors' estimations

From Table 4.5, similar to the determination of the value of the quarter as mentioned above, we compare the times obtained in the range obtained in the Friedman test, namely the times from Q3/2019 to Q3/2020. As a result, we found a specific time for the change. First of all, with Q1/2020 and Q4/2019, because the first case of Covid – 19 occurred in Q1/2020, businesses may not have prepared in time to deal with the complicated situation of the epidemic. Besides, there is also a difference between Q2/2020 and Q4/2019 because in Q2/2020, our country implemented social distancing for the first time, and service business activities were all cut off. At the same time, businesses were prepared to adapt to the epidemic, so only firm performance changed, financial constraints did not change significantly. Next, there is a difference between Q3/2020 and Q1/2020, due to the recurrence of the Covid - 19 in Q3/2020, businesses could not endure for a long time with production suspension. Therefore, both firm performance and financial constraints changed compared to the past at this time.

Table 4.6. The regression results of FEM and REM

| ROA | FEM | REM |
|-----------------|------------------------------|------------------------------|
| KZ | -0.0001*** (-2.70) | -0.0002*** (-3.95) |
| GROWTH | 0.0027*** (11.62) | 0.0027*** (11.88) |
| TANGI | -0.0198*** (-3.79) | -0.0070** (-2.45) |
| LIQ | -0.0031*** (-5.36) | -0.0014*** (-2.99) |
| LEV | -0.0718*** (-9.75) | -0.0346*** (-8.90) |
| SIZE | 0.0180*** (7.56) | 0.0020*** (4.21) |
| N | 3568 | 3568 |
| within R | 0.0990 | 0.0829 |

t statistics in parentheses

* p<0.1, ** p<0.05, *** p<0.01

Source: Authors' estimations

From table 4.6, regression **H1** with two models FEM and REM with ROA. Then we use the Hausman test to choose which model is suitable for the study.

Table 4.7. The result of the Hausman test

| |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Test: Ho: difference in coefficients not systematic $\chi^2(16) = (b-B)' [(V_b - V_B)^{-1}] (b - B)$ = 84.76 Prob > χ^2 = 0.0000 ($V_b - V_B$ is not positive definite) |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Source: Authors' estimations

From table 4.7, the result Prob > $\chi^2 = 0.0000 < 5\%$. We can reject the hypothesis Ho. The selected model is FEM. Thus, for the following regressions and the following model, we use the FEM model to ensure the reliability of the study. This was also done in Fatematuz Tamanna Ahamed's study (2021) on financial stress.

4.3. The impact of financial constraint on firm performance in the Covid – 19

Table 4.8. Result for the impact of financial constraints on firm performance with ROA before and after Covid - 19

| ROA | (1) Post=0 | (2) Post=1 | (3) Fullsample | (4) Fullsample |
|----------------|----------------------------|------------------------------|------------------------------|----------------------------|
| KZ | -0.0001 (-0.81) | -0.0001** (-1.99) | -0.0001** (-2.59) | -0.0000 (-0.17) |
| POST | | | | -0.0042* (-1.88) |
| POST*KZ | | | | -0.0000 (-0.18) |
| GROWTH | 0.0015*** (3.94) | 0.0037*** (11.61) | 0.0030*** (10.47) | 0.0034*** (7.56) |
| TANGI | -0.0109 (-1.03) | -0.0176** (-2.43) | -0.0197** (-2.51) | -0.0307* (-1.71) |
| LIQ | -0.0032* (-1.81) | -0.0025*** (-3.44) | -0.0031*** (-4.16) | -0.0033 (-1.61) |
| LEV | -0.0212 | -0.0698*** | -0.0701*** | -0.0760*** |

| | | | | |
|-----------------------|---------|-------------------|-------------------|-------------------|
| | (-0.98) | (-5.82) | (-5.90) | (-4.06) |
| SIZE | 0.0002 | 0.0168*** | 0.0175*** | 0.0188*** |
| | (0.02) | (4.95) | (4.70) | (3.12) |
| _cons | 0.0293 | -0.4212*** | -0.4365*** | -0.4916*** |
| | (0.11) | (-4.54) | (-4.30) | (-2.81) |
| N | 1187 | 2381 | 3568 | 1207 |
| within R ² | 0.0232 | 0.1485 | 0.0876 | 0.1256 |

t statistics in parentheses

* p<0.1, ** p<0.05, *** p<0.01

Source: Authors' estimations

The result of **H2** is presented in table 4.4. Based on regression results, the model specification (1), (2), (3) are chosen for further analysis. First, with model (1), before Covid – 19, firm performance of the enterprise is mainly affected by the positively correlated variable GROWTH. It means the performance of the enterprise increase, and the growth rate of the enterprise also increases.

From model (2), when Covid – 19 is happening, GROWTH, SIZE have a positive impact on firm performance. Otherwise, LEV, LIQ, KZ and TANGI have a negative impact on firm performance.

First, the larger firm size, the higher firm performance, which can be explained by the fact that large-scale enterprises will be able to control the debt structure as well as long-term investments to overcome the epidemic.

Moreover, the higher the growth rate, the higher the impact firm. Because increasing profit after tax helps improve firm performance.

The lower leverage, the higher impact firm This means that, when the enterprise manages and controls the debt structure appropriately, it will help reduce pressure on the financial.

Next, the lower tangible assets, the higher firm performance. When the business does not have too many fixed assets, the business does not have to spend too much capital to finance, which helps to improve firm performance of the business.

Next, the lower the current ratio, the higher firm performance. When the ratio of current assets to short – term liabilities decreases, it means that businesses can increase debt to support capital structure.

In addition, the lower the KZ ratio, the higher efficient the business is. This has been mentioned above.

From model (3), the main variables affecting the firm performance of enterprises are GROWTH, LIQ, LEV, and SIZE, followed by KZ and TANGI with the same impact as analyzed in the model (2).

As for **H2** presented earlier, the result of model specification numbered (4). POST*KZ is added to examine the impact of financial constraints on firm performance before and after Covid – 19 happening. In fact, financial constraints do not have a significant impact on firm performance. Through quarters, companies were not affected clearly thanks to the supportive policies of the Government. Being cautious in business and production to cope with the complicated situation in Vietnam also played the important role in this context. In addition, the main variables affecting firm performance of enterprises are GROWTH, LIQ, LEV, and SIZE with the same impact as analyzed in model (2).

Table 4.5. Result for the impact of financial constraints on firm performance with ROE before and after Covid - 19

| | (1) | (2) | (3) | (4) |
|---------|---------|------------------|-------------------|------------|
| ROE | Post=0 | Post=1 | Fullsample | Fullsample |
| KZ | -0.0002 | -0.0003** | -0.0003*** | 0.0000 |
| | (-1.41) | (-2.33) | (-2.75) | (0.04) |
| POST | | | -0.0024 | -0.0041 |
| | | | (-1.55) | (-1.22) |
| POST*KZ | | | | 0.0000 |
| | | | | (0.10) |

| | | | | |
|------------------------------|-----------------------------|------------------------------|------------------------------|------------------------------|
| GROWTH | 0.0029*** (3.99) | 0.0077*** (12.25) | 0.0059*** (11.56) | 0.0077*** (10.61) |
| TANGI | -0.0131 (-0.84) | -0.0362*** (-2.63) | -0.0241* (-1.85) | -0.0364 (-1.28) |
| LIQ | -0.0070** (-2.45) | -0.0037*** (-3.45) | -0.0044*** (-3.67) | -0.0033 (-1.01) |
| LEV | -0.0663* (-1.89) | -0.0572*** (-2.78) | -0.0748*** (-3.99) | -0.0566 (-1.63) |
| SIZE | 0.0118 (0.72) | 0.0279*** (4.42) | 0.0324*** (5.33) | 0.0412*** (3.52) |
| _cons | -0.2560 (-0.56) | -0.7218*** (-4.15) | -0.8398*** (-5.03) | -1.1554*** (-3.37) |
| <i>N</i> | 1194 | 2381 | 3575 | 1208 |
| within <i>R</i> ² | 0.0304 | 0.1648 | 0.0979 | 0.1424 |

t statistics in parentheses

* p<0.1, ** p<0.05, *** p<0.01

Source: Authors' estimations

In conclusion, from the result of table 4.4, using ROE or ROA as the dependent variable, we also find the same results, this proves our view is correct. Otherwise, there exists a difference between the model with ROE and ROA from models. Financial constraints have more impact on performance with ROE than the other. Because of the difference between the two ways of calculating two variables. Therefore, this confirms the financial constraints are caused by the capital shortage and cash flow difficulties during Covid – 19.

4.4. Examine the impact of financial constraints on firm performance by firm size

Table 4.6. Result for the impact of financial constraints on firm performance with ROA before and after Covid – 19 by firm size

| ROA | (5) Small firm | (6) Medium firm | (7) Large firm |
|------------------------------|------------------------------|------------------------------|------------------------------|
| KZ | 0.0001 (0.86) | 0.0001 (0.46) | -0.0000 (-0.17) |
| POST | -0.0023 (-1.30) | -0.0013 (-0.78) | -0.0042* (-1.88) |
| POST*KZ | -0.0005*** (-3.28) | -0.0004** (-2.58) | -0.0000 (-0.18) |
| GROWTH | 0.0027*** (5.30) | 0.0027*** (6.28) | 0.0034*** (7.56) |
| TANGI | -0.0085 (-0.69) | -0.0249 (-1.33) | -0.0307* (-1.71) |
| LIQ | -0.0029*** (-2.64) | -0.0025** (-2.29) | -0.0033 (-1.61) |
| LEV | -0.0663*** (-2.91) | -0.0617*** (-2.63) | -0.0760*** (-4.06) |
| SIZE | 0.0246** (2.39) | 0.0109 (1.30) | 0.0188*** (3.12) |
| _cons | -0.6146** (-2.27) | -0.2492 (-1.09) | -0.4916*** (-2.81) |
| <i>N</i> | 1184 | 1177 | 1207 |
| within <i>R</i> ² | 0.0923 | 0.0789 | 0.1256 |

t statistics in parentheses

* p<0.1, ** p<0.05, *** p<0.01

Source: Authors' estimations

Table 4.7. Result for the impact of financial constraints on firm performance with ROE before and after Covid – 19 by firm size

| | (5) | (6) | (7) |
|-----------------------|-------------------|------------------|-------------------|
| | Small firm | Medium firm | Large firm |
| ROE | 0.0000 | -0.0003 | 0.0000 |
| KZ | (0.04) | (-1.14) | (0.04) |
| POST | -0.0046** | -0.0025 | -0.0041 |
| | (-2.00) | (-0.98) | (-1.22) |
| POST*KZ | -0.0006** | -0.0004 | 0.0000 |
| | (-2.49) | (-1.42) | (0.10) |
| GROWTH | 0.0046*** | 0.0053*** | 0.0077*** |
| | (5.74) | (5.58) | (10.61) |
| TANGI | -0.0156 | -0.0255 | -0.0364 |
| | (-0.83) | (-0.90) | (-1.28) |
| LIQ | -0.0046*** | -0.0042** | -0.0033 |
| | (-2.74) | (-2.44) | (-1.01) |
| LEV | -0.0599** | -0.0657* | -0.0566 |
| | (-2.17) | (-1.73) | (-1.63) |
| SIZE | 0.0262** | 0.0146 | 0.0412*** |
| | (2.27) | (1.05) | (3.52) |
| _cons | -0.6427** | -0.3322 | -1.1554*** |
| | (-2.12) | (-0.88) | (-3.37) |
| N | 1187 | 1180 | 1208 |
| Within R ² | 0.0938 | 0.0767 | 0.1424 |

t statistics in parentheses

* p<0.1, ** p<0.05, *** p<0.01

Source: Authors' estimations

As **H2.1**, we divide enterprises into three main groups by size, therefore, we analyze the impact of financial constraints on the firm performance of the three groups. As a result, small and medium-sized enterprises are more affected by financial constraints than large enterprises during Covid – 19 (This is explained by the impact of the variable POST*KZ). Because, during Covid – 19, larger companies have more debt capacity and larger cash flow reserves (explained by the impact of LEV and SIZE). Similarly, from the above results from table 4.6, it can be seen that table 4.7 gives similar results, which contributes to confirming that our interpretations are reasonable.

5. Conclusion

The study investigates the impact of financial constraints on the firm performance in the context of the Covid – 19, by assessing the impact of financial constraints on the firm performance of enterprises listed on the Ho Chi Minh Stock Exchange. The authors are based on the main research subject the main topic is the financial constraints of the business as expressed by the KZ Index of financial constraints. The data includes 298 companies listed on the Ho Chi Minh Stock Exchange between Q1/2019 and Q4/2021. This study determines that there exists a negative relationship between financial constraints and firm performance after Covid – 19 happened. Especially, this research divides enterprises into three main groups by size, therefore, we analyze the impact of financial constraints on the firm performance of three groups. As a result, small and medium-sized enterprises are more affected by financial constraints than large enterprises during Covid – 19.

The study contributes evidence on the impacts of financial constraints on firm performance. Furthermore, this research also finds the relationships between the impacts of financial constraints on small, and medium-sized enterprises. Finally, this research gives some recommendations to improve firm performance of enterprises.

On the State side: Implementing reasonable effective economic policies, bailouts, stimulating the economy, adjusting tax policies accordingly, and resolutely handling cases of illegal profiteering to create conditions for enterprises and workers to overcome the crisis period because of a covid-19 epidemic. As

mentioned above, debt helps businesses overcome financial stress. When businesses are properly supplemented with capital, they will have enough capital to be able to improve their financial situation as well as enough capital to be able to prepare for complicated developments of the epidemic and have reserves to be able to recover after the Covid-19 epidemic.

On the business side: Enterprises should be proactive in their financial decisions on debt structure, on risk management policies in financial activities in addition to constantly improving and improving the capital financing capacity of enterprises through the maximum exploitation of endogenous capital from retained profits to maintain stable capital sources, have sufficient reserves to meet all the needs of the market as well as the unpredictable negative effects of the epidemic. Risk management should be more focused and invested, especially for small and medium enterprises. Small and medium enterprises need to have appropriate cash flow management measures to be able to prevent during complicated developments of the epidemic.

The limitations of this study are from three sources. Firstly, data is collected on 298 companies listed on the Ho Chi Minh Stock Exchange, some enterprises that do not offer complete data. Secondly, the study only focuses on companies listed on the Ho Chi Minh City Stock Exchange. However, Vietnam is a growing market, researchers may consider other groups of developing countries, such as those in Southeast Asia, to have a more complete and comprehensive view of this topic. Thirdly, the study focuses on financial stress during the Covid-19, a case of an unpredictable economic crisis, studies may extend to other special periods of the economy.

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A DEEP – NET APPROACH TO SCENARIO GENERATOR: APPLICATION FOR BANK STRESS TEST

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ABSTRACT

Risk management is based on the quantification of risk and stress testing is seen as a set of techniques and methods used to assess the risk tolerance or vulnerability of financial institutions and banks under very unfavorable circumstances or events. One of the most important steps in building a stress test is *generating scenarios*. Machine learning and deep learning techniques can enable the generation of more accurate scenarios by identifying complex non-linear patterns in large data sets. Thus, the aim of this paper is to propose a novel deep-net model for scenario generators and to check its validity using data for Vietnamese context. By integrating traditional methods with the application of advanced analysis and development technologies, the proposed model can search for nonlinear relationships between input data and output data that are otherwise difficult to detect.

Keywords: stress testing, deep learning, scenario analysis, GAN, commercial banks, Vietnam.

1. Introduction

In general, the term ‘stress testing’ refers to the analysis of how an object or system copes under pressure. In medical science, cardiac stress tests are performed when patients are asked to run on treadmills while doctors monitor their heart rate and blood pressure. For construction materials, they are stress-tested by measuring their behavior when they are subject to strain.

In banking and financial sector, stress testing aims to evaluate the resilience of banks under hypothetical adverse but plausible shocks such as severe recessions or financial crises (Hirtle and Lehnert, 2015). In fact, bank stress testing was developed in an attempt to monitor the economic viability of the financial system and financial institutions during the instability that took place in the 90s of the last century. This is attained by quantifying immediate capital shortages in distressed banks. Prior to the global financial crisis, the use of stress testing by banks was limited, and mainly for the purposes of internal risk management (Blaschke *et al.*, 2001). Following the financial crisis, stress tests have become a prominent regulatory tool for effective banking supervision (Kenton, 2021).

Stress tests typically start with the specification of hypothetical adverse scenarios. A variety of economic and financial variables are incorporated in designing the scenarios, and modelling techniques can then assist the estimation of the impact of these scenarios on banks’ balance sheets and performance indicators (Garcia and Steele, 2022; Kupiec, 2020). The ultimate purpose is to determine if a bank has sufficient capital to withstand a severe financial/economic downturn (Segal, 2021). For this purpose, more advanced stress testing techniques often employ computer-generated simulation models to search for and verify all possible scenarios (Hamilton, 2021).

The most crucial and hardest aspect of stress test is to determine the size of the shock in scenario design. The events must be "unusually powerful but yet possible," as it is stated in the definition of stress testing, although the terms "unusually strong" and "likely" are still somewhat ambiguous. Using too severe or too weak shocks can make the entire testing process pointless (Sorge, 2004). In fact, before the global financial crisis, stress tests failed to detect possible systematic threats due to a lack of sufficient shock identification (IMF, 2012). Thus, the generation of high confidence scenarios built upon solid foundations plays a large part in the success of stress test.

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As mentioned earlier, scenario development often depends on economic variables and economic models. Since stress testing at the macro level aims to evaluate the impact of changes in economic variables on banks' financial status, satellite models have traditionally been employed to quantify the impacts of external changes on the internal macroeconomic variables of the economy (for example, Naili and Lahrichi, 2022; Chen and Lu, 2021; Barra and Ruggiero, 2021; Drake et al, 2006; Trenca *et al.*, 2015). In fact, VAR (Vector AutoRegressive) model and VECM (Vector Error Correction Model) are frequently employed.

For example, Pesaran *et al.* (2004) and Alves (2004) use VAR model to assess the impact of macroeconomic factors on the default likelihood of firms. Factors such as GDP, consumer price index, nominal money supply, stock prices, exchange rates and nominal interest rates are included for the eleven countries/regions over the period 1979-1999. The global VAR is used as an input to simulate the firm's profit margin, which is then linked to the loss distribution of the firm's loan portfolio. One obvious advantage of this approach is that it considers the credit risk of a globally diversified loan portfolio in a detailed macroeconomic model that allows for variation across countries and regions.

Alves (2004) builds a uniform VAR model, using the expected debt default frequencies (EDFs) of KMV as endogenous variables and macroeconomic factors including 12-month change of industrial output, 3-month change in interest rates, oil prices, and 12-month change in stock market index) as exogenous variables. The EDFs of each EU industry are modeled based on exogenous macroeconomic factors together with the EDFs of other industries to capture the possibility of contagion.

However, none of the aforementioned VAR models explicitly integrates measures of bank balance sheet quality. Some authors have voiced their opinions to incorporate a direct measure of a bank's vulnerability - debt forgiveness ratio - as well as macroeconomic variables in building stress testing scenarios (Fender *et al.*, 2001). In the context of liquidity risk management, stress testing can assess a bank's liquidity needs during extreme market events and to prepare liquidity risk management for stressful conditions.

Some studies even mention the need for liquidity stress testing. For example, Neu and Matz (2007) exemplify stress testing following a stepwise approach to the design of liquidity stress tests. First, the bank determines its tolerance to liquidity risk. Then, more efficient measures available for governance and expected cash flows over a period. Scenarios designing and quantifying their impact on cash flows can be identified. Based on the stress of cash flows, the bank determines the limits of the structure and ability to balance against liquidity risk. In this regard, scenarios designing and the quantification of their impact on cash flows are expected to be central to liquidity risk management, but particular challenges remain.

In terms of the models used to generate scenarios, VAR model has been widely used in previous studies. The most critical advantage of the VAR model is that it is not necessary to determine which variables are endogenous and which are exogenous (Toda, 1991). Another advantage of the VAR model is that the value of a variable in the VAR system depends only on the past values of the variables. Therefore, estimating the equations requires no information other than the variables included in the model themselves. In addition, one can use OLS or the method of maximum likelihood to estimate each equation of the system. However, the disadvantage of the VAR model is that it requires all variables to be stationary. In addition, the p lag in a VAR(p) model is usually not given; therefore, one needs to determine what the optimal delay length is. Besides, employing VAR model can present a challenge for policy analysis. Specifically, the estimation requires many observations because the model has many equations (Abrigo and Love, 2016).

Turning to the scenario generating techniques, two common approaches include historical and hypothetical approaches. The former is based on historical facts (for example, using the largest observed changes or extreme values over a given period), whereas the latter creates hypothetical scenarios with large fluctuations that are judged to be realistic. While historical scenarios based on historical data should be objective and easier to understand, it is often criticized of the premise that future crises will be like previous ones. The assumption that historical events are likely to be repeated is utilized in scenarios generators so that the results as well as effects on the variables of interest can be found fast (Sorge, 2004). However, it is impossible to say that events that happened in the past will repeat in the future. That is not to mention the

increasingly rapid introduction of new products and new management methods. The more recent they are, the rarer their historical data are, making it virtually impossible to generate scenarios based on this method.

Even though the historical scenarios are easier to implement and more tangible, the hypothetical approach may be the only option when structural flaws in the financial system renders previous experience useless. In today's economic conditions, it is hard to believe that historical events and situations will be likely to repeat themselves. Therefore, when generating scenarios for stress testing, implementers need to add an element of "fantasy" but still have to make sure that the transformations are extreme and likely to happen. It is a way of generating a complete scenario and responding to the ever-changing and unpredictable needs of today's financial markets by combining historical data with the most reasonable assumptions. However, unlike statistical models such as extreme value approach (Longin, 2000) or Monte Carlo simulation (Elsinger *et al.*, 2006), the events posed here are not tied to any probability distribution. Yet, the imaginary capacities of stress testing experts are limited to certain subjective bias and future factors are still difficult to predict accurately. Another major difficulty in generating hypothetical scenarios is how to measure the impact of factors and to verify the assumptions that affect the state of the balance sheet, income statement, and financial position of the company.

In summary, economists have discovered various flaws in current economic models after the 2008 Global Financial Crisis, such as the DSGE model, which failed to foresee the global economic catastrophe (IMF, 2012). The fundamental reason for this is because neither the economy nor the financial market has been regarded as a behavioral system complex (Breuer *et al.*, 2009; Catalan and Hoffmaister, 2022). This is where the theories of behavioral economics and behavioral finance got their back. Agent-based computational models such as network analysis and deep neural network are just a few of the novel algorithms that have been developed and explored in conjunction with machine learning, deep learning, and big data analysis throughout the years. These computational techniques have the advantage of using existing knowledge of the research area to extract information from the original raw data, while improving the accuracy and reducing the model training time.

In this paper, we focus on deep learning methods and specifically the Generative Adversarial Network (GAN) model due to its potential to handle large sequence of time series data. The aim is to propose a novel method of scenario generator and to verify its validity in stress testing on real data from Vietnam context.

The remainder of this paper is organized as follows. Section 2 reviews the literature on the application of machine learning models in stress testing. Section 3 presents the proposed model while Section 4 checks its performance using data for Vietnamese context. Finally, Section 5 wraps up with concluding remarks.

2. A brief review of the related

With the success of machine learning and deep learning in various fields, researchers have attempted to capitalize on its potential in the banking sector. For example, Hirtle *et al.* (2016) suggests the CLASS (Capital and Loss Assessment under Stress Scenarios) model which uses linear regressions and specific assumptions regarding loan loss, asset growth, taxes, and other aspects to determine expected industry capital gaps during challenged macroeconomic conditions.

So far, the literature on generating foreseeable macroeconomic scenarios has focused on structural approaches, which relate to conceptual domain knowledge or dynamics explaining the relationships economic factors may have with one another. These structural methodologies include the Global Economic Model (GEM) (Bayoumi *et al.*, 2004; Pesaran *et al.*, 2004; Lalonde and Muir, 2007) and Global Auto-regressive Model (GVAR) (Dees *et al.*, 2007).

As a matter of fact, national and international regulators have gathered a substantial amount of detailed information on banks' operations and performance following the 2008 Global Financial Crisis, but they have yet to employ machine learning techniques to extract more information about the potential dangers in the financial systems. With the application of deep learning to a dynamic balance sheet stress-testing system, Petropoulos *et al.* (2019) make the first contribution to this field. By simultaneously training a deep neural network using macroeconomic and financial variables, financial or macroeconomic shocks are propagated to

banks' balance sheets. The model is capable of extracting more information from a large dataset and accounting for complicated non-linear correlations that emerge under unfavorable macroeconomic and financial conditions. Such a paradigm evaluates the vulnerability of the whole banking system without relying on the estimates of individual institutions. Only publicly available data are required, and the model is built in a consistent manner, allowing regulators to check the validation and perform mistake correction more systematically.

According to Islam *et al.* (2013), stress testing entails simulating the interaction between macroeconomic changes and bank variables to assess the impact of severe scenarios on banks. When future profit/loss projections are generated over most of the disaggregated portfolio levels, the bottom-up approach is more commonly used, making the data in-depth and difficult to determine the causes of loss. This process can be supplemented by utilizing a top-down strategy to anticipate composite portfolios. The Least Absolute Shrinkage and Selection Operator (Lasso) approach is a supervised learning algorithm that does not require a pre-defined model. The Adaptive Lasso is a more complicated variation of the Lasso with appealing convergence qualities. In the absence of theoretical models, such as in top-down stress testing, Adaptive Lasso can be used to find a parsimonious top-down model from a set of thousands of potential specifications. By looking for factors that best describe the behavior of credit loss rates, it was proven to yield sparse, approximately unbiased answers, resulting in a parsimonious account of the relationship between macroeconomic and credit loss rates (Petrooulos *et al.*, 2019). The necessity for large volumes of data to train a model is indeed a major concern.

As argued by Chan-Lau (2017), lasso regressions are better suited to assisting organizations in the development of forecasting models than stress testing, because the number of observations is minimal, but the number of potential covariates is large. Jacobs (2018) discovers that Multivariate Adaptive Regression Splines (MARS) have a higher accuracy in model testing, which leads to more acceptable forecasting in financial organizations. For evaluating and modeling concentration risk credit, a Bayesian network with an augmented tree can be utilized in conjunction with a probabilistic graph to provide a comprehensive picture and make informed judgments about the risks. According to Pavlenko and Chernyak (2009), a combination of the two methodologies could be used in stress testing analysis to estimate the risk of losses due to changes in the borrowers' financial circumstances.

The work by Malik (2018) includes scenario generation and bank performance prediction using machine learning approaches and is closely related to the proposed framework in this paper. The author's objective is to improve the present regulator methodology by finding more realistic stress-tests for each bank utilizing Conditional Generative Adversarial Network (CGAN) for scenario development and Long short-term memory (LSTM) for bank performance prediction. The aim is to include scenarios that are personalized but thorough to potential bank or industry threats. As suggested by Malik, their method can aid regulators since it can sample from more probable and dangerous distributions than present regulatory scenarios, and it can incorporate hypothetical shocks rather than depending on past situations

In summary, banks may improve their decision-making processes, strengthen risk prevention, and assess hazards in their operations through stress testing by combining big data with machine learning and deep learning algorithms. Even experts often find it challenging to foresee potential risk in the banking operations given the current development trend. Therefore, banks should now focus on developing and improving predictive models for dealing with new banking risks.

3. The proposed deep-net model

GAN, or generative adversarial networks, refers to a class of generative machine learning frameworks developed by Ian Goodfellow and colleagues in 2014 (Goodfellow *et al.*, 2014). In essence, *generative models* are processes that can generate new data instances more formally. Given an observable variable X and a target variable Y , a generative model is a statistical model of the joint probability distribution on $P(X|Y)$. In general, the process involves finding patterns in the input data and learning them so that the model can create new samples that retain the original dataset's features.

Owing to the virtues of simplicity and effectiveness, these models have attracted a lot of attention. In a short period of time, significant progress has been made not only in the initial application of GANs - image generation, but also in the creation of numerous types of GANs to optimize for various tasks, ranging from computer vision to fraud detection in banks.

For a deeper scrutiny of GAN which stands for Generative Adversarial Network, such a model is called ‘adversarial’ as the GAN is composed of two networks, *Generator* and *Discriminator*, which are always opposed to each other during the training. The GAN is thus based on a competition between two deep neural network modules. The Generator (G) is a generative model that captures data distribution and creates new data while the Discriminator (D) is a classifier that assesses the chance that a sample comes from the training data rather than G. The Generator's training procedure aims to increase the likelihood of the Discriminator misclassifying its output.

The Generator oversees data generation, while the Discriminator is in charge of evaluating the quality of the data generated and delivering input to the Generator. The Generator is optimized to generate data to trick the Discriminator, while the Discriminator is optimized to detect the source of the input, namely the Generator or the genuine data set, under game-theoretic constraints.

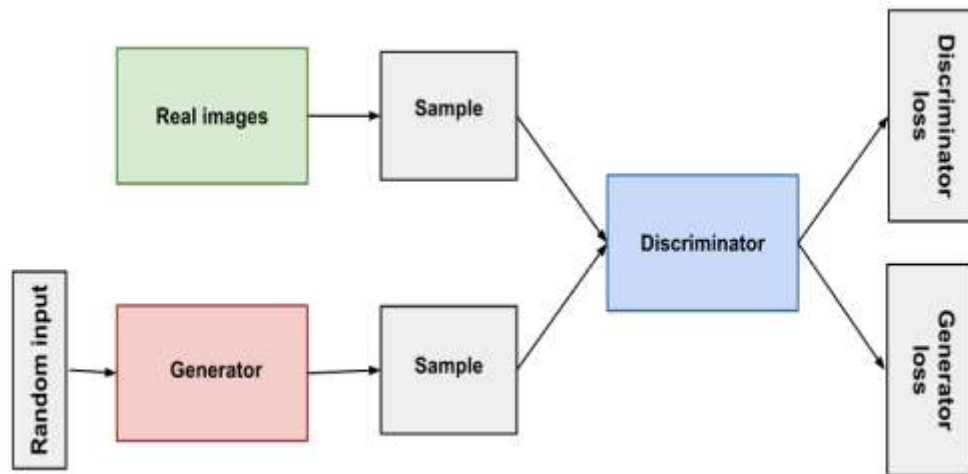


Figure 1. The originally proposed architecture for Generative Adversarial Networks.

The generator takes a random input and tries to generate a sample of the data. As depicted in Figure 1, generator $G(z)$ takes input z from $p(z)$, where z is a sample of probability distribution $p(z)$ randomly generated from latent space, and then $G(z)$ assigns noise. The sample generated from $G(z)$ is loaded into the Discriminator network $D(x)$. The job of the Discriminator network is to take the input from the train set (real sample) and the sample generated from G (generated sample) and determine which one is real. The real sample x is taken from the probability distribution $p(x)$.

$D(x)$ handles the binary classification problem by using the sigmoid function, which returns a result between 0 and 1. Simply speaking, the higher the output probability, the greater the probability that the sample (taken from the data set) is real, and vice versa.

D is trained to maximize the probability of correctly labeling the sample, and G is trained to minimize the detectability of D , equivalent to at least $\log(1 - D(G(z)))$.

In other words, training D and G corresponds to a minimax game between two people for the function:

$$\min_G \max_D V(D, G) = E_{x \sim p_{data}(x)} [\log D(x)] + E_{z \sim p_z(z)} [\log (1 - D(G(z)))] \quad (1)$$

where $D(x)$ is the Discriminator's estimate of the likelihood that actual data instance x is real, E_x is the expected value based on all real-world examples, $G(z)$ is the Generator's output given the noise z , and $D(G(z))$ is the Discriminator's estimate of the chance that a phony instance is real.

Optimizers:

The model is updated by optimizers in response to the loss function's output. In essence, they have control over a neural network's learning process by determining the values of parameters that result in the lowest loss function. The learning rate is a critical hyperparameter that scales the gradient and controls the model's update pace. A gradient descent-based optimizer is used in the majority of models. The direction of steepest descent of a function is called gradient descent, and these techniques are used to determine the local minimum of a differentiable function using short iterations.

Adaptive moment estimation (Adam) is a deep learning optimization algorithm that is used to repeatedly update network weights (Kingma, 2014). It is an extension of stochastic gradient descent and has found widespread use in applications ranging from computer vision to natural language processing. Both the exponentially decaying average of past squared gradients and the exponentially decaying average of past gradients are stored by Adam. In the GAN literature, there are a few different types of optimizers, but Adam is now one of the most prominent.

Training

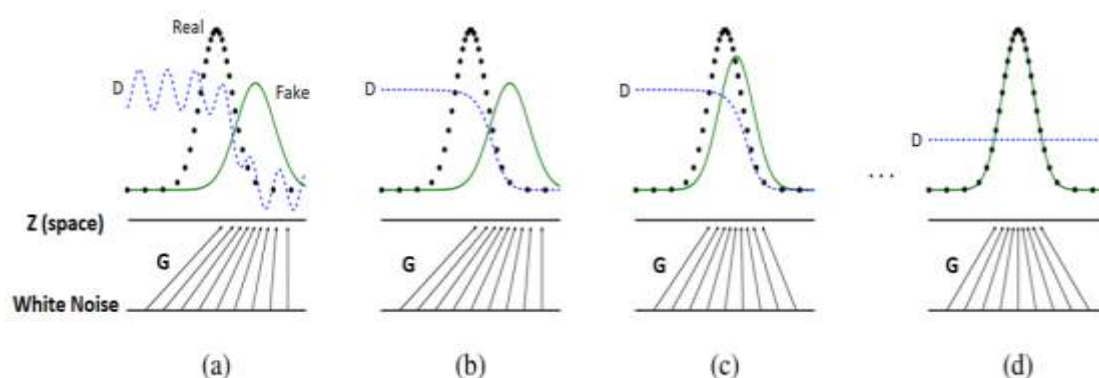


Figure 2. GAN training's theoretical progression.

Source: Goodfellow et al. (2014)

The Discriminative distribution (dotted blue line) will be unable to separate them when the Generative distribution (green line) approaches the real data distribution and will stabilize at $D(x) = 1/2$.

Different alternating procedures are used to train the Discriminator (D) and Generator (G) networks individually.

Generator – G

Sample from random noise $z \rightarrow$ new sample is produced in $G \rightarrow$ D classifies the sample as "Real" or "Fake" \rightarrow Loss calculated from D classification \rightarrow Backpropagate through Discriminator and Generator to obtain gradients \rightarrow Gradients used to change G weights.

Discriminator - D

D classifies real data and G fake data \rightarrow Discriminator loss penalizes G for misclassifying real and fake instances \rightarrow D updates its weights through backpropagation from the Discriminator loss through the network D.

Adversarial training

According to the preceding description, both models are fighting against each other in a zero-sum game, which is known as adversarial in game theory. This means that when the Discriminator correctly identifies a sample, it is rewarded or the model parameters are not updated, whereas the Generator is penalized with big model parameter changes. When the Generator deceives the Discriminator, the Generator

is rewarded, or its parameters are not updated, while the Discriminator is penalized, and its model parameters are changed.

Using the Discriminator to train the Generator

Weights are changed when training a neural network to reduce output error or loss. Because the Generator is not directly connected to its loss function, Generative Adversarial Networks are more sophisticated. The Discriminator is the one who generates the output that has an impact on the Generator (Generator loss). After then, backpropagation adjusts each weight by calculating the influence of the weight on the output. A Generator weight's impact is determined by the Discriminator weights it feeds into. Backpropagation begins at the output and flows back into the Generator via the Discriminator.

4. Experiment with real data for Vietnam's context

This paper selects GAN model to generate scenario. Like other neural network models, the GAN model consists of three layers: (1) the first layer contains the input data, (2) the most important layer in the middle contains one or more hidden layers, and (3) the last layer contains the output data. In particular, the hidden layer is where the computer's "learning" takes place and is also the most important layer of any machine learning/deep learning model.

Before going into more details about the mechanism of action of units in the GAN model, some symbols used in the analysis are worth mentioning. $P_{data}(x)$ represents the distribution of real data, x denotes sample from $P_{data}(x)$, $P(z)$ is the distribution of generator, z is sample from $P(z)$, and finally $G(z)$ and $D(x)$ represent generator and discriminator respectively.

For Training

Input data: batch size m (number of data samples in a batch), drop rate α , random seed, number of iteration (iterations is the number of batches needed to complete 1 epoch), latent dimension n .

While:

Update Discriminator

Sample batch from historical data

$$\{x^i, y^i\}_{i=1}^m \text{ from } P_{data}(x)$$

Generate noise from Gaussian distribution

$$\{z^i, y^i\}_{i=1}^m \text{ from } P(z)$$

Decode Noise using Generator

Feed into Discriminator (D) and calculate loss Discriminator and update Discriminator, calculate loss Generator and update Generator

$$\nabla_{\theta_d} \frac{1}{m} \sum_{i=1}^m [\log D(x^{(i)}) + \log(1 - D(G(z^{(i)})))] \quad (2)$$

$$\nabla_{\theta_g} \frac{1}{m} \sum_{i=1}^m (\log(1 - D(G(z^{(i)}))) \quad (3)$$

Output: Trained Generator

Loss function

A popular loss function is the Binary Cross Entropy. Each of the projected probabilities is compared to the actual class output, which can be either 0 or 1. The score is then calculated, penalizing the probabilities depending on their deviation from the predicted value. This refers to how close or far the value is to the actual value.

$$\text{logloss} = \frac{1}{N} \sum_{i=1}^N -(y_i \times \log p_i + (1 - y_i) \times \log(1 - p_i)) \quad (4)$$

The loss function calculation formula of GAN model is given as:

$$\min_G \max_D V(D, G) = E_{x \sim p_{data}(x)} [\log D(x)] + E_{z \sim p_z(z)} [\log (1 - D(G(z)))] \quad (5)$$

For Testing

After collecting the output of trained generators, the effectiveness of the generated scenarios will be evaluated. If the generated scenarios are almost the same as the real scenarios, then the model is considered efficient. In order to evaluate the GAN model, a classifier, more specifically a clustering technique, is employed in this paper. Clustering is an unsupervised learning problem in which similar data are grouped into groups or clusters based on their underlying structure. A well-known clustering procedure, the K-means algorithm, attempts to minimise the distance from data points to the cluster centre, also known as centroid (which is simply the average of data points in the cluster) (MacQueen, 1967). The number K denotes the number of clusters making up the data.

The procedures of a K-means Clustering Algorithm can be summarized as follows:

Input: Data points D, number of clusters k are the inputs.

While:

Step 1: Create K centroids at random.

Step 2: Find the nearest centroid for each data point in D. The data points will be divided into K clusters as a result of this.

Step 3: Recalculate the centroids' positions. Repeat Steps 2 and 3 until the membership of the data points no longer changes.

Output: Data points with cluster memberships as output.

In this paper, scenarios are classified into two groups: Noise and (Generated + Real). If K-means is distinguishable, then the generated scenarios that are not Noise will be viewed the same as real scenarios.

The formula for calculating Score is given by:

$$Score = \frac{True\ Noise + True\ (Generated + Real\ Scenario)}{Total} \quad (6)$$

In this section, the proposed deep-net model is applied for real data in the Vietnamese context. Specifically, we employ the following twelve variables, including Composite Stock Price Index, Central Bank Policy Rate, Deposit Rate, Lending Rate, Exchange Rate, Merchandise Trade Balance, Industrial Production Growth Rate, Retail Sales Growth, Broad Money Growth, CPI, Core CPI, Bloomberg Commodity Index during the period from January 2003 to December 2020. Data are collected from four different sources Bloomberg², International Monetary Fund³, World Bank⁴ and CEIC⁵ database.

The collected data are divided into two separate sets: the training and the testing. Data in the training set are used to train the model and then the model is applied to predict the data in the testing set. The important point when dividing these two sets is to ensure that the data in the testing set are not allowed to be used in training. Otherwise, the meaningfulness of the prediction is lost because the model has already “seen” that observation. In this regard, 80% of the data are used for the testing set and 20% for the training set. With the full dataset covering 216 months, the first 180 months (January 2003 to December 2017) are employed for testing and the remaining 36 months (January 2018 to December 2020) are utilized to train the model. Since data are measured with different units, it is necessary to normalize the data before performing the algorithm. Therefore, the input variables are normalized to have the mean of zero and the standard deviation of one.

Figure 4 shows the loss values of the model. The results of the model have some losses that have not yet converged mainly due to insufficient computing power. Loss of GAN pattern will be different from other

² www.bloomberg.com

³ www.imf.org

⁴ www.worldbank.org

⁵ www.ceicdata.com

models in that it fluctuates continuously. The constant volatility is because when the Discriminator/Generator learns something new, the loss of the Generator/Discriminator jumps sharply and vice versa. Eventually G's loss is more stable and D's loss starts to increase gradually. However, due to the limited computing power, we only trained 12,000 epochs once. Therefore, the result is not as expected. The ideal model is the one in which D's loss is increasing and G's loss is decreasing.

During model training, we expect that the value of accuracy on both real and fake data to fluctuate at around 50%. This means that about 50% of real data is mistakenly predicted to be fake and about 50% of fake data is predicted to be real. If this is true, the generator has generated a fake image that is quite similar to the real thing and makes the discriminator sometimes distinguish between real and fake scenarios and sometimes not. On the contrary, if the accuracy value of real scenarios is too high or the accuracy of fake scenarios is too high, either situation proves that the generator is not good enough to fool the discriminator.

The results of model are shown in Table 1. Overall, our experimental results show that the proposed GAN model works well. The generated scenarios based on the predictions of the GAN model yield relatively reliable results when 72.65% (after 10,000 trials) of the generated scenarios are similar to the real ones. As the quality of the generated scenarios is ensured, they can further be applied in bank stress testing models.

5. Conclusion

Deep learning in particular or machine learning in general has become increasingly popular and has been applied in various fields of research. The banking and financial sector is no exception. As pointed out by Ozbayoglu (2020), the potential for deep learning research in the financial sector has remained largely untapped. In particular, eight topics that need to be further researched include: (1) algorithmic trading, (2) risk assessment, (3) fraud detection fraud, (4) portfolio management, (5) financial asset pricing and derivatives, (6) cryptocurrencies and blockchain technology, (7) psychoanalysis financial consumption and (8) data mining. With the Fourth Industrial Revolution being under way with the explosion of big data and the development of artificial intelligence or machine learning models, there is much room for the application of deep learning algorithms in solving real-world problem.

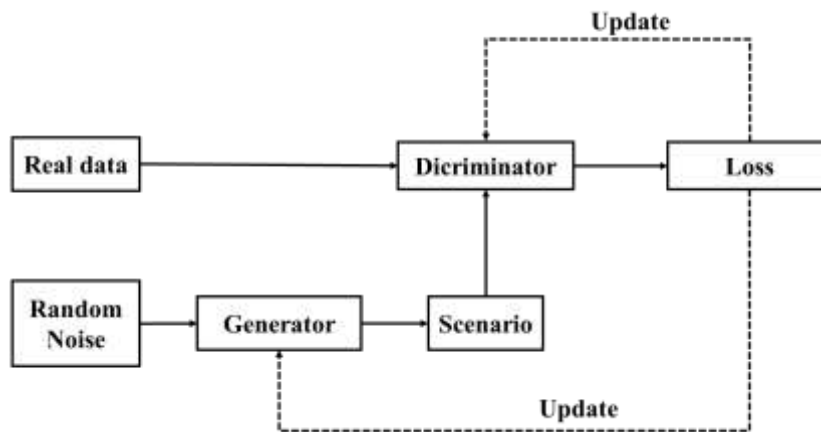
Against this backdrop, the focus of this paper is on the application of deep learning techniques to build stress test scenarios for Vietnamese banks. Up to now, previous methods of constructing stress testing scenarios have several limitations. For instance, data can be aggregated from different sources that do not rely on the same calculation methods or assumptions. Consequently, the data reliability is often questioned. In fact, simulations based on historical macroeconomic data are not likely to predict economic changes in the future. Assuming that one factor changes while the other relevant factors remain constant, this method does not provide highly reliable results in real-life situations. Therefore, the novel GAN model is proposed in scenario generators to overcome these limitations.

Despite many research papers on stress testing, studies in Vietnamese context are still limited. To fill in this gap, we introduce a new model to build stress testing scenarios, which can serve as the references to help guide Vietnamese commercial banks. Based on real data on the microeconomic and macroeconomic situation in Vietnam, we also evaluate the performance of the proposed framework and assess the quality of the generated scenarios. Once the accuracy and suitability of this model is confirmed, it will be possible for policymakers to formulate effective monitoring policies and for banks to implement better stress test for risk management.

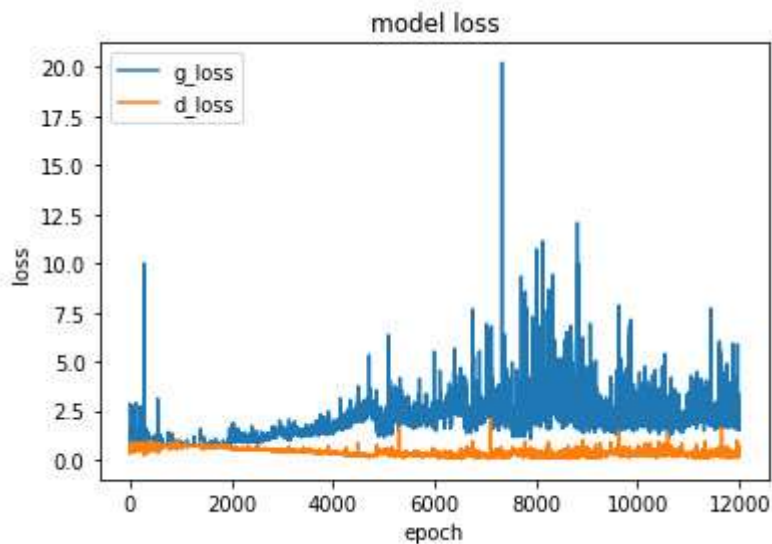
However, due to time constraints and limited resources, we could only collect data starting from 2003 for 12 microeconomic and macroeconomic variables. Future studies could expand the sample space by observing more samples and employ data augmentation techniques to increase the amount of training data. At the same time, other microeconomic and macroeconomic variables could be further included in the deep-net model to present a broader and more comprehensive view of the various risk factors. Finally, future research could consider Annealed Importance Sampling (AIS) to calculate log-likelihood of different scenarios for a more comprehensive view over model results. Also, different GAN models, for example the popular conditional GAN or Wasserstein GAN, could be employed.

6. Appendix

Appendix A. A proposed model.



Appendix B. Results of the loss values.



Appendix C. The mean value and standard deviation of predictive results of 36 months in the testing pool.

| | |
|----------------------|--------|
| mean (100 trials) | 0.7317 |
| stdev (100 trials) | 0.0129 |
| mean (10000 trials) | 0.7265 |
| stdev (10000 trials) | 0.0185 |

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IMPACT OF TAXATION ON DIVIDEND EVIDENCE FROM VIETNAM

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ABSTRACT

This research was conducted to analyse the impact of tax on dividend policy with the sample of 430 non-financial companies listed at Ho Chi Minh Stock Exchange (HOSE) and Ha Noi Stock Exchange (HNX) from 2007 to 2018. Based on static and dynamic panel data, this paper used regression models including OLS, FEM, REM and GMM to analyse that relationship. The results of the study show that the new personal income tax law related to dividend and capital gains income of investors has effects on the corporate dividend policy, though the level of influence is not much. Along with that is the biggest impact of the profit variable. The size, leverage and last year's dividends also significantly influenced the dividend policy of enterprises in Vietnam's stock market.

Keywords: personal income tax; dividend policy; Vietnam

1. Introduction

Motivation: Taking the theory of Corporate Finance into consideration, there are three important financial decisions of a business i.e. investment decisions, financing decisions and profit distribution decisions, in which the decision on dividend payment has increasingly played an important role in satisfying shareholders and attracting investment capital for the company.

Keeping a record of huge dividend payment, in the beginning of 2018, Cafef.vn reported: "Vinacafe Bien Hoa (VCF) announced having finalized the right of receiving cash dividends at the rate of 660%". The positive information also pushed up VCF stock price sharply, reaching nearly VND 328,000 per share (unadjusted price) in top price of stocks on Vietnam's stock market. After the last mid-2019 shareholders' meeting, "West Coach Station Joint Stock Company (WCS) made a surprise with a 200% dividend payout in the first phase and expected total payment rate of 400% for the whole year." Not only received high dividends, shareholders also satisfied with the fact that the price of WCS stock has increased by more than 35% since the beginning of 2019 till now, from the price of VND 133,000 per share up to VND 180,000 per share. Companies have many ways to distribute dividend to shareholders, mainly cash and stocks. The third week of August 2019 report regarding dividend payments shows that most of companies seem to prefer paying cash dividends. Among 13 enterprises announcing dividend policy (share rate and division method: cash, common stocks and preferred stocks), up to 10 businesses chose to pay cash (TVH, VCS, VPI, GHC, TPC, DNE, VFG, SOV, MBN, HST) and 3 businesses paid stock dividends (DNA, DTG, L14). So, which basis do businesses use to decide the pattern of dividend payouts? In other words, what factors affect the dividend policy of businesses? Is the stock market going smoothly? Is it simply because achieving profit margins far exceeds the plan so businesses are massively paying dividends to attract shareholders?

There are several micro and macro factors that affect dividend policy of the firm. One of which is income tax because it has a direct impact on the firm's profit as well as the income of shareholders. From the investor's perspective, dividend is an important source of income, hence the dividend policy is always adjusted appropriately to maximize shareholder wealth. In a country where laws are as dominant as in Vietnam, a question arises that how tax law affects corporate dividend policy. Back in the context of Vietnam's economy and stock market in the last 10 years, a prominent event mentioned is the change of personal income tax rates for capital investments. How does it affect all participants in stock market? In Vietnam, transactions related

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to capital investment were tax-free before 2009 but the Government has levied a 5% tax on dividend and 20% tax on capital gain or 0.1% on each capital assignment after that. However, the promulgation of the tax law on securities income is considered a big challenge for firms listed on Vietnam's stock market which is still weak. By the time the new tax law was published, the stock market was under the influence of the world financial crisis as well as the domestic economic downturn. Therefore, the Government extended the first enforced date to the end of 2009. The above changes in tax law had led to various reactions from investors and managers tended to change dividend policy to avoid income tax for shareholders. Supporting to this view, there have been many studies conducted in Vietnam (Thanh Nam, 2008; Duong Kha, 2012; Ngo Thi Quyen, 2015) concluded that companies increased cash dividend payment before January 1, 2009 in order to avoid personal income tax for investors.

With the desire to clarify the relationship between the new tax rate and dividend policy of listed firms, I conducted the graduation thesis with the topic "Impact of taxation on dividend: Evidence from Vietnam".

Research objective: The main objective of study is to examine the impact of investment income taxation on dividend policy decision of listed firms in Vietnam. In order to accurately reflect this relationship, the research period is from 2007 – 2018 including the time when the government issued and enacted a new tax rate on capital gains. Besides, the research also mentioned about how other factors such as liquidity, profitability, size and leverage ratios affect profit distribution decision. From the analysis results, it can propose prospective managerial solutions that contribute a stable development foundation for the Vietnam stockmarket in the future.

In order to achieve the above research objectives, it is necessary to answer the following main research questions:

- Does the changing the income tax law related to capital investments and dividends affect the corporate dividend policy?
- How do liquidity, profit, size and leverage ratios affect dividend policy?
- Whether the manager rely on last period's dividend to determine current dividend policy?

2. Theoretical framework

2.1. Cash dividend

The most common dividend payment method is cash dividend, which means that businesses pay cash directly or by bank transfer to shareholders. Receiving cash is always the top priority for shareholders because of the certainty of the return on investment in the business, rather than the promises of future capital gains. In the fact that, the dividend payment of cash also represents a strength in the financial potentiality of the business, and conveys the forecast signaling of the effective growth as well as the stability of the firm's cash flow to the market. Investors often rely on cash dividend policy over the year to assess the attractiveness of stocks when making investment decisions.

2.2. Stock dividend

Instead of cash, businesses can pay dividend in the form of stock. This method is called stock dividend. Enterprises will issue additional shares and divide to shareholders following to a particular percentage. When choosing this form, no cash will go out of the business, instead, there is an increase in the number of outstanding shares, while reducing the value of shares. The stock dividend payment does not change the corporate capital structure since this is a shift from retained earnings to shareholder equity only. For businesses, stock dividend method is often chosen when businesses want to use retained earnings for the reinvesting purpose with higher rate of return and to reassure shareholders. While for investors, the advantage of this method is that they can retain shares or convert into cash dividends by selling their shares anytime they want.

2.3. Stock repurchase

Stock repurchase is also a manner of paying dividend to shareholders instead of dividend payments in cash. Accordingly, the company will use the surplus cash to buy back a part or all of its shares being owned by shareholders. These shares will be owned by the company and entered in the accounts as treasury shares. The repurchasing share method may be performed by buying at market prices (open market repurchases), offering bids for buying a particular number of shares at a fixed prices (tender offer) or buying directly from specific shareholders (targeted repurchase). The stock repurchase reduces the number of outstanding shares of the business, which reduces the pressure of paying dividends in the future and can offset to dilution.

2.4. Factors affecting dividend policy in emerging countries

Azhagaiah and Priya (2008) conducted research about the effect of dividend policy on the potential profitability of shareholders on the Indian stock market. The research methodology is a multivariate regression technique with a sample of 28 chemical companies (organic and inorganic) listed on the Bombay Stock Exchange for 10 years from 1997 to 2006. The dependent variable is the market value of the stock which is used to predict the profit potential of shareholders, while the independent variable, DPS, is used to measure corporate dividend policy. The study showed that dividends are seen as a characteristic for potential profitability because shareholders often prefer to receive dividends over uncertain capital gains in the future. Besides, the potential earning of shareholders is also affected by growth in revenue, improvement of profit margins, capital investment decisions, capital structure decisions and cost of capital. However, unlike enterprises paying dividends, the dividend policy does not have any effect on the profit potential of shareholders in case the enterprise does not pay dividends. Jabbouri (2006), in his study, explored the factors that affect dividend policy in emerging markets such as the Middle East and North Africa during the period 2004-2013. Jabbouri realized that dividends are proportional to this year's liquidity, size, and income; while there is a significant inverse relationship to free cash flow, growth, leverage and current position of a state.

Nishat and Bilgrami (1994) conducted a study of 225 companies listed on the Pakistan Stock Exchange between 1980 and 1986 in order to identify the typical factors of dividend payment behavior. While dividend policy is represented by the variable DPS, the independent variables include net profit after tax, surplus profit, net working assets, firm size, and changes in shareholding. In addition, the author used a number of dummy variables to specialize businesses. It can be seen from the results that current DPS has a significant positive correlation with the dividends paid in the previous year but there is a negative relation with net profit after tax. The results also showed the negative impact of the surplus profits on dividends paid because of using usually for available investment opportunities. However, variables such as size, private companies and multinational companies have a positive impact on dividend payment policy.

Similarly, Afza and Mirza (2010) conducted research on the influence of some corporate characteristics on dividend policy of 100 companies listed on the Pakistan Stock Exchange from 2005 to 2007. Through the regression analysis method, the less controlled the company is, the more dividends will be paid to shareholders. In addition, dividends tend to be paid more in companies with high level of cash flow and profits, while companies with high financial leverage do not want to pay dividends. Moreover, the study also showed a negative relationship between firm size and dividend policy. According to the conclusion of Afza and Mirza, businesses in Pakistan tended to reduce dividend payments, from 46% in 2005 to 40% in 2007. Thereby, the ownership of management, size and cash flow are the main factors when considering a corporate dividend policy.

Overall, the studies in Pakistan support the notion that companies with internal control are very common in Pakistan and the agency costs between minority and majority shareholders are more concerned than that between company and shareholders (Abdullah and partners., 2012; Amin and partners., 2013). Following to the study of Abdullah and partners. (2011) on *investors' power* hypothesis as opposed to the hypothesis of minimizing the cost of dividends on the Pakistani market, the author argued that the capital market in Pakistan exhibited by family companies and insider owners. With these characteristics, firms often avoid paying dividends unless forced by powerful investors. To test the hypothesis mentioned above, the

research sample was collected including 183 companies listed on the Pakistan Stock Exchange. The author pointed out some evidence supporting *investors' power* hypothesis. According to the results of the study, the decrease in the dividend payment rate leads to the decline in the ownership ratio of shareholders, managers and their families. In addition, there was only a small amount of evidence that institutional investors may force managers to pay dividends.

Considering to another research, Nishat and Irfan (2001) used a sample of 160 companies listed on the Pakistan Stock Exchange from 1981–2000 to analyze the impact of dividend policy on stock price movements at Pakistan. The results proved that stock prices were significantly affected by the dividend policy of each company. At the same time, it indicated a positive impact between stock prices, volatility, size as well as financial leverage.

3. Research method

3.1. Data

Research subjects include 430 non-financial firms of different industries listed on the Ho Chi Minh Stock Exchange (HOSE) and Ha Noi Stock Exchange (HNX) and pay dividends at least once in the period 2007–2018. The data was collected from reliable sources, which are extensively used in previous studies. The author collected manually from the financial statements (Balance Sheet, Income Statement, Cash Flow Statement and Notes to Financial Statements) of the companies on *cafef.vn* and *data-Finpro*. Raw data includes all unprocessed variables: dividend amounts; total assets; total liabilities; short-term assets; short-term debt; earnings before tax (EBT) from 2007 to 2018. The author went to filter out financial, insurance, and securities companies since the operating method and accounting regime are not the same. Companies that did not pay dividends at least once from 2007 to 2018 were also eliminated because they did not meet demand. The author then proceeded to process the data with the help of excel and conduct research.

3.2. Regression models

Table 3.1: Variables expectation in the model

| Variable | Description | Calculation | Expectation |
|-----------------------------|-----------------------------|------------------------------------------------------------|-------------|
| Dependent variable | | | |
| DIVA | Dividend payment | $\frac{\text{Dividend Total}}{\text{Assets}}$ | |
| Independent variable | | | |
| TD | Dummy variable for taxation | $1: \text{from 2010 onwards}$ $0: \text{before 2010}$ | (+) |
| LIQ | Liquidity | $\frac{\text{Current Assets}}{\text{Current Liabilities}}$ | (+) |
| PROF | Profits | $\frac{\text{Earnings before tax Total}}{\text{Assets}}$ | (+) |
| SIZE | Firm size | $\ln(\text{Total assets})$ | (-) |
| LEV | Leverage | $\frac{\text{Total Liabilities}}{\text{Total Assets}}$ | (-) |

Source: The author

4. Result and discussion

4.1. Descriptive statistic

The data is preliminarily checked through estimation methods. The first step was descriptive statistics for eliminating abnormal data (Table 4.1). Second, the mean differencetest was used to consider the difference before and after changing tax law (Table 4.2). Next step, the Variance Inflation Factor (VIF) was used to detect whether multicollinearity phenomena occur (Table 4.3). Along with that, the author checked the correlation between the independent variables (Table 4.4). Test the variance change was conducted to choose suitable model (OLS/FEM) (Table 4.5). Test the existence of random or fixed effects was conducted to choose suitable model (FEM/REM) (Table 4.6).

Descriptive statistics of independent and dependent variables are presented in the table below with following meanings:

The ratio of dividends on total assets has an average of 0.0317757, meaning that one unit of assets must pay an average of 0.0317757 VND (3.178%) - a relatively small number as compared to the current average payment. The difference between the minimum and maximum value is 0.7906561 (0.00% - 79.07%). The liquidity of firms has a average value of 2.26>1. This shows that the majority of enterprises have the ability to fulfill their obligations on due debts. In general, the average profit of the sample firms in this period was relatively low at about 0.082275, which means that one unit of assets generates only 0.082 unit of profit. The cause may be due to the economic downturn during the 2008 crisis that Vietnam also suffered. Moreover, the gap between businesses is very large (-1.65% to 89.72%). The next ratio taking into consideration is the firm size with average about 6.27 with very low level of disparities. The final value referred by the descriptive statistics is leverage, before removing the exceptions, the result shows that the minimum and maximum values have a larger gap. If the firm does not want to go bankrupt, the value of leverage cannot be greater than 1, hence all values greater than 1 are removed. Some businesses instead of borrowing as before, they raise funds from shareholders to conduct the development policies of the company. Therefore, there is a LEV ratio with a value near zero.

4.2. Regression result of static panel data

Table 4.1: Results of stable panel data regressions

| Variables | (1) | (2) | (3) | (4) |
|--------------------|------------------------|------------------------|-----------------------|---------------------------|
| | OLS | REM | FEM | FEM (Excluding year 2010) |
| SIZE | -0.00173*** (-3.93) | -0.00184*** (-2.82) | -0.00267* (-1.81) | -0.00376** (-2.38) |
| LEV | -0.0292*** (-4.64) | -0.0355*** (-5.34) | -0.0261*** (-3.78) | -0.0247*** (3.39) |
| PROF | 0.273*** (10.19) | 0.209*** (5.60) | 0.131*** (5.83) | 0.133*** (5.65) |
| LIQ | 0.0000638 (0.25) | -0.000192 (-0.62) | -0.000400 (-1.48) | -0.000405 (-1.49) |
| TD | 0.0108*** (7.41) | 0.00918*** (5.74) | 0.00770*** (5.55) | 0.00952*** (5.80) |
| Constans | 0.0268*** (4.77) | 0.0378*** (5.79) | 0.0462*** (5.26) | 0.0515*** (5.68) |
| Observation | 5160 | 5160 | 5160 | 4730 |

Notes: Dependent variable is dividend payment on total assets (DIVA); Independent variables are taxation dummy variable (TD), liquidity (LIQ), profits (PROF), firm size (SIZE) and leverage (LEV). Standard errors in parentheses. *** p<0.01, **p<0.05, *p<0.1

Source: The author

The focus of the paper is to explore the impact of taxes on dividend policy of Vietnamese companies on Vietnam's stock exchange. Through the use of the dummy variable TD, all models show that tax affects the dividend policy with a high level of statistical significance, although the influence level is not much. This is entirely consistent with the theory of tax incentives and is similar to the previous study of Thai Ai Uyen (2014). As an emerging market similar to Vietnam, Naimat U. Khan and partners. have studied and concluded that tax does not affect dividend policy in Pakistan. This difference can be explained by the fact that most companies in Pakistan are family owned. The shareholders of this company seek profits other than receiving dividends and they will not be willing to pay dividends if not forced by outside shareholders. Taxes therefore do not bother them. This argument has been supported by Abdullah and partners. (2012).

As the results presented in the table above, profit is the biggest factor affecting the dividend payment of enterprises in a positive direction with regression coefficients in all four models in the range of 13% - 27% and statistically significant in all models. It is easy to understand that when a business achieves its target profitability, it pays a large amount of dividends to its shareholders to offset the rewards they deserved and vice versa. Many studies in the world have also affirmed that profit is a decisive factor for the dividend policy of enterprises (Lintner, 1956). In the Vietnamese market, a firm with a large dividend payment implies that it is doing well with expected profits. This is researched and confirmed by Le Hoang Hien (2010). In summary, the model's results are completely consistent with previous studies in the world and reality in Vietnam stock market.

Among the factors that affect dividends, firm size negatively impacts dividends, which means that the bigger the business, the lower the dividend payment. In the research paper: "The impact of dividend policy on corporate value and some suggestions" Dr. Nguyen Ngoc Huy and Truong Thi My Tram (2016) also agree with the above conclusion. For Vietnam market, this can be explained as follows: Large-scale enterprises often tend to retain a relatively large level of profit to continue investing and reinvesting in potential projects instead of paying dividends. In contrast, small-sized businesses often propose a higher level of dividends to build trust and attract investors.

According to the trade theory of capital structure, firms with high leverage require maintaining a larger monetary fund to meet the obligations of periodic interest payments and other major payments. According to Brockman and Unlu (2009) it is also explained that lenders sometimes impose restrictions on lenders' policies, for example: requiring commitment to reduce dividend payment to ensure that the firm's first cash flow is used to pay off the loan. Therefore, all four models' results of this study with negative regression coefficients and high statistical significance level of LEV are consistent with theories and previous studies.

Author Phung Tat Huu (2015) supported the argument that paying dividends makes cash flow come out, meaning that enterprises with greater liquidity are more likely to pay dividends. Conversely, even businesses with high growth rates and high earnings performance may not want to pay high dividends if the majority of their capital is devoted to investing in low liquidity assets such as inventories. However, liquidity variable does not have any effect on dividend policy in all regression models.

Comparing regression results of the FEM model excluding year 2010 and previous models, we found that the change is insignificant, even the coefficient (α) does not change much. This implies that the complexity of the 2010 tax policy has no major impact.

4.3. Regression result of dynamic panel data

Because the dividend policy of businesses is long-term, they often rely on last year's payment policy to determine the current year's policy and make adjustments to achieve a target dividend policy. Therefore, this research adds a new variable into model representing the lagged of the dependent variable. The adjustment model is as follows:

$$DIVA_{it} = \alpha DIVA_{it-1} + \sum^k \beta_k X_{it} + \gamma_i + TD + \varepsilon_{it}$$

Where DIVA is dividend divided by total assets of firm i at time t . X_{it} is the vector of all independent variables. γ_i represents the special influence of each company, TD is a dummy variable representing the influence of taxes. ε_{it} is the error of the above model.

γ_i are random and probable to occur correlations with $DIVA_{it}$ (Bond, 2002). Therefore, estimates of the intercept and slope of a simple OLS model are no longer accurate. At that time, GMM was proposed to use. This method provides more stable and accurate estimates through the tool is the lag variable of the dependent variable. Arrelano and Bond (1991) suggest that the sGMM technique should be used.

Sargan test in the model is used to consider the suitability of tool variables. With H_0 is the null hypothesis that there is no correlation between instrument variables and errors. AR (1) and AR (2) check the first and second degree autocorrelation of the remainder in the equation.

Table 4.8 shows most of the similarities between the results of the static table regression and the GMM regression. The regression coefficient of the lagged variable $DIVA_{i,t-1}$ is - 0.0276, showing that the dividend policy of the previous year relatively affects this year's policy.

The main variable of the model is a dummy variable TD that is statistically significant for both models. The coefficient of TD is at 0.0088 approximately with the result of the static panel data regression, which means that the tax affects the dividend policy in the GMM model.

Similar to the static table regression, SIZE and LEV are the factors that have negative impacts on dividend policy and statistically significant in both sGMM models with and without year 2010.

Table 4.2: Results of the GMM regressions

| | sGMM | sGMM (Excluding year 2010) |
|-------------------------------------------------------------|------------------------|----------------------------|
| DIV_{Ai,t-1} | -0.0276*(-1.94) | -0.100*** (-6.27) |
| SIZE | -0.00174*** (-5.15) | -0.00200*** (-5.59) |
| LEV | -0.0373***(-12.06) | -0.0418***(-12.83) |
| PROF | 0.246***(39.22) | 0.261***(39.02) |
| LIQ | -0.0000748 (-0.36) | -0.000199 (-0.96) |
| TD | 0.00267** (2.06) | 0.00787*** (6.55) |
| Constant | 0.0419*** (14.67) | 0.0444*** (14.98) |
| Number of obs | 4730 | 3870 |
| Arellano-Bond test for AR(1) in first differences: z | -15.81 (p = 0.000) | -13.61 (p = 0.000) |
| Arellano-Bond test for AR(2) in first differences: z | -0.05 (p= 0.959) | -0.71 (p = 0.476) |
| Sargan test | 3732.28 (p = 0.000) | 2870.25 (p = 0.000) |

Notes: Dependent variable is dividend payment on total assets (DIVA); Independent variables are taxation dummy variable (TD), liquidity (LIQ), profits (PROF), firm size (SIZE) and leverage (LEV). Standard errors in parentheses. *** p<0.01, **p<0.05, *p<0.1

Source: The author

5. Conclusion

Thus, it can be seen that dividend policy is affected by many different factors, both internally and externally. Simultaneously, the level of impact of each factor is a difficult problem to determine. In particular, the impact of income tax, especially the tax on capital gains, is a factor mentioned with high expectations of its influence and has been empirically studied in many countries around the world. In Vietnam, the tax law on income from investment and capital assignment has only really been imposed since 2010 due to many amendments and extensions. This is a condition for researching the reactions from investors and firms on Vietnam's stock market when faces changes in tax law.

This thesis was conducted based on the objective of understanding the impact of tax on dividend policy on HOSE and HNX by regression analysis method for a set of 430 non-financial companies in the period 2007–2018 with a total of observation is 5160 observations. Based on the empirical models made in previous studies, the thesis has selected the ratio of dividend on total assets as the dependent variable, while independent variables includes liquidity, leverage, size, profit and last year's dividends along with the dummy variable representing taxes.

Using static and dynamic panel data models to analyze the impact of taxes, the FEM model was selected as the most appropriate model. The data is seem to be quite good when no collinear, self-correlation phenomenon occurs. In addition, all models overcome the phenomenon of heteroskedasticity and sGMM is used to overcome endogeneity of the model. The analysis results from OLS, FEM, REM and GMM models are consistent, showing that tax affects the dividend payment to shareholders. In other words, the dividend policy of firms on Vietnam's stock market during the research period has responded to the appearance of the Law on Personal Income Tax. This is entirely reasonable because the impact of income tax on dividend decisions will affect the corporate value and the interests of shareholders. With the difference in tax rates so high between cash dividends and price differences (or capital gains), many companies have tended to increase dividend payments to avoid income tax for investors. The main question of the research paper: "How does tax affect dividend policy?" has been answered and completely consistent with the findings of previous studies.

Besides, through empirical evidence and analysis of regression results, it can be seen that the company's leverage ratio, profit and dividends of the previous year are the factors that have a significant impact on the dividend payment policy of non-financial companies listed on HOSE and HNX. The explanations for this result are presented in detail in section 4.1 "Results of static panel data regression". The difference from previous studies is that this paper summarizes all the factors considered to influence the dividend policy of the business that the previous authors used.

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DIGITAL TRANSFORMATION IN BANKING - SITUATION AND SOLUTIONS

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ABSTRACT

The rapid development of science and technology, especially the internet and smart mobile devices, has pushed the trend of digital transformation in all fields. With changes in customer behavior, banks have been transforming themselves to adapt to the digital age. Therefore, adapting to change, developing fully, effectively and becoming prominent in the eyes of customers is one of the big trends that banks in Vietnam and around the world need to focus on developing. In Vietnam, no bank has fully developed digital banking, although many banks have implemented Internet Banking (Online Banking) and Mobile Banking systems. Therefore, the application and development of digital banking is not only an opportunity but also a challenge for each bank to create breakthroughs, outstanding innovations in the field of technology, increase competition in the market as well as attracting and improving customer experience to the bank.

Keywords: digital banking, Internet Banking, Mobile Banking.

1. Introduction

1.1. Research scope

The overall objective of the basic theories of digital banking services, important benefits of developing digital banking. Analyze the current situation of developing digital banking services at banks in some countries around the world and in Vietnam recently. Propose the solution and implementation organization to successfully develop digital banking services.

1.2. Research methods of the study

The study uses a number of research methods such as document collection, statistics, analytical methods, comparisons, ...

1.3. Structure

Part 1: Introduction

Part 2: Theory of digital banking

Part 3: Situation of digital banking development in Viet Nam and in the world

Part 4: Solutions

Part 5: Conclusion

2. Theory of digital banking

2.1. What is Digital Banking?

According to Temenos and Forbes Advisors: **Digital banking** is the digitization (or moving online) of all the traditional banking activities and programs services that were historically only available to customers when physically inside of a bank branch². This includes activities like Money Deposits, Withdrawals, and

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² Darryl Proctor (2019), What is Digital Banking?, <https://www.temenos.com/news/2019/12/19/what-is-digital-banking/>

Transfers, Checking/Saving Account Management, Applying for Financial Products, Loan Management, Bill Pay, Account Services.

Online banking means accessing banking features and services via your bank's website from your computer. You may log into your account to check your balance or pay your electricity bill. You can access additional banking features, such as applying for a loan or credit card, at many banks via your online banking portal.

Online banking lets you sit down at your computer and tackle many of your personal finance needs without ever having to leave your home.

Mobile banking means using an app to access many of those same banking features via mobile devices such as smartphones or tablets. These apps are proprietary, issued by the bank where you hold your account, and usually use the same login information as your online banking portal.

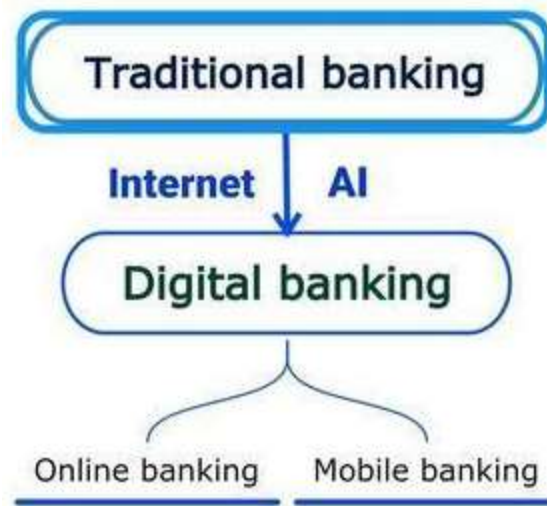
Designed for people on the go, mobile banking apps tend to include the most used banking features, such as mobile check deposits, funds transfers and bill payments. They also often have convenient features like peer-to-peer payments through systems. Banks also may use their mobile apps to send customers banking alerts such as fraud detection and low balance notifications.

Here's a visual equation that sums up (literally) digital banking:

$$\text{Online Banking} + \text{Mobile Banking} = \text{Digital Banking}$$

The definition of digital banking that authors infer:

Digital banking is the shift of traditional banking activities that are carried out only through branches to services provided thanks to the internet. From there, all transaction activities do not need to go to the branch and can be performed anytime, anywhere regardless of time and space, so customers are completely proactive.



2.2. The advantages of digital banking in banking system

The Government's requirements for the banking industry in the Strategy on Development of Vietnam's banking industry to 2025, with orientation to 2030 in Decision No. 986/QĐ-TTg: Monetary system, banking and operations of Credit institutions are the lifeblood of the economy, continuing to play an important role in the overall financial system of Vietnam.

In the implementation contents of the Strategy on Development of the Banking Industry in Vietnam to 2025, with orientation to 2030, promoting digital banking activities is one of the important contents mentioned because this is considered the inevitable future of banking activities.

Digital banking is an operating model that mainly relies on electronic platforms and data to trade in banking products and services. The explosion of information technology has led to the development of digital banking, which has brought many benefits to both banks and customers.

Compared with traditional banks, digital banks help consumers save time, costs and effort when paying electricity and water bills directly, shopping online without having to go to the place... Digital banking offers convenience to both the bank and its customers. For customers, they can save time dealing with problems related to transactions anytime, anywhere. For banks, they save more on infrastructure investment and staff when all transactions are done online.

The advantages of digital banking are increasing the bank's operational efficiency and improving service levels, saving time and effort for the bank's customers and employees. It is the availability of service 24 hours, including holidays and easy control of your trading activities.

- Saves effort and time as customers can perform banking activities without having to go to the bank's headquarters. Customers can do them anywhere, whenever they want.
- The ease of transactions in Digital banking and the speed of their execution is much faster than in traditional banks.
- Integrated with many new technologies such as Blockchain, making it more secure, reducing the risk of customers' account data being stolen.
- All transactions are done via online, which helps to reduce operating costs for banks, thereby reducing costs for customers to pay for such transactions.

At the same time, with the support of technology, digital banking services can better serve many customers, even those in remote areas, helping banks improve their competitive advantage. compete effectively against competitors. Digital banking also helps to create unique and high-value products that can meet a wide range of customers.

The development of digital banking brings many practical benefits to the bank. As income from credit activities is decreasing, developing digital technology-based products and services creates conditions for many banks to increase the proportion of revenue in total profits

3. Situation of digital banking development in Viet Nam and in the world

3.1. Digital banking experience of countries in the world

Along with the strong trend of international economic integration and globalization, implementing the digital transformation of the economy and especially for the banking sector is a very important factor. This not only brings major changes to the entire operations of the banking industry worldwide but also has a positive impact on the productivity and quality of the economy, improving competitiveness in the global production chain. Moreover, the outbreak of the Covid 19 pandemic in recent years has been a catalyst to accelerate the digital transformation in the banking industry, while enhancing the application and convenience for users.

Looking at the world economy, digital banking has become an indispensable and crucial part of the development of the economy.

- **Korea:**

The Central Bank of Korea (BoK) announced on April 5 that demand for Internet banking grew at more than two figures last year, due to limited access to bank branches by residents in the midst of the COVID-19 outbreak. Particularly mobile banking, in 2020, recorded a growth rate of 10.6%³.

Digital banking has brought positive effects to the Korean banking system. Since the implementation of digital banking, the Korean banking system has had some changes as follows: Fees and interest rates tend

³ Q.Chung (2021), Dịch vụ ngân hàng trực tuyến Hàn quốc tăng trưởng hai con số.

to decrease, increasing competitiveness; products and services are more digitized; banking applications on mobile devices become more friendly.

Digital banks expand their credit market share for the group of customers who do not meet the requirements of traditional bank's records and procedures.

- **The United States**

The United States is a country that has had great success in the partnership between banks and Fintech companies in the context of digital transformation. The results of the study “LendIt Fintech Bankers Survey” (2020) show that 58% of senior staff at the bank in the US see the relationship with the Fintech company as an important strategy of the bank, 84% of the respondents think they are willing to cooperate with the UK-based Fintech company. Banks see the Fintech company as an integral part of their development plans. To avoid differences in corporate culture, banks in the US prefer to select Fintech corporate partners as suppliers rather than partners to build digital products/solutions for banks.

According to AT.Kearney, in the digital banking sector, Mobile banking is changing the game with an increasing number of customers, banks are increasingly interested in mobile banking channels. Banks surveyed in the AT study. Kearney has: (i) changed the business model in the digital age; (ii) enhanced the role of the branch in advising customers in the direction of improving digital customer service skills; (iii) transformed more flexibility in technology; (iv) changed the organizational model such as forming departments of both operations and technology centre to ensure rapid development of products and services⁴.

In the US, for Fintech companies, in the short term, their goal is often to provide concrete solutions and feasibility tests (POCs). Accordingly, these solutions will be directly applied to the Bank's operations and have observation and evaluation. On the bank side, they will normally approve the solution pilot application within a certain period of time. The cooperation between the Fintech company and the bank must be specified with the appropriate period of time, enough time for the bank to provide the necessary information and the Fintech company to complete the solution, implement the POC. However, if the time lasts too long, it will put pressure on the resources of both parties. The partnership between the bank and the Fintech company in the United States is a two-way relationship, built on the following foundation:

- **Current situation of DB development in Vietnam**

Some Vietnamese banks have tested digital banking services and transformed business models in the direction of modernization, such as using e-banking solutions to transfer money via social networks, withdraw money at ATMs without using cards (TechTNMT), My Ebank (Sacombank) electronic banking application; Data analysis technology (VPBank) application. Or some banks have tried to implement digital business models such as Digital Lab (Vietcombank) transaction space; Timo digital banking project (VPBank); LiveBank automated banking service of Tien Phong Joint Stock Commercial Bank (TPBank), E-Zone modern electronic banking trading experience area (BIDV); channel cooperation platform (Omni Chanel -OCB).

According to the State Bank survey in September 2020, 95% of banks have been developing digital transformation strategies or plan to develop and implement this plan in the coming time. In particular, 39% of banks have approved a digital transformation strategy for business development as well as information technology and 42% are developing a digital transformation strategy for themselves.

Due to the wide variety of financial capabilities, the mode of operation that each bank will choose for itself is an appropriate digital transformation model.

It can be seen that the majority of banks (88%) have the option of switching both front-end and internal (back-end) communication channels or full digitization; few banks (6%) expect to digitize only front-end communication channels. New technological technical solutions such as cloud computing, Big data

⁴ TS. Đinh Thị Thanh Vân, TS. Nguyễn Thanh Phương (2019), Phát triển ngân hàng số: kinh nghiệm quốc tế và bài học cho Việt Nam, Tạp chí Ngân hàng.

or robotic process automation, artificial intelligence (AI) applications... are being applied at most banks. In particular, Big data and AI are the most used by banks to analyze the behavior and needs of customers to improve the quality of products and optimize the needs of users.

In addition, under the development of science and technology, the issue of security and security in payment as well as customer information is also put first by banks, to enhance the peace of mind of customers in the use of electronic services such as internet banking, electronic wallets...

In addition, in order to provide customers with seamless and personalized experience services as well as create more cohesion between banks and customers, banks also cooperate with Fintech companies and connect with digital ecosystems of other industries and sectors (Fintech companies, organizations supplying goods and services (Vingroup, Grab,...), e-commerce companies (Lazada, Shopee,...), telecommunications companies (HBG, VNPT...).

With the rapid growth rate over the years and the trend of shifting customers' services to digital channels, many banks have not been afraid to invest in the cost of building data warehouses, centralized digital infrastructure, standardization, creating ecosystems spread across many industries such as mobile banking ecosystems... This, in addition to helping the bank save costs, also increases more utilities than direct transactions at the bank, creating convenience for customers. Since then, the number and value of transactions through banking on online channels has also increased significantly. As reported in VPBank's performance report on June 30, 2019, the number of users has increased by more than 500,000 people by more than 300,000 people compared to December 31, 2018, reaching 15% growth. The transaction value is over VND 4,000 billion with more than 1 million transactions carried out. Meanwhile, in 2018, transaction value was just over VND 300 billion with more than 471,000 transactions.

Some other banks such as TPBank, MB have recorded more than 80% of transactions made on digital platforms. Tens of millions of customers are using the applications: the digital banking application and digital banking application, VietinBank iPay, BIDV Smart Banking, eBank X of TPBank; Omni-Channel of OCB;... to make daily transactions and payments. Through the data available, it can be expected that in the next 3-5 years, the number of customers using digital channels will reach 60%.

In the first 6 months of 2020, while many economic sectors were affected by the COVID-19 pandemic, cashless banking transactions continued to grow at an impressive 48.3% in number and 13.4% in value compared to the same period in 2019.

3.2. Challenge

Financial experts believe that Vietnamese banks may be in a pretty rough race in DB development, but in fact, they are still in the first stage or the first form.

From infrastructure to operations and distribution channels, DB still relies heavily on the traditional banking system. New products and services have only been redesigned to better meet the needs of usage trends as well as technical customer segments. So far, only VPBank has turned its distribution channels into an independent branch operating on a digital platform. Its products, services and independent sales policies have been transformed into DB called Timo (third form). Other banks are still on the verge of change and development. Banks have been very cautious so far because there are still many challenges in DB development in Vietnam.

The biggest problem is the lack of talent, qualified human resources to manage and current legal corridors. There are still many regulations that are not compatible with the context of digitization of services, not really promoting the development of digital banking and digital payments. In particular, legal corridors for new issues such as consumer protection in the financial sector, protection of privacy of user data, open connection standards, data sharing, e-customer identification (eKYC)... have not yet been issued to create banks and payment intermediaries with investment peace of mind.

Another issue is the issue of capital and limited a budget for digitization, the investment and application of new solutions and technologies. Only a few banks have invested significantly in this sector while most others are taking precautions, depending on the annual distribution budget.

However, wanting DB to grow steadily in Vietnam is a difficult problem. The Bank of Vietnam is still preparing for the digitalization and application of digital technology, cooperating to open banking agents, e-KYC (Know Your Customer), cryptocurrencies and open the Application Programming Interface (API). On the other hand, a good DB can not only meet the daily financial requirements but must also be reliable in the eyes of customers.

When digitized, Vietnamese banks will face cybersecurity risks such as fraud, phishing, cyberattacks, and the risk of leakage of user information. The difficult problem when switching to a digital environment is the authentication of users because using a digital bank will limit the direct contact between customers and bank employees, so authentication requires a specific technology platform such as a biometric authentication system, electronic identity card, digital signature as well as related legal issues to meet the requirements. As a result, customers remain cautious when using DB, which also slows the development of this segment.

Therefore, in addition to the plan to digitalize financial services at the bank, there are great challenges in creating adequate regulatory regulations, facilitating development, maintaining a good balance in promoting creative advances and protecting consumer interests, as well as preventing risks in finance market.

4. Solutions

Looking back at the successful digital transformation of several banks in the region, such as changing demographics, better and cheaper technology, need to optimize return on investment, legal system and flexibility. These will be the core drivers for banks to transform their operations to meet more complex and diverse customer needs.

Vietnam is a potential market for digital banking conversions. To achieve this, banks should start by building their digital strategies and visions. They can then assess their current digital status and choose the right approach to digital transformation with clear goals aligned with financial performance.

4.1. Recommendations for state management agencies

Firstly, regulators have an important role in the orientation, organization and deployment of digital banking in a country. Therefore, the regulator needs to evaluate and evaluate the potential of digital banking development in Vietnam, thereby developing a specific strategy and plan. In addition, the construction of legal corridors and policies on digital banking must be timely and synchronous. In fact, although the Korean banking authorities have reduced the load on procedures and administration to facilitate the implementation of digital banking, some policies of the legal system have not changed accordingly, thereby creating overlap in implementation.

Secondly, it is necessary to develop a common digital banking framework and specific guidelines for commercial banks to facilitate the implementation process, avoiding each commercial bank rebuilding under a different framework and model. In addition, the digital banking framework must promote national financial services; meet accessibility and customer service.

Thirdly, the implementation of digital banking at commercial banks requires the consent of the State management agency. The purpose of this control is to ensure that commercial banks have a solid foundation to implement digital banking including the following contents: People, technology, pricing. At the same time, it is necessary to have policies to encourage and promote digitalization at banks.

Fourthly, there is monitoring and monitoring the level of compliance with the regulations on digital bank deployment of commercial banks after the State management agency has granted permission for commercial banks to deploy digital banks.

4.2. For commercial banks

Firstly, commercial banks need to study and develop a roadmap to transfer models to digital banks. Digital banking is no longer a trend but a mandatory requirement that each bank needs to achieve in order to fit the current digital transformation landscape. At the same time, the bank must have a prudent business plan. In the early stages of implementing digital banking, banks have to spend a lot of costs on technology investment, advertising and promotion leading to negative profits. A prudent, clear business plan will help

the bank quickly overcome initial difficulties and achieve profitability, ensuring capital adequacy as required.

Secondly, allocate resources to develop new technologies. In the annual budget plan, commercial banks need to consider the proportion of investments with expenditures, the reduction of costs that are not really necessary to devote resources to technological investment should also be considered. It is necessary to determine the cost of investment clearly, properly, coupled with the potential revenue expectations in the future. Step by step apply modern technology to the activities of the bank, creating the premise for the transformation into a digital bank. The study of these technologies will take a long time and have a roadmap so the initial solution may be to partner with technology companies and/or to invest in technology startups as a possible direction to consider. During that time, commercial banks need to have an interest in upgrading Core Banking, ensuring that Core Banking meets the requirements of customer expansion, operational management and risk management.

Thirdly, prepare human resources to meet the implementation of digital banking in the following directions: Hiring experts and experienced people to implement digital banking; training and retraining staff in specialized courses or internal courses to help improve the understanding and application of digital banking; having remuneration policies, attracting competent staff in digital banking; expanding exchanges and learning from the experience of implementing digital banking from other experts, organizations and banks; making technology-related skills into a factor of recruiting staff. At the same time, it is required for middle-level leaders and senior leaders of banks to understand banking technology and digital banking.

Fourth, promote the application of technology in data management in four steps: Establishing governance structures; developing policies and processes; operating and implementing policies; controlling the effectiveness of data management in accordance with the context of digital transformation in the banking industry.

Fifth, build a centralized database of banks, facilitate easier and more complete access by departments, and collect data; at the same time, decentralize access to confidential information. Commercial banks may consider establishing a business data mining and management centre to specialize in the data warehouse analysis function, manage data projects, and coordinate the provision of information for business units, product and service development research departments, information technology units, and bank leaders.

Sixth, continuously innovate and innovate products and services, in accordance with the needs and tastes of customers. Develop smart banking products and services, including focusing on building a product ecosystem including: Products in many areas, increasing the number of acceptance points, overcoming technological constraints and improving security solutions. Promoting linkages with retail websites to integrate electronic wallet payment gateways on sales websites, especially e-commerce websites with a lot of tracking can help expand the customer base and interact with commercial integration and wallet payment.

Seventh, strengthen cooperation with Fintech companies in the direction of openness and mutual benefit. For its part, the bank should have a risk management plan in cooperation with Fintech companies, such as regulations on the types of data provided, regulations on information security in cooperation...

5. Conclusion

As tech-savvy fintechs enter the market, big banks are beginning to reap the benefits of adopting technology. For instance, Bank of America now receives more deposits via mobile than its brick-and-mortar branches. Banks must use technology to transform products, attract customers, empower employees and optimize operations. Technologies can shape the future only when they permeate all internal and external levels of a bank's activities. Contrary to common misconceptions, the digital transformation won't make traditional banking institutions go extinct. Instead, it is an opportunity to reimagine financial services, making banks customer-centric, innovation-driven and future-ready.

Banks need to increase the focus on business outcomes. Customers want a seamless and simple transactional journey enabled by technology and various digital channels. Digital innovations in banking sector, emerging financial models, delivery systems and customer expectations are driving banks to re-

evaluate how they deliver value to their digital customers. Anytime anywhere banking is now the norm and banks will have to offer innovative, robust, secure and flexible solutions for the empowered customer.

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BANK BUSINESS COMPLEXITY AND THE IMPLICATIONS FOR BANK RISK AND BANK PROFITABILITY EVIDENCE FROM VIETNAM

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ABSTRACT

This paper investigates the impacts of bank business complexity on bank risk and bank profitability using Vietnamese bank data for the period 2007-2020. Bank business complexity is a normalized Herfindahl index based on affiliate types, classified into banks, insurance companies, mutual and pensions funds, other financial subsidiaries, and nonfinancial subsidiaries. The inverse of the bank z-score is used to measure bank risk, whereas the proxies of bank profitability include returns on equity (ROE) and returns on assets (ROA). Our empirical findings reveal that bank business complexity induces bank risk and reduces bank profitability. This suggests several managerial implications for commercial banks in Vietnam.

Keywords: Bank business complexity; Bank risks; Bank profitability; Vietnam

1. Introduction

In recent years, the bank's activities have become more diversified. The diversity in banking activities is reflected in the areas. Firstly, it is the insurance sector. The fact that banks are associated with life insurance companies is becoming a matter of debate. Secondly, it is the joint-stock commercial banks' development of unsecured loans and installments. Unsecured loans are for borrowers who do not need collateral, simpler procedures, and faster disbursement by banks. Unsecured loans will subject the borrower to a higher percentage of interest and a lower amount of capital. However, this type of loan will lead to bad debt. Ultimately, it is the banks that are invading the stock market. The stock market is a fertile place for investors, and the bank cannot ignore this market. Recently, banks have opened up securities companies and participated in investment securities more.

The complexity of a bank can be measured by considering the size of the bank's operations, the sectors it participates in, and its subsidiaries. A large number of branches opened in different regions will help the bank to allocate and reduce risks. In addition, in operations, the complexity of the products and sectors in which a bank is involved will affect profitability. In fact, banks with complex branch systems and diversified business activities will bring more profits. However, the complexity of banks does not always help reduce risks and bring high returns. When banks have the complexity of a number of branches in different regions, managers have to deal with the risk assessment at those branches. Since the branches will be interconnected, when something goes wrong, a domino effect will appear and affect the entire system. In addition, this will result in a cost of capital. Given the complexity of business operations, managers will be faced with pricing and capturing the exact flow of profits. In general, the complexity of banks will affect their profits and risks. The positive or negative influence will have to be assessed based on many factors.

This paper investigates the impact of bank complexity on bank risk and profitability in Vietnam. Research data is collected from year-end audited consolidated financial statements of Vietnamese commercial banks from 2007 to 2020. Firstly, we use the inverse coefficient of the Z-score. To identify the risks that banks face when they are complex. After that, we will study how bank complexity affects

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profitability through ROA and ROE ratios. These two ratios represent the profitability of assets and equity. Through these two indicators, we will consider profitability when the bank becomes complex.

By using the econometric model and analyzing the results, we reach convincing conclusions. Our results show that bank complexity brings less risk to the bank and adversely affects the bank's profitability. In other words, the more branches a bank has, the more branches, subsidiaries, or affiliates will share the burden of risk. Besides, the bank's involvement in many business fields will reduce the bank's profit.

2. Theoretical framework

2.1. Theoretical backgrounds

2.1.1. Bank complexity

In many countries, the role of banks still plays an important role in promoting money circulation in the economy. Thus, the development of the banking industry in the current context can be considered a positive signal for the development of the country. Over the decades, the banking system has grown in size, organizational complexity, and commercial scope, today encompassing new sectors of financial intermediaries and non-financial operations (Cetorelli et al., 2014). Furthermore, banking institutions' foreign footprints have evolved, with bank branch and affiliate networks increasing and considerable increases in nationally and globally nonbank legal entities (Cetorelli et al., 2014).

Regulatory changes, financial innovation, and competitive forces have all affected the development of banking complexity (Cetorelli et al., 2014). The gradual lifting of prohibitions on non-traditional banking operations such as securities underwriting and permitting banks to operate in investment banking and insurance business development has allowed banks to set up subsidiaries with other areas of activity. For example, in Vietnam, Techcombank has Techcom Capital, which is a securities company, or Bao Viet Bank has Bao Viet Insurance. Asset securitization altered intermediaries' technology, while risk and liquidity management allowances, as well as changes in tax regulations and financial secrecy, may have influenced some of the complex patterns (Cetorelli & Goldberg, 2014). People consider whether the bank's structure becomes so complex that the bank's risks will increase or decrease (Cetorelli & Goldberg, 2014). Especially, whether banks should be encouraged to develop such non-traditional activities (Cetorelli & Goldberg, 2014). In developed countries in the world, a new wave of regulatory adjustments is aimed at decreasing the systemic risks posed by financial institutions by reducing their complexity (Martynova & Vogel, 2021).

This paper focuses on analyzing the impact of bank complexity on banks' risks and returns. A firm having several legal entities is more likely to present obstacles to those attempting to liquidate it in a timely manner, thus increasing the danger of systemic ramifications.

To measure bank complexity, a complexity measure was constructed according to the following formula:

$$\text{Bank Complexity}_i = \frac{T_i}{T_i - 1} \left(1 - \sum_{j=1}^{T_i} \left(\frac{\text{Count}_{ij}}{\text{Totalcount}_i} \right)^2 \right)$$

In this formula, $\text{Count}_{i,j}$ is the number of affiliates in type j owned by bank i . T_i is the total number of affiliate types that own banks i . Totalcount_i is the total number of affiliates owned by bank i

Whereas better measures may be built using more precise supervisory or regulatory data, the measures described in the study have the advantage of being available for a large number of businesses, making them helpful for cross-country and broad conceptual debates (Cetorelli & Goldberg, 2014). Herfindahl concentration indexes are used in the formula. The affiliates' diversity in terms of the sorts of business they perform is measured by the business complexity measure, which is divided into five categories (Cetorelli & Goldberg, 2014). Those are banks, insurance companies, mutual and pension funds, other financial subsidiaries, and nonfinancial subsidiaries. The output values vary from 0 to 1, with 0 being the simplest and 1 being the most complex (Cetorelli & Goldberg, 2014).

There are many ways to calculate complexity. In the study of Correa and Goldberg (2021), bank complexity is measured based on the level of assets of the bank. Besides, Marinelli et al. (2022) have used another way to compute bank complexity. They depend on four characteristics, which are exposure to global

commercial banking operations, geographical allocation, income stream diversification, and the integration of trading activities in the market. However, the use of the Herfindahl index formula is still the most common. The reason is that this formula covers most aspects of the methods used by other researchers. For example, counting the types and number of subsidiaries, a bank has also implied that the bank has multiple sources of income. Besides, the bank's size is also partly expressed through the number of affiliates that the bank has. There are many research papers that use this formula to measure bank complexity. One of them can be mentioned is the study of Martynova and Vogel (2022), also using similar components to calculate complexity. Another paper such as the paper of Cetorelli and Goldberg (2014) also uses Herfindahl concentration indexes to measure bank complexity. Moreover, this indicator is used in the article about the correlation between bank risk and bank complexity by Ho et al. in 2020 as well.

2.1.2. Bank risk

After the financial crisis in 2008 and the fall of the Lehman Brothers, the risk of bank complexity is a high concern of the experts and policymakers, which makes them have to generate new regulations and reforms to control and enhance the operation of such a big and complex bank. Vietnam's bank system is not out of that. At the same time, the merger of many banks in recent years makes people concerned about the effectiveness of banks' operations, especially private banks. As a consequence, more and more banks are establishing their risk management department to control the risk of their business, and prevent them from bankruptcy and merger.

The available studies are still controversial about the impact of bank complexity on bank risk. In general, a higher level of complexity may imply a wider range of company operations. Some argue that more diversified banks may have a greater non-financial income share and benefit from a wider range of revenue sources (Laeven & Levine, 2007). Same to Laeven and Levine (2007), banks with complex organizations often have diverse sources of income from different business activities, which can help the parent company to share risk, and reduce the risk of the affiliates (Goetz et al. 2016, Cetorelli et al. 2017). Another study by Cetorelli and Goldberg in 2016 illustrated that complex banks can use the internal capital market to manage their liquidity effectively. If liquidity holdings at banking units are made available to meet the needs of the organization's nonbank parts, the banking unit may be more liquid than it would otherwise be, and the rest of the organization's exposure to liquidity risk is reduced due to access to intra-organizational reallocations. On the contrary, in 2000, Scharfstein and Stein found the problem of the agency and the cost of monitoring. Because of the parent's complexity, maintaining frequent communications across all affiliates may be more difficult. The parent's and affiliates' management conflicts are aggravated by a deterioration of the quality and quantity of management communication. As a result, greater agency issues and moral hazards suggest that affiliates are motivated to take on larger risks. Therefore, this problem can encourage weaker affiliates to seek rent, resulting in suboptimal risk-taking and wasteful investment (Scharfstein & Stein, 2000). Moreover, in the context of globalization, agents' problems can become more complicated as they have to accommodate the associated legal costs of different regions. However, this paper only studies banks in the Vietnam market so this problem is not trivial.

In this paper, we will investigate the relationship between bank complexity and the risk of bankruptcy in Vietnam's banks by using the inverse coefficient of the Z-score.

$$\text{Bank risk} = \frac{1}{Z\text{-score}}$$

Z-score is measure by the formula $\frac{\text{ROA} + \text{Equity}/\text{Assets}}{\sigma(\text{ROA})}$ (Aldasoro et al. 2020). The Z-Score value can be positive or negative, with a positive value indicating that the score is above the mean and a negative score indicating it is below the mean. Thus, we can evaluate whether the complexity of Vietnam's banks will increase the risk or not.

2.1.3. Bank profitability

There is a huge number of papers studying the determinants of banks' profitability and they focus on a particular region or country. In those previous studies, the net interest margin is commonly used to compute

a bank's profitability, which can describe the bank's primary source of income. In addition to net interest margin, another way to measure is using two variables return on asset (ROA) and return on equity (ROE), which are used in this paper (Naceur & Omran 2011; Olson & Zoubi 2011; Van Horen 2007). In a model of bank profitability drivers, profitability is often measured as a function of internal and external variables. ROA is the rate of return on total assets used for the business of the company or enterprise. ROA is computed by Net Income divided by Total Assets. Whereas, ROE measures the profitability per dollar of common stockholders' equity. This index is a precise assessment of how much profit may be made from a dollar of money invested, Net Income divided by Shareholder Equity is the formula used to estimate ROE.

Internal and external determinants ROA and ROE are commonly expressed as a function. Internal factors are variables that are influenced primarily by the activities and policies of a bank's management. Profitability is affected by a variety of factors including liquidity, provisioning policy, capital sufficiency, expense management, and bank size (Athanasoglou, Delis & Staikouras, 2008). Liquidity risk is a crucial predictor of bank profitability since it stems from a bank's probable inability to absorb declines in liabilities or fund increases on the assets side of the balance sheet. Despite the fact that capitalization has been proved to be critical in explaining financial institution performance, its impact on bank profitability remains unclear. Reducing expenses is believed to increase a financial institution's efficiency and thereby its profitability by Bourke (1989) and most of the other literature, assuming that an operational expense ratio and profitability have a negative relationship. Bank size is often used in the banking industry to identify possible efficiencies or diseconomies of scale. Based on the credit institution's size, this variable factors for cost differences as well as product and risk diversification. External determinants, on the other hand, are variables that represent the credit institution's economic and legal environment, both industry-related and macroeconomic. As mentioned above, we will use two variables ROA and ROE combined with the Herfindahl-Hirschman index to investigate whether bank complexity affects bank profitability or not. Bank profitability will have positive or negative effects because of bank complexity: positive impact because it diversifies product portfolio and activities; negative impact because many activities become complicated and difficult to control.

2.2. Hypothesis setting

2.2.1. Effect of bank complexity on bank risk

Based on the above arguments, the following hypotheses are proposed

Ho: Bank complexity reduces bank risks

In recent years, there are a huge number of different theories that evaluate the impacts of complexity in the relationship with reducing bank risks. Some studies recommended that more complex banks can become safer and less risky by being able to diversify their activities (Goetz et al. 2016, Cetorelli et al. 2017). In fact, to maintain a stable income stream, several numbers of commercial banks in Vietnam have diversified away from their traditional lending services into non-traditional business activities.

First of all, based on the traditional principles, Boyd and Graham (1988) pointed out that the expansion of components in the bank institutional system (by transferring from the traditional activities to non-traditional activities in services elements) will help reduce as well as limit the risk on the bank's business activities and also control the performance fluctuations on the profit of the bank. It comes from the adjustment of banks' capital and asset mechanisms in different business fields. For example, during the Covid-19, the demand for purchasing insurance for people dramatically increased. Therefore, some domestic banks which invested in this business field can gain a lot of profit to maintain their business income. Furthermore, the complexity in the bank could improve the efficiency of banks because of the economic scales cross-selling, reuse inputs, shared monitoring, and promotion between bank's products or services and financial conditions are just a few examples. During the Covid-19 pandemic, according to the Vietnam Securities Depository (VSD), in January 2021, domestic investors opened 86,269 new securities accounts, up 36.4% over the previous month and this is the largest number of new accounts opened in a month since the stock market came into operation. It creates a golden chance for the bank to get more profit when they have the income capital from their security-financial-institution.

Secondly, another group of complexity reduces bank risk theories, Keeton (1991) and Templeton and Severiens (1992) illustrated that appropriate diversification incremental selections can reduce the volatility in shareholder returns. This issue may be seen in the overall adjustment method for the variance of each traditional and modern activity variation throughout the portfolio weights. Therefore, a reaction cycle will emerge. Increased activity diversity will aid in adjusting the total risk of banking operations, but only if new unrelated banking activities are included in the portfolio diversification. Moreover, the diversification of a bank's business activities to separate the income can generate the financial conglomerates with a "too-big-to-fail" status (DeYoung et al., 2009). Therefore, by cooperating with several small companies and diversifying the capital income, the bank can limit the high risk in the fluctuating market of finance over the world.

Last but not least, according to Berger, Hasan, and Zhou (2010), the complexity of the bank has dramatic effects on reducing bank risk, and it impacts the bank risk in two dimensions: the more complexity, the higher the financial leverage banks enjoy. The complexity will likely reduce the profitability of bearing risks from the financial issues over the world or even avoid bankruptcy. Besides, the complexity directly impacts the restructuring of all the operational business activities of banks (Berger, Hasan, and Zhou, 2010). Because the diversification in the bank will increase the complexity of a bank's structure and governance. The capital income can be supervised more effectively thanks to the different levels of corporate management apparatus in the complex system of the bank. Therefore, the risk will be controlled easier and the income stream will separate into several fields.

H₁: Bank complexity increases bank risks

As above, we mentioned the assumption that bank complexity reduces bank risks. But there were also a few studies we found that assumed that bank complexity increases bank risks. There are two main reasons: Due to owning many subsidiaries that have business activities in many different fields, and the difficulty in management and decrease in monitoring the systems together.

Firstly, according to Ho et al. (2020), complexity can increase a bank's risk because owning more subsidiaries with non-banking or non-financial activities makes it more difficult to control. Having many subsidiaries helps the bank to be able to participate in many different economic sectors and makes it possible for the bank to maintain its position and importance in the economic system, and economy in general. Accompanied by a broader, larger scope of business activities and a wider distribution of branch geographical locations, all of which increase the level of risk in banking institutions. This view is similar to that of Kwan et al. (2019) that the bank can bear many risks from subsidiaries. When there are many subsidiaries, banks will have to intervene and participate in other business activities besides performing functions like a simple bank. It is not easy to join a field that is not the main expertise of a banking institution, the potential risk is high, which also increases the risk in the bank.

Secondly, in the increasingly complex context, as banks begin to develop and expand into new industries and business areas, management issues arise between the parent company and its subsidiaries. As a result, the structure and organization of the apparatus can become much worse and more complex. According to Chernobai et al. (2021), there is evidence provided that manager failure in these events negates the benefits of strategic risk-taking. The reason is that because of the expansion of business fields, the increasing diversity, and interconnectedness of companies, the management and supervision capacity of the company's leadership may be reduced and limited, unable to connect and attach the parts together tightly, making the risk higher and higher. At that time, it will easily entail risks for related companies and the parent company itself, following a chain effect.

From this, we make the following assumption: bank complexity increases bank risks. And we will test the accuracy of the assumption in the section running the econometric model below.

2.2.2. Effect of bank complexity on bank profitability

We propose the following hypotheses based on all of the possibilities mentioned above

H₀: Bank complexity reduces bank profitability

Firstly, according to some studies, the more complex a bank becomes, the lower its profitability turns into. The study by Bourke (1989) shows the negative relationship between operational expense ratio and

profitability when claiming that fewer expenditures improve a financial institution's efficiency and thus its profitability. That is, an increase in operating costs (administrative expenses, employee salaries, and so on) leads to a decrease in revenues, resulting in low bank profitability.

Secondly, we look at how geographical and functional diversification affect a bank's performance during the financial and sovereign debt crises of 2008 and 2010. Both scenarios have a negative impact on bank profitability, but the Z-Score analysis reveals unexpected results (Brighi & Venturelli, 2016). Rapid debt accumulation, particularly if it leads to a debt crisis, can trigger a currency crisis. On recessionary grounds, creditors may refuse to lend and withdraw their capital from the economy following a sovereign default, putting downward pressure on the exchange rate and this can lead to the reduction in bank profitability. The resultant credit crunch triggered the financial crisis because interbank liquidity was frozen.

Last but not least, bank size has a positive outcome on US banks after the period of financial crisis, proving the US banks' scale economies, while it has an adverse outcome on Chinese banks, showing the instability of economic scale (Ding, Fung & Jia, 2017). Ding et al. (2017) also found that the US banking industry restructured after the crisis and that there is a positive relationship between size and profitability. The size of a bank has a significant impact on its profitability. A bank that is too big may experience diseconomies of scale, which means that variable costs, such as operational, bureaucratic, and marketing expenses, will rise, negatively impacting bank profitability (Athanasoglou et al., 2008; Dietrich & Wanzenried, 2011). Furthermore, due to the occurrence of aggressive competitive strategies, a larger bank can impede efficient bank management, according to Garca-Herrero et al. (2009).

H₁: Bank complexity increases bank profitability

First and foremost, numerous studies have shown that more sophisticated banks are more profitable and less risky. According to Smirlock (1985), large bank size is positively related to bank profitability. In other words, by having a larger size, the bank can increase its services by having the same fixed expenses, thus enabling a reduction in expenses (García-Herrero et al., 2009). A bank with a complex branch system and diversified business activities will increase profit. Deposit taking, credit extension, via-account payment, capital contribution and share purchase, treasury bill and government bond trading, foreign exchange services, derivative provision, entrustment and agency, cash management, banking and financial consulting, asset management, monetary brokerage services, and other banking-related activities are permitted with written approval from the central bank. With so many services, it is undeniable that the bank will reach a large number of customers, increasing profits.

Secondly, R & D spending is one of the potential outcomes of a boost in profitability. Research and development activities provide significant contributions to the growth and performance of businesses (Vurur & Ilarslan, 2016). For countries and businesses to gain a competitive advantage at the same time, large-scale innovation and the development of new products are required. Managing R & D activities effectively in everyday life, where gaining a competitive advantage is not only important but also a survival strategy. To increase sales and profits, banks must be able to compete for both domestically and internationally, and they must incorporate innovation-enhancing structures into their innovation-enhancing structures. Spending a lot of money on R&D will help the bank improve its working efficiency, shorten stages, and save time and effort for both customers and the bank.

Thirdly, the higher the level of complexity, the higher the share of non-financial income as well as more diverse sources of income (Laeven & Levine, 2007). Furthermore, bank risk would be reduced. In addition, mergers and acquisitions have improved bank positions, such as SCB merging three banks for two years in a row in 2011 and 2012. During that year, SCB made significant progress, improved significant liquidity position, and financial capacity through solutions to increase charter capital, call capital from foreign investors, strengthen collateral value, speed up debt settlement, and mobilize capital. According to the findings, it is the complexity that allows banks to become more profitable and risk-free. As a result, expanding the scope and specificity of domestic activities increases profitability. Besides, banks can also increase profitability by combining cost-cutting efforts and increasing revenue (through improved customer satisfaction, and healthier customer relationships).

3. Research method

3.1. Data

3.1.1. Bank complexity

As our purpose is to estimate the impact of bank complexity on bank risk and bank profitability, we have to measure them both. We follow Cetorelli and Goldberg (2014) and Aldasoro et al. (2020) to compute a Herfindahl-Hirschman index as a proxy for bank complexity:

$$\text{Bank Complexity}_i = \frac{T_i}{T_i - 1} \left(1 - \sum_{j=1}^{T_i} \left(\frac{\text{Count}_{ij}}{\text{Totalcount}_i} \right)^2 \right)$$

Where $\text{Count}_{i,j}$ is the number of affiliates in type j owned by bank i . T_i is the total number of affiliate types that own banks i . Totalcount_i is the total number of affiliates owned by bank i . Higher value in this index means higher complexity. If all affiliates owned by a bank have a similar type, this index receives the lowest value, 0. If they are different, this index will record 1, the highest value.

Figure 1 demonstrates the distribution of bank complexity over observed banks. In here, we use the range from 0 to 100 to make it easier to see the results. If the results reach 20, it means the bank has 1 type of subsidiary. Reach 40 means the bank has 2 types of subsidiaries and so on. It can be seen that EIB, HD Bank, KLB, VBB, and VPB do not have any subsidiary. Thus, level of complexity of them equal to 0, these banks have no complexity. Meanwhile, others bank has at least one subsidiary. It is seen that banking system of Vietnam most are complexity.

3.1.2. Bank risk and bank profitability

The measure of the bank risk of banks comes from the z-score. The Z-score is defined as the ratio of return-on-assets plus capital-asset-ratio to the standard deviation of return on assets. Specifically, the z-score suggests the number of standard deviations that a bank's return on assets has to fall below its expected value before equity is exhausted and the bank's insolvency occurs. In line with the present literature, and in order to interpret increases in the index as greater bank risk, we compute the natural log of the inverse of the z-score (Laeven & Levine, 2009; Berger et al., 2017).

Figure 2 illustrates the distribution of bank risks across the banks in Vietnam. It is clear that while most of the banks remained at 0.06, there are two banks with the highest risks, which are Techcombank (TCB) and Vietnam Thuong Tin Commercial Joint Stock Bank (VBB), where the difference between the two is more than 0.02, which is not a good number for VBB. To be specific, the banks that have the least risks are BID, which has a bank risk index of below 0.02 in terms of the bank's risk index, followed by ABB, MBB, CTG, and SHB. These banks are likely to have more risks than BID but are still considered the low-risk ones, as there are more banks with a higher risk index. Next, from 0.03 to 0.04, there are eight more banks, whose indexes are considered moderate. Apart from TCB and VBB, the four banks that have high risk in their business are ACB, SGB, STB, VIB, and VPB as their figures exceeded 0.04 and stood around 0.05 and 0.06. Overall, it can be concluded from the "Distribution of bank risk over banks" figure that BIDV (BID) has the lowest risk (also the only bank that has a risk index below 0.02) as the bank also has the most complex business in terms of the bank-complex index as mentioned above. Also, Techcombank (TCB) has a very high figure in bank complexity, but through the bank risk bar chart, it can be said that the bank has a high risk in business as well. Vietnam Thuong Tin Commercial Joint Stock Bank (VBB) has had a disappointing performance in the last two figures. Not only does it have the highest risk in business (almost 0.1), but it also has no complexity because the bank only cares about its parent bank.

Figure 3 illustrates distribution of bank profitability over banks in Vietnam. It can be seen that ACB, MBB, TCB, VCB and VPB, have the highest figures. It means that they have the most profitability among other banks. In contrast, SCB and VBB, have the lowest value. Its ROEE mean all below 5. In addition, the remaining banks have a mean of ROEE from 5 to 15, so the profitability of those banks are on average.

In figure 4 and 5, the relationship between bank complexity, bank risk and bank profitability are shown. For bank risk and bank complexity, it is negative correlation. It means that as bank complexity increases, bank risk decreases, and vice versa. Besides, about the relationship between bank complexity and profitability, it is a situation where the effect size is too small to be useful. Although it shows the positive relationship, to get a more accurate picture of the impact of bank complexity on bank profitability, we will need to run a panel regression model.

3.1.3. Control variables

Table 1. Statistical Summary

| | count | mean | sd | min | max |
|----------------|-------|-------|-------|-------|--------|
| Bankrisk | 257 | 0.04 | 0.02 | 0.01 | 0.10 |
| Bankcomplexity | 257 | 45.62 | 39.42 | 0.00 | 97.63 |
| ROEE | 257 | 11.30 | 7.34 | -8.27 | 36.28 |
| Loantoasset | 257 | 56.12 | 13.14 | 11.39 | 85.17 |
| Deposittoasset | 257 | 0.64 | 0.13 | 0.23 | 0.89 |
| Costtoincome | 257 | 50.04 | 14.57 | 19.72 | 109.81 |
| Assets | 257 | 11.67 | 1.25 | 7.79 | 14.23 |
| LLR | 250 | 79.10 | 45.52 | 15.52 | 366.67 |
| NPL | 252 | 2.05 | 1.41 | 0.02 | 11.40 |

The table is provided to illustrate the statistics summary. Looking at the table above, it can be seen that there are up to 257 observations, and there are two dependent variables, bankrisk and ROEE. Bankrisk is the risk level of the bank; ROEE (Return On Equity) is the rate of return on equity, and this variable is used to measure bank profitability. The remaining variables are independent variables (Bankcomplexity, Loantoasset, Deposittoasset, Costtoincome, Assets, LLR, and NPL). Bankcomplexity is calculated and shown in the previous part.

3.2. Model specification

In this section, we specify our model in which we enable us to estimate the nexus between bank complexity, bank risk and bank profitability. We apply a dynamic model based on panel data. We clean the data by dropping the omitted observations and minorizing the data to solve with outliers. Ultimately, we are left with 257 observations in 20 banks between 2007 and 2020². The model is given as follow

$$BankRisk_{it} = \beta_0 + \beta_1 BBC_{i,t-1} + \beta_2 CONTROL_{i,t-1} + \varphi_t + \omega_i + \varepsilon_{it}, \quad (1)$$

$$BankProfit_{it} = \beta_0 + \beta_1 BBC_{i,t-1} + \beta_2 CONTROL_{i,t-1} + \varphi_t + \omega_i + \varepsilon_{it}, \quad (2)$$

Where subscripts i and t represent bank i and year t , respectively. φ_t and ω_i , respectively, denote year, bank-fixed effects. $BankRisk_{it}$ is the bank default based on the natural log of the inverse of the z-score in bank i at year t . BBC_{it} is the bank complexity in bank i and year t . For robustness check, we also use $Totalcount_{it}$ and T_{it} that capture the organizational complexity. To mitigate the omitted variable bias, we incorporate control variables, $CONTROL_{i,t}$, recommended by existing studies on financial fragility.

²The data that support the findings of this study are available from the corresponding author upon reasonable request.

4. Results and discussion

Table 2. Benchmark Estimation Results

| VARIABLES | (1) Bankrisk | (2) Bankrisk | (3) ROEE | (4) ROEE |
|----------------|---------------------------|---------------------------|-----------------------|------------------------|
| Bankcomplexity | -5.83e-05** (2.37e-05) | -4.73e-05** (2.25e-05) | -0.0261** (0.0125) | -0.0316** (0.0139) |
| Loantoasset | 5.58e-05 (6.21e-05) | 2.63e-05 (6.03e-05) | 0.0772** (0.0333) | 0.102*** (0.0364) |
| Deposittoasset | -0.00301 (0.00613) | 0.00431 (0.00681) | -7.662** (3.765) | -12.44*** (3.598) |
| Costtoincome | 0.000171*** (5.01e-05) | 0.000271*** (5.02e-05) | -0.259*** (0.0278) | -0.315*** (0.0294) |
| Assets | 0.00185** (0.000842) | 0.00790*** (0.00143) | 5.530*** (0.792) | 2.064*** (0.494) |
| LLR | 3.90e-05** (1.52e-05) | 2.05e-05 (1.47e-05) | -0.00887 (0.00815) | -0.000201 (0.00894) |
| NPL | -0.000591 (0.000417) | -0.000573 (0.000399) | -0.339 (0.221) | -0.279 (0.245) |
| LISTED | -0.00258 (0.00188) | -0.00160 (0.00179) | 1.045 (0.988) | 0.832 (1.104) |
| Constant | 0.0101 (0.00846) | -0.0682*** (0.0173) | -37.66*** (9.570) | 6.906 (4.966) |
| Observations | 250 | 250 | 250 | 250 |
| R-squared | 0.851 | 0.879 | 0.800 | 0.723 |
| Bank FE | YES | YES | YES | YES |
| Year FE | NO | YES | YES | NO |

Standard errors in parentheses

**** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$*

The table above describes the empirical results of the two econometric models mentioned above.

With panel data, each model will be regressed taking into account the influence of the year and not the effect of the year.

Thus, it can be seen that with the model for the effect of complexity on bank risk, the relationships between the independent variable and the dependent variable are shown as follows.

Bank complexity and bank risk are statistically significant with a confidence level of 95%. Furthermore, the result of bank complexity is negative, which means it has the opposite effect of bank risk. The more complex a bank is; its risk is reduced. The results found in this study are different from the available studies on this correlation. According to Ho (2020), complexity can increase a bank's risk because owning more subsidiaries with non-banking or non-financial activities makes control more difficult. This view is similar to that of Kwan et al. (2019) that the bank can bear a lot of risk from subsidiaries. However, in the case of banks in Vietnam, bank complexity shows a negative correlation with bank risk. This can be attributed to the diversification of income streams and improved liquidity management. Besides, well-managed organizations are also factors that reduce risks as bank complexity increases. It can be seen that compared to many banks around the world, the bank size of Vietnam is still quite small. Thus, the

management is also not complicated and can be easily implemented. Besides, cost-to-income (CIR) is also the variable that obtains statistically significant results for bank risk. At the 99% confidence level, the results show a high degree of reasonableness. From the table above, it can be seen that the cost-to-income has a positive sign, which means it has the same effect as bank risk. The higher this ratio, the higher the bank risk. For example, the decrease in CIR means that the bank is increasing its operating costs to increase the bank's operational efficiency. Better management will help banks reduce risk. Therefore, this result is quite reasonable. Similarly, the assets variable shows the same correlation as the cost-to-income variable. If assets increase, the bank's risk will also grow. However, if the effect of year is not taken into account, assets are only statistically significant at 95% of the level of confidence. Considering the effect of the year, assets will be statistically significant at the 99% level. The results make sense because assets implied for bank size. If the bank size is larger, it means that the management will be more complicated and the risks will also increase. The LLR variable is only statistically significant at the 95% level if the year factor is not taken into account. In the table, it can be seen that if LLR increases, bank risk also has the same effect. Loan-loss reserve is a reserve of value for a bank's total loans on its balance sheet, representing an amount believed to be appropriate, to cover estimated losses in its loan portfolio. If these amounts increase, the bank's credit risk will also go in the same direction. Therefore, the results found are valid. However, if factor year is taken into account, the results will not reflect the relationship between bank risks and LLR.

Next are the results found after processing the model for bank complexity and bank profitability.

It can be seen that bank complexity will be statistically significant in both columns with a confidence level of 95%. Due to its negative sign, it will have an opposite effect on ROEE, which represents the bank's profitability. In other words, it can be said that an increase in bank complexity will decrease the bank's profit. The results obtained from this study are consistent with previous studies. According to Ho (2020), the more complicated a bank's system is, the lower its profitability will be. Although the bank has many additional sources of income from other fields, it may incur many expenses for subsidiaries such as investment costs, merger and acquisition costs, borrowing costs from companies, subsidiaries, or management costs. As a result, complexity can limit a bank's profitability. Besides, the loans to assets variable and assets variable are statistically significant with bank profitability and show a positive correlation. That is, if the values of these two variables both increase, so will the bank's profitability. This is reasonable because high loans to assets means that the bank lends to its customers with collateral and the bank can make a profit without worrying about bad debt because it has collateral to secure. Similarly, with assets, a bank has more assets which means increased profitability as assets are financed by debt and equity as well. Banks can use it to make more profit by investing and doing other businesses. In addition, deposit to assets and cost to income also showed statistically significant results. They all show a negative correlation with bank profitability at the 99% confidence level. Deposit to assets shows the ratio of deposits to the bank's assets. If this ratio is high, it means that the bank has many people trusting to deposit and the bank has few assets. Although there are more deposits, the bank can lend and invest more. However, if there is too much deposit, it means that the bank's other profitable assets such as deposits with other credit institutions, securities, credit or reserves will be less. Deposit is actually the bank's liability. Having too many deposits and few assets means that the bank ignores assets that can generate larger returns. Therefore, it is reasonable for deposit to assets to have an inverse relationship with bank profitability. Besides, cost-to-income is similar to deposit to assets. Banks spend a lot of money to make their operations more efficient, their profitability is also reduced.

5. Conclusion

It is seen that concern about banking complexity and its effects on different aspects of banking is growing recently. This paper investigated the impact of bank complexity on bank profitability and bank risk. The study consists of two main parts that discuss the impact of bank complexity on its risk and return and the second part which is empirical testing and results. First of all, the theories raised from previous studies have been analyzed and dissected about the three main components of this paper, which are bank complexity, bank risks, and bank profitability. From the collected data and information, the hypotheses have been stated for testing. To measure bank complexity, the Herfindahl index formula was used in combination with the data of Vietnamese domestic banks on the number and type of subsidiaries of each bank. In view of the financial system's continual flux and globalization, bank risk is measured by using inverse z-score and the

drivers of bank profitability by using ROA and ROE through the econometric technique of panel data analysis.

After analyzing the data, empirical results show that bank complexity does have a certain effect on bank risk and profitability. To specify, since the financial crisis, the relationship between bank complexity and risk has become more and more distinct. The study found that the complexity of the bank has no bad effect but on the contrary, reduces the bank's risk. However, over time, the risk could increase because the bank's size can increase making management more difficult, or the complex structure can increase operational risks.

To sum up, the study found that bank complexity has a negative impact on both bank risk and bank profitability. This can be explained because the size of banks in Vietnam is small and easy to manage. But over time, the size of banks can also expand and make management less efficient. Therefore, banks always need to have a governance strategy and they all need to be reviewed and updated every year to match the context. For bank profitability, the bank's involvement in other non-banking activities also increases its operating costs. Moreover, whatever happens to the subsidiaries will affect the parent company. Therefore, although bank complexity can help a bank get more revenue streams, the cost it has to pay to maintain subsidiaries is also significant. Hence, banks have to control their expenditure tighter and they should forecast cash flow carefully. In general, any future regulatory reform and expansion could result in increased bank complexity, with expected or unanticipated consequences for their risk. Therefore, authorities should track the progression of a bank's banking complexity in order to determine the dangers that their business may face.

Appendix

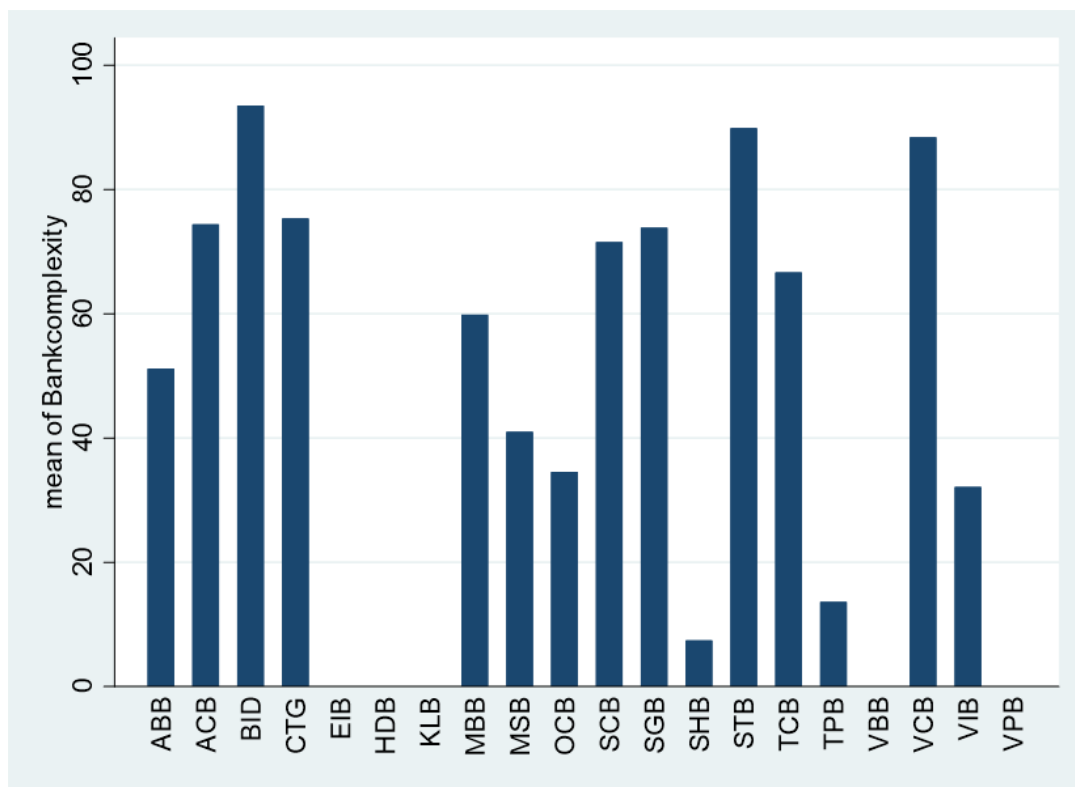


Figure 1. Distribution of bank complexity over banks

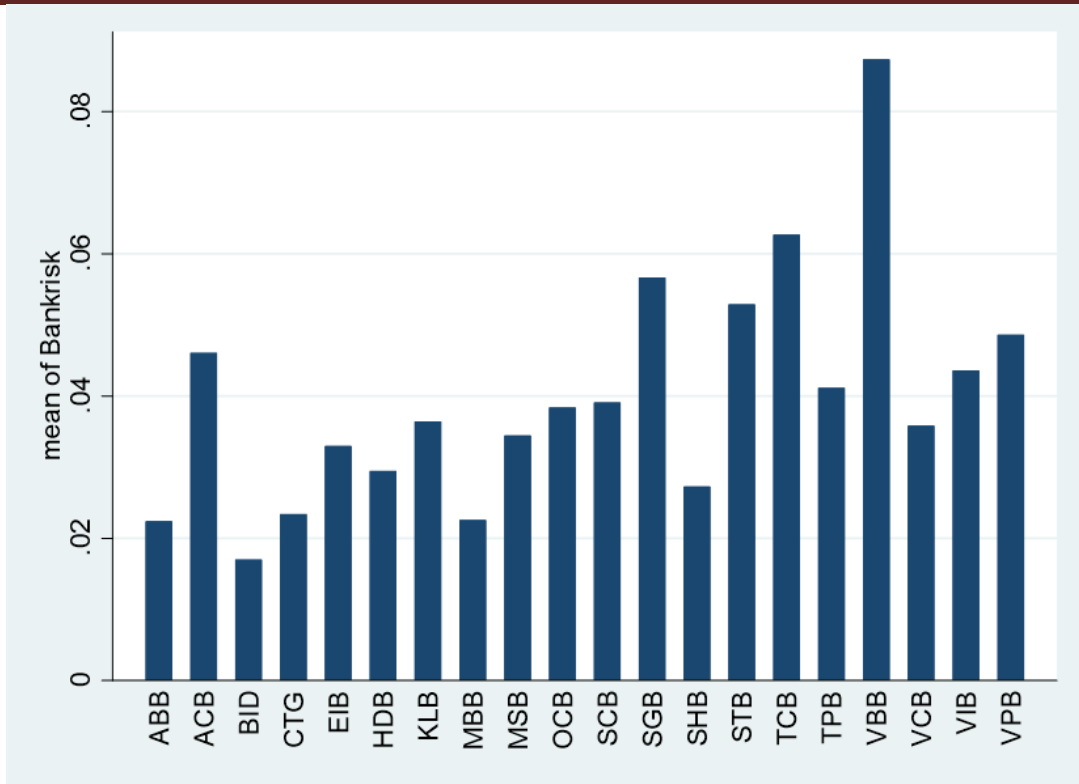


Figure 2. Distribution of bank risk over banks

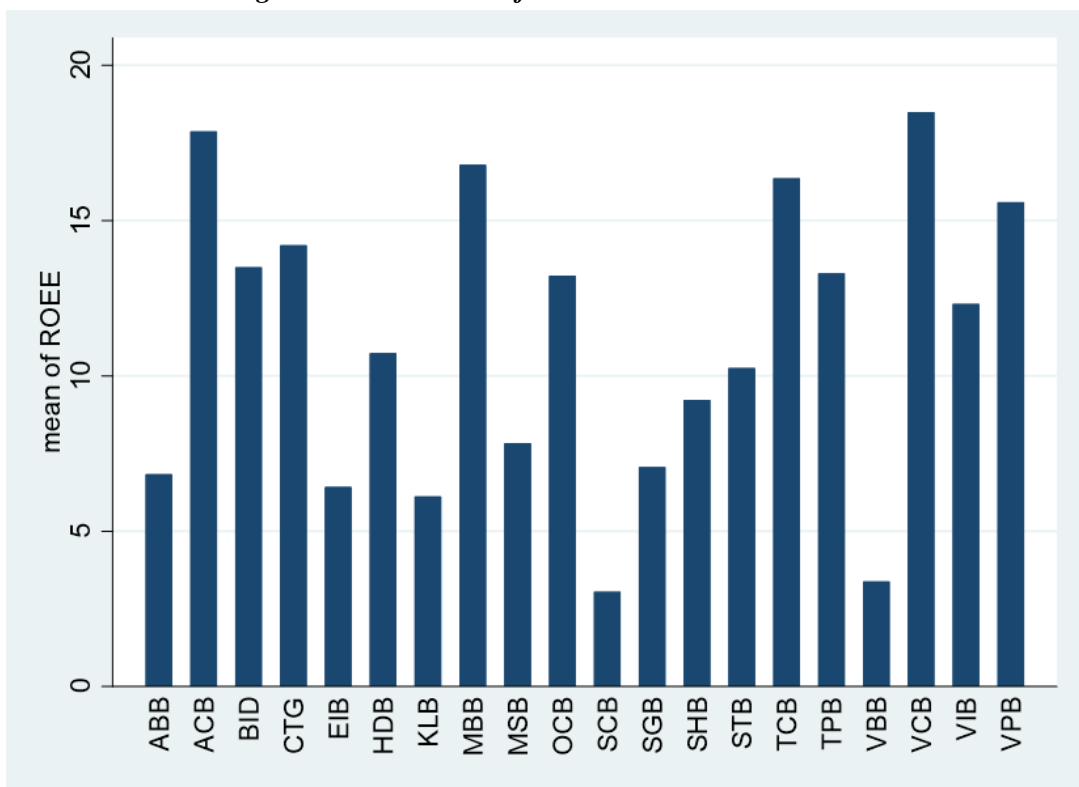


Figure 3. Distribution of bank profitability over banks

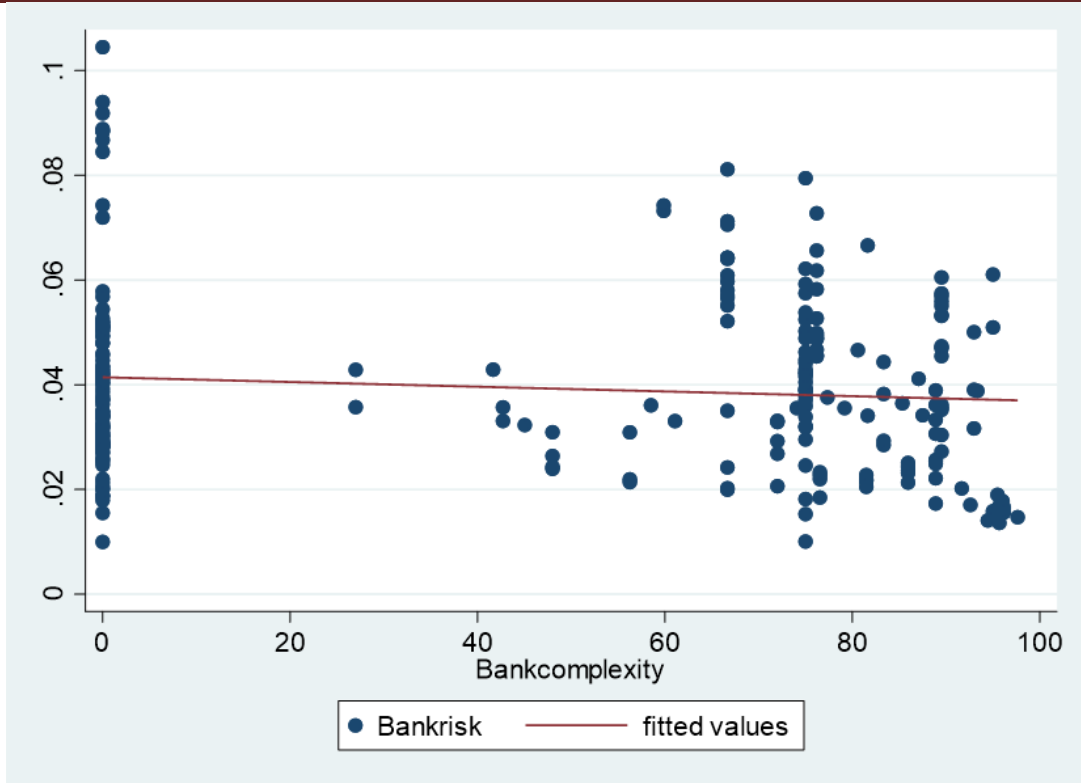


Figure 4. Bank complexity and bank risk

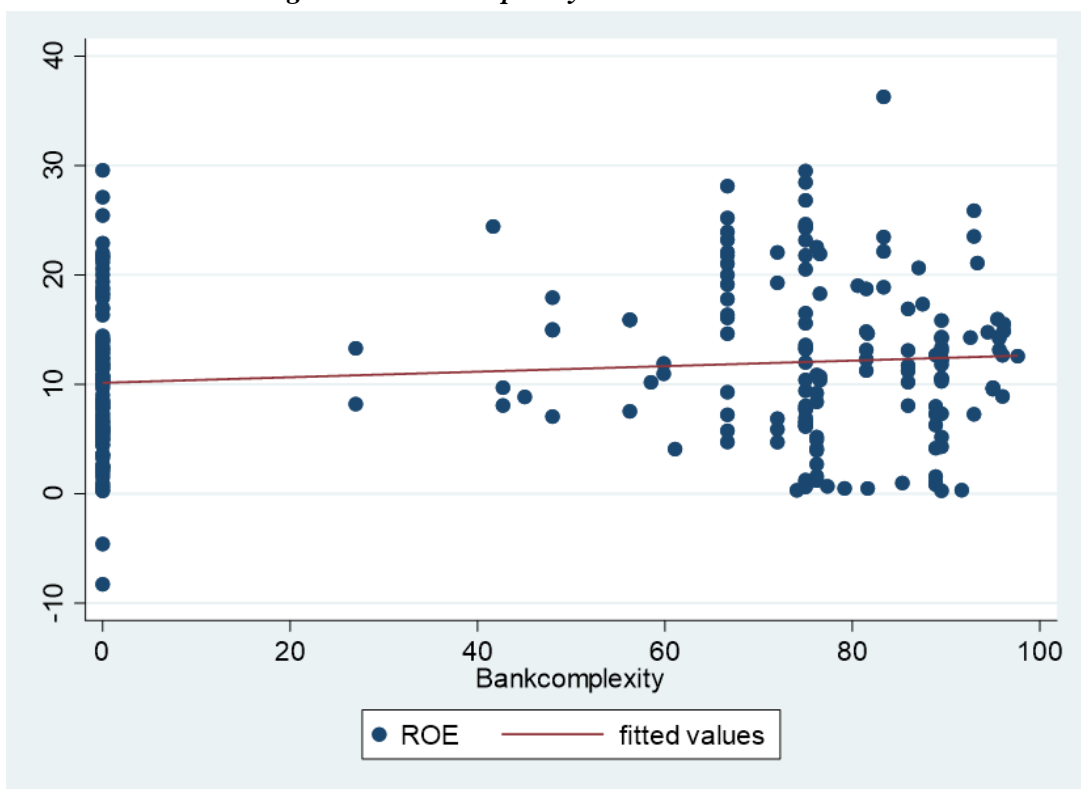


Figure 5. Bank complexity and bank profitability

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FACTORS AFFECTING THE EFFICIENCY OF ACCOUNTING INFORMATION SYSTEMS MINIMIZE FRAUD AND ERRORS IN SMALL AND MEDIUM SIZED ENTERPRISES IN THE NORTHERN PROVINCES OF VIETNAM

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ABSTRACT

This paper aims to determine the extent of influence of the accounting information system on fraud and errors in enterprises, in order to offer some recommendations for businesses to minimize the existence of fraud and errors. To conduct the research, the research team interviewed 110 accountants of small and medium enterprises in the Northern provinces of Vietnam. In which, 4 factors are included for evaluation: the Form of information updating of the accounting team, the Audit activity, the Level of information technology application in accounting work, and the Legal Environment. The research results show that the factors: the Form of information updating, the Legal Environment, the Audit activity have a positive impact on the degree of fraud and error reduction, while the factor - the Level of information technology application shows the opposite effect.

Keywords: Financial statements, accounting information system, fraud, errors.

1. Introduction

Fraud and errors can be said to be constant issues in the operation of businesses in the economy. They exist in all areas, causing significant damage to the financial position of those businesses. Even at a more serious level is the bankruptcy and dissolution of businesses that encounter fraud and errors. In terms of business accounting, fraud and errors will of course be hidden in many small aspects, but one of the important aspects that need to be urgently addressed is the accounting information system (AIS) of the enterprise.

This article aims to look from the theoretical perspective on the existence of errors and frauds before the influence of the AIS, to study specifically the extent to which the factors in the AIS affect the quality of the AIS, consider the extent of minimizing errors and frauds in small and medium enterprises (SMEs) in the Northern provinces and offer some solutions and recommendations for businesses to minimize the level of inventory at errors and frauds.

2. Theoretical framework

This study applies four theoretical bases:

2.1. Standard accounting theory

The definition of standard economics theory is composed by Friedman (1953), as the basis for standard accounting theory. The standard accounting theory stipulates how the arising transactions should be recorded and disclosed to answer the question "What should the preparer of the financial statements do?", applied the research, according to Phan Le Thanh Long, (2010). Normative theory on determining the legal environment factors that affect the reduction of errors of enterprises (Mattessich, 1995).

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2.2. Institutional theory

William Richard Scott (2004) supposed to be that institutional theory is a theory on the deeper and more resilient aspects of social structure. It considers the processes by which structures, including schemes, rules, norms, and routines, become established as authoritative guidelines for social behavior. In the economy in Vietnam, institutions can be understood as the rules, norms promulgated by state (An, 2017). The institutional theory shows that the legal environment factors are related, specifically legal documents, policies and standards issued by the state have a direct impact on the legal environment coming of accountants in enterprises. (Tuan, 2017) confirmed that if the legal environment is good, with adequate and clear instructions, accountants will limit errors in the process of performing accounting work.

2.3. Asymmetric information theory

According to Löfgren and et al (2002), this theory is on the basis of the research on the three scientists' researches in the field of economics having won Nobel Memorial Prize in Economic Sciences in 2001 with the study of "Market analysis in asymmetric information", George Akerlof (1970) and Joseph Stiglitz (1975). The authors have identified that asymmetric information is a common feature of market interactions.

For the financial sector, the theory is studied in the analysis of Lopatta and et al (2016), Chaney and et al (1995) shown asymmetric information on the information between the internal managers announced information and the people using external information. Indeed, (Tuan, 2017) considered that the theory of asymmetric information shows that if managers are aware of accounting, it will reduce possible errors in accounting work.

2.4. Fraudulent triangle theory

Fraudulent triangle theory can explain fraudulent behavior in general and financial reporting fraud in particular on the basis of a combination of three factors, which were synthesized by Cressey (1953): First, the pressure leading to fraudulent behavior is perceived. Represented in this theory are financial pressures from lifestyle, debt or business consequences; Second, fraud occurs when the opportunity is present (such as no control, weak control, or duality); Third, individuals and organizations often find excuses to rationalize their fraudulent behavior. Therefore, this theory is mainly used to study and assess fraudulent risks in many areas, including accounting. This theory also builds auditing standards related to auditor's responsibilities for fraud in financial statements.

3. Research method

3.1. Research sample

Based on an overview of the research problem and reference to related research papers, the research team built an initial survey questionnaire. The group carried out a pilot survey to revise the survey questionnaire to suit reality.

After that, the research team carried out the survey on a large scale when the questionnaire was satisfactory. In case the questionnaire is unsatisfactory, re-implement the test survey and edit it until it meets the requirements.

The research team collects data by using a questionnaire that is distributed online by the design and reference group to the accountants of SMEs in the Northern provinces, auditors and experts in this field. to obtain in-depth information about the purpose of the study. The study collected 110 observations. In which data is collected from those surveyed who have expertise, understanding and knowledge in the field of accounting.

The analysis and data processing will be processed through SPSS software after coding the survey results. The processing steps include: parameter estimation, result analysis, prediction, decision making.

3.2. Research models and hypotheses

3.2.1. The variables, measurement methods and research hypotheses

a) Variables in the model

The study includes 5 independent variables, 1 intermediate variable and 1 dependent variable. According to Doan Thi Thuy Anh et al (2021), the study uses the Likert scale to assess the influence,

including 5 points from score 1 - "Strongly disagree" to point 5 - "Strongly agree" for both the independent variable, the intermediate variable and the dependent variable. Specifically:

Table 1. Scale of variables used in the study

| | Variable | Factor | Content | Reference |
|---|---------------------------------------------------------------|---------------|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| 1 | The extent to which fraud and errors are minimized | GS1 | The information provided by the AIS is useful. | Doan Thi Thuy Anh et al (2021), Le Thi To Anh (2015), Hang et al (2013), Nguyen Dinh Tuan (2017) |
| | | GS2 | The economic nature of transactions and events is properly reflected by the product of the AIS. | |
| | | GS3 | Products of AIS ensure materiality, reasonableness and truthfulness. | |
| 2 | Effectiveness of the AIS | TT1 | Information users are satisfied with the product of the AIS. | Pham Anh Tuan (2017), Le Thi To Anh (2015), Hang et al (2013), Nguyen Dinh Tuan (2017) |
| | | TT2 | Time to respond to requests for information promptly and quickly. | |
| | | TT3 | Information is highly secure and reliable. | |
| 3 | The form of updating information of the accounting department | HT1 | Training and retraining courses to improve the accounting profession are regularly held. | Doan Thi Thuy Anh et al (2021), Le Thi To Anh (2015), Hang et al (2013), Nguyen Dinh Tuan (2017) |
| | | HT2 | Enterprises regularly update accounting circulars, decisions and standards. | |
| | | HT3 | Information of the accounting department is updated in an efficient manner. | |
| 4 | Auditing activities | KT1 | Enterprises often use external control activities. | Doan Thi Thuy Anh et al (2021), Le Thi To Anh (2015), Hang et al (2013), Nguyen Dinh Tuan (2017) |
| | | KT2 | Through auditing, businesses can detect frauds and errors. | |
| | | KT3 | Enterprises pay attention to audit results. | |
| | | KT4 | Business results are more effective thanks to independent audit activities. | |
| 5 | Application of information technology in accounting work | CN1 | Enterprises regularly update advanced accounting tools. | Doan Thi Thuy Anh et al (2021), Le Thi To Anh (2015), Hang et al (2013), Nguyen Dinh Tuan (2017) |
| | | CN2 | Accountants are taught how to use tools and accounting tools are also easy to use. | |
| | | CN3 | Accounting operations are fully met by accounting tools. | |
| | | CN4 | The accounting work is fully equipped with infrastructure. | |
| | | CN5 | Accountants use software in accounting work. | |
| 6 | The role of managers in the accounting system | QL1 | Managers focus on building and effectively applying the AIS at the enterprise. | Doan Thi Thuy Anh et al (2021), Le Thi To Anh (2015), Hang et al (2013), Nguyen Dinh Tuan (2017) |
| | | QL2 | Managers communicate information clearly to accounting staff. | |
| | | QL3 | Accounting work is focused and concerned by managers. | |
| | | QL4 | Managers have knowledge of accounting. | |

| | | | | |
|---|------------------------|-----|---------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
| | | QL5 | Managers listen to the opinions of accountants to help improve the working environment. | |
| 7 | Regulatory environment | PL1 | Issues arising in reality at enterprises are fully and promptly promulgated by the accounting regimes and regulations in the Law. | Doan Thi Thuy Anh et al (2021), Le Thi To Anh (2015), Hang et al (2013), Nguyen Dinh Tuan (2017) |
| | | PL2 | Clarity in regulations of circulars guiding accounting work. | |
| | | PL3 | Promulgating uniformly, there is no difference in the provisions in the standards, regimes and circulars guiding the accounting work. | |

b) Research hypothesis

- Hypothesis H1: The factor "The form of updating information of the accounting team" has a positive impact on the AIS, reducing fraud and errors.
- Hypothesis H2: The factor "Audit activities" has a positive impact on the AIS, reducing fraud and errors.
- Hypothesis H3: The factor "The degree of application of information technology in accounting work" has a positive/negative impact on the AIS, reducing fraud and errors.
- Hypothesis H4: The factor "Role of managers in the accounting system" has a positive impact on the AIS, reducing fraud and errors.
- Hypothesis H5: The factor "Legal environment" has a positive impact on the AIS, reducing fraud and errors.

3.3. Building a research model

Through the process of reviewing domestic and foreign research articles, the research team found that the research of (Hang et al., 2013) and the study of (Doan Thi Thuy Anh et al., 2021) are most suitable for the purpose research objective of the topic. The research team selected a number of variables and added independent variables.

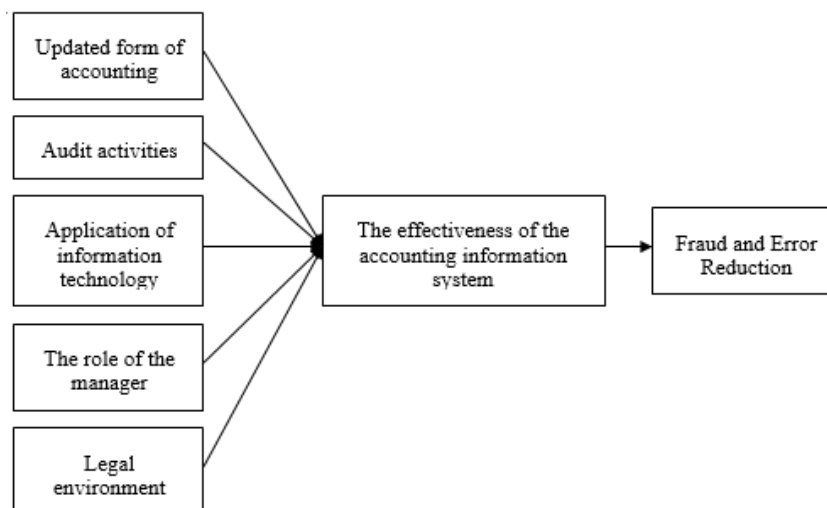


Figure 1. Expected research model

4. Results and discussion

4.1. Results

4.1.1. Descriptive statistical analysis of the variables

Table 2. Descriptive statistics of the variables in the model

| Variable | Factor | Number of samples | The average value | Standard deviation | Smallest value | The greatest value |
|---------------------------------------------------------|--------|-------------------|-------------------|--------------------|----------------|--------------------|
| Information update form (HT) | HT1 | 110 | 3,60 | 0,921 | 1 | 5 |
| | HT2 | 110 | 3,86 | 0,784 | 2 | 5 |
| | HT3 | 110 | 3,77 | 0,964 | 1 | 5 |
| Auditing activities (KT) | KT1 | 110 | 3,61 | 1,005 | 1 | 5 |
| | KT2 | 110 | 3,80 | 0,965 | 1 | 5 |
| | KT3 | 110 | 3,93 | 0,896 | 1 | 5 |
| | KT4 | 110 | 3,95 | 0,866 | 2 | 5 |
| IT applications (CN) | CN1 | 110 | 3,78 | 0,817 | 2 | 5 |
| | CN2 | 110 | 3,81 | 0,914 | 1 | 5 |
| | CN3 | 110 | 3,86 | 0,933 | 1 | 5 |
| | CN4 | 110 | 4,12 | 0,832 | 1 | 5 |
| | CN5 | 110 | 3,98 | 0,857 | 1 | 5 |
| Manager's role (QL) | QL1 | 110 | 3,85 | 0,890 | 1 | 5 |
| | QL2 | 110 | 3,78 | 0,892 | 1 | 5 |
| | QL3 | 110 | 3,76 | 0,867 | 1 | 5 |
| | QL4 | 110 | 3,79 | 0,899 | 1 | 5 |
| Regulatory environment (PL) | PL1 | 110 | 3,73 | 0,957 | 1 | 5 |
| | PL2 | 110 | 3,85 | 0,844 | 1 | 5 |
| | PL3 | 110 | 3,96 | 0,918 | 2 | 5 |
| Effectiveness of the AIS (TT) | TT1 | 110 | 4,11 | 0,922 | 2 | 5 |
| | TT2 | 110 | 3,79 | 0,930 | 1 | 5 |
| | TT3 | 110 | 3,75 | 0,869 | 1 | 5 |
| The extent to which fraud and errors are minimized (GS) | GS1 | 110 | 3,80 | 0,965 | 1 | 5 |
| | GS2 | 110 | 3,86 | 0,933 | 1 | 5 |
| | GS3 | 110 | 3,79 | 0,899 | 1 | 5 |

The results of descriptive statistics show that most of the average values of the observed variables of the dependent factor are > 3 . It shows that the observed variables are agreed by the survey subjects.

4.1.2. Check the reliability of Cronbach's Alpha scale

The research team conducted Cronbach's Alpha test on the groups of factors affecting the AIS to reduce fraud and errors in SMEs in the Northern provinces with 5 groups (19 independent variables), 1 group (3 median variables). time) and 1 group (3 dependent variables) to remove the scales that are not reliable

enough. In summary, the Cronbach's Alpha coefficients of the variables are all greater than 0.6 and the correlation coefficients of the appropriate aggregate variables are not less than 0.3. From that, we can conclude that the scales are all standard and can be used in the next steps.

Table 3. Scale reliability test results

| Variable encoding | Total variable correlation | Cronbach's alpha coefficient when removing the variable |
|------------------------------------------------------------------------|----------------------------|---------------------------------------------------------|
| Information update form (HT) = 0,748 | | |
| HT1 | 0,632 | 0,595 |
| HT2 | 0,497 | 0,749 |
| HT3 | 0,611 | 0,622 |
| Auditing activities (KT) = 0,797 | | |
| KT1 | 0,687 | 0,704 |
| KT2 | 0,693 | 0,749 |
| KT3 | 0,583 | 0,758 |
| KT4 | 0,563 | 0,767 |
| IT applications (CN) = 0,785 | | |
| CN1 | 0,519 | 0,758 |
| CN2 | 0,497 | 0,767 |
| CN3 | 0,609 | 0,728 |
| CN4 | 0,597 | 0,734 |
| CN5 | 0,591 | 0,735 |
| Manager's role (QL) = 0,790 | | |
| QL1 | 0,676 | 0,698 |
| QL2 | 0,589 | 0,743 |
| QL3 | 0,581 | 0,747 |
| QL4 | 0,552 | 0,762 |
| Regulatory environment (PL) = 0,628 | | |
| PL1 | 0,500 | 0,433 |
| PL2 | 0,352 | 0,638 |
| PL3 | 0,465 | 0,488 |
| Effectiveness of the accounting information system (TT) = 0,725 | | |
| TT1 | 0,519 | 0,669 |
| TT2 | 0,545 | 0,637 |
| TT3 | 0,574 | 0,605 |
| The extent to which fraud and errors are minimized (GS) = 0,668 | | |
| GS1 | 0,512 | 0,528 |
| GS2 | 0,518 | 0,521 |
| GS3 | 0,413 | 0,656 |

4.1.3. Exploratory factor analysis EFA

The EFA evaluation factor analysis aims to remove the uncertain scales and condense variables with the same characteristics to create a new representative variable suitable for conducting regression analysis. With a sample size of 110 of the study, in order to ensure practical investigation results, the research team decided to choose a Factor Loading factor of 0.5.

- Conduct EFA analysis for the independent variable

KMO and Bartlett's Test table has $0.5 \leq \text{KMO} = 0.875 \leq 1$, so it is possible to conduct factor analysis for research data. Sig Bartlett's Test = $0.000 < 0.05$, so factor analysis is significant. The total variance extracted = $59.922\% > 50\%$ shows that the EFA model is appropriate and the 3 factors extracted are condensed 59.922% of the observed variables.

Table 4. Independent variable factor analysis results

| Evaluation factor | Test value |
|----------------------------------|-------------------|
| KMO coefficient | 0.875 |
| Sig value in the test Bartlett's | 0.000 |
| Total variance extracted | 59.922% |
| Eigen coefficient | 1.072 |

The extracted variance reached 59.922%, because of the requirement for the factor loading of the variables (> 0.5), after running the first EFA, the group removed 2 variables PL2 and QL3 and ran it again for the second time. All other variables are satisfactory.

Principal factor extraction method, varimax rotation to rotate factors: rotate the factor whole angle to minimize the number of variables with large coefficients at the same factor, thus enhancing the ability to explain factors.

Table 5. Result of rotation matrix for independent variable

| | Factor | | |
|------------|---------------|----------|----------|
| | 1 | 2 | 3 |
| PL3 | .787 | | |
| HT1 | .737 | | |
| HT3 | .660 | | |
| QL1 | .638 | | |
| PL1 | .622 | | |
| HT2 | .573 | | |
| KT1 | | .775 | |
| KT3 | | .723 | |
| CN2 | | .669 | |
| KT2 | | .668 | |
| QL4 | | .550 | |
| KT4 | | .531 | |
| CN1 | | .517 | |
| CN4 | | | .803 |
| CN5 | | | .803 |
| QL2 | | | .540 |
| CN3 | | | .534 |

The results of the rotation matrix show that 17 observed variables are reduced to 3 factors, all observed variables have factor loading coefficients greater than 0.5.

- Conduct EFA analysis for the intermediate variable

Table 6. The results of the factor analysis of the intermediate variable

| Evaluation factor | Test value |
|----------------------------------|-------------------|
| KMO coefficient | 0.679 |
| Sig value in the test Bartlett's | 0.000 |
| Total variance extracted | 64.590% |
| Eigen coefficient | 1.938 |

KMO and Bartlett's Test table has $0.5 \leq \text{KMO} = 0.679 \leq 1$, so it is possible to conduct factor analysis for research data. Sig Bartlett's Test = $0.000 < 0.05$, so factor analysis is significant. The total variance

extracted = 64.59% > 50% shows that the EFA model is suitable and the extracted factor is 64.59% of the observed variables.

Table 7. The matrix table of the intermediate variable

| Observed variables | Factor |
|--------------------|--------|
| TT1 | .823 |
| TT2 | .804 |
| TT3 | .783 |

According to the matrix of intermediate variables, with factor loading coefficient greater than 0.5, the matrix results show that 3 observed variables are reduced to 1 factor; Therefore, condensing the observed variables into a representative factor can be used for the following analysis steps.

- Conduct EFA analysis for dependent variable

Table 8. Result of factor analysis of dependent variable

| Evaluation factor | Test value |
|----------------------------------|------------|
| KMO coefficient | 0.644 |
| Sig value in the test Bartlett's | 0.000 |
| Total variance extracted | 60.132% |
| Eigen coefficient | 1.804 |

KMO and Bartlett's Test table has $0.5 \leq \text{KMO} = 0.644 \leq 1$, so it is possible to conduct factor analysis for research data. Sig Bartlett's Test = $0.000 < 0.05$, so factor analysis is significant. The total variance extracted = 60.132% > 50% shows that the EFA model is suitable and the extracted factor is 60.132% of the observed variables.

Table 9. The matrix table of the dependent variable

| Observed variables | Factor |
|--------------------|--------|
| GS1 | 0.807 |
| GS2 | 0.803 |
| GS3 | 0.173 |

From the matrix of the dependent variable, we can see that, with the factor loading factor greater than 0.5, the matrix results show that 3 observed variables are reduced to 1 factor; Therefore, condensing the observed variables into a representative factor can be used for the following analysis steps.

4.1.4. Correlation analysis between variables

From the results of Cronbach's Alpha test and EFA factor analysis as above, the research model has 3 independent variables, 1 intermediate variable and 1 dependent variable including: HT&PL: Information update form and legal environment; KT: Auditing activities; CN: Application of information technology; TT: Efficiency of the accounting information system; GS: The extent to which fraud and errors are minimized.

Table 10. Table of variance extracted

| | | GS | TT | HT&PL | KT | CN |
|----------------------------|------------------|-----------|----------------|------------------|----------------|----------------|
| Pearson Correlation | GS | 1 | .561** .000 | .700** .000 | .886** .000 | .776** .000 |
| | TT | | 1 | .701** .000 | .612** .000 | .486** .000 |
| | HT&PL | | | 1 | .722** .000 | .665** .000 |
| | KT | | | | 1 | .681** .000 |
| | CN | | | | | 1 |

The correlation table shows that the Pearson correlation sig between the independent variables HT&PL, KT, CN, and the intermediate variable TT; and sig Pearson correlation between the intermediate variable TT and the dependent variable GS are at $0.000 < 0.05$. That shows that 3 independent variables are correlated with the intermediate variable and the intermediate variable is correlated with the dependent variable. In which, the correlation between GS and KT is the strongest with $r = 0.886$; The correlation between GS and CN is the weakest $r = 0.486$.

4.1.5. Analysis of regression model

Model 1: “The influence of factors on the effectiveness of the accounting information system to reduce fraud and errors in the Northern provinces”

ANOVA analysis is a hypothesis test about the fit of the overall linear regression model.

Table 11. Check the fit of the model 1

| Model | | Sum of squares | df | Mean Square | F | Sig. |
|--------------|-------------------|-----------------------|-----------|--------------------|----------|-------------------|
| 1 | <i>Regression</i> | 29.884 | 3 | 9.961 | 37.724 | .000 ^b |
| | <i>Residuals</i> | 27.990 | 16 | .264 | | |
| | <i>Total</i> | 57.875 | 109 | | | |

From the results of ANOVA test with Sig test $F = 0.00 < 0.05$, the regression model is significant and consistent with the collected data.

Overall regression model: $TT = \beta_1 \beta_1 + \beta_2 *HT\&PL + \beta_3 *KT + \beta_4 *CN + u$

TT: Efficiency of the accounting information system

HT&PL: Information update form and legal environment

KT: Auditing activities

CN: Application of information technology

Table 12. Summary of model 1

| Model | R | R² | R² correction | Standard error of the estimate | Durbin-Watson |
|-------------------------|-------------------|----------------------|---------------------------------|---------------------------------------|----------------------|
| 1 | .719 ^a | .516 | .503 | .51387 | 1.954 |
| Constant: HT&PL, KT, CN | | | | | |
| Dependent variable: TT | | | | | |

From the regression analysis we see that R^2 correction = 0,503. This shows that the independent variables explain 50.3% of the variation of the dependent variable. Durbin - Watson value to evaluate first order series autocorrelation. The value $1.5 < DW = 1,954 < 2.5$, so the results do not violate the first-order sequence autocorrelation assumption.

Table 13. Statistical parameters in regression model

| Model | | Unnormalized coefficients | | Normalization coefficient | T | Sig. | Multicollinear statistics | |
|-------|------------|---------------------------|----------------|---------------------------|-------|------|---------------------------|-------|
| | | B | Standard error | Beta | | | Tolerance coefficient | VIF |
| 11 | (Constant) | .825 | .314 | | 2.715 | .008 | | |
| | HT&PL | .592 | .110 | .560 | 5.389 | .000 | .423 | 2.364 |
| | KT | .262 | .114 | .243 | 2.295 | .024 | .406 | 2.463 |
| | CN | -.054 | .103 | -.051 | -.523 | .062 | .473 | 2.113 |

The sig value of the t-test with all three independent variables is less than 0.1. That can confirm that these variables have significant explanations for the change of the dependent variable. The exaggeration coefficient of variance VIF of all 3 independent variables is less than 10, so multicollinearity in the model is assessed as not serious.

From there, we have the sample regression equation rewritten with the unnormalized regression coefficient as follows:

$$TT = 0,825 + 0,592*HT\&PL + 0,262*KT - 0,054*CN + u$$

Specifically, in the condition that other variables remain unchanged, when the factor "Information update form and legal environment" increases by 1 unit, the level of impact on "Efficiency of the AIS" will be increased by 0.592 units. In the condition that other variables remain unchanged, when the factor "Auditing activities" increases by 1 unit, the level of impact on "Efficiency of the AIS" increases by 0.262 units. In the condition that other variables remain unchanged, when the factor "Application of information technology" increases by 1 unit, the level of impact on "Efficiency of the AIS" decreases by 0.054 units.

Model 2: "Impact of the economic information system on the extent of fraud and error reduction in SMEs in the Northern provinces"

Perform ANOVA analysis for model 2.

Table 14. Check the suitability of the 2 . model

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|-------|------------|----------------|-----|-------------|--------|-------------------|
| 2 | Regression | 17.974 | 1 | 17.974 | 49.701 | .000 ^b |
| | Residuals | 39.057 | 108 | .362 | | |
| | Total | 57.030 | 109 | | | |

From the results of ANOVA test with Sig test $F = 0.00 < 0.05$, the regression model is significant and consistent with the collected data.

Overall regression model:

$$GS = GS = \beta_1 \beta_1 + \beta_2 \beta_2 * TT + u$$

GS: The extent to which fraud and errors are minimized

TT: Efficiency of the AIS

Table 15. Summary of the 2 . model

| Model | R | R ² | R ² correction | Standard error of the estimate |
|------------------------|-------------------|----------------|---------------------------|--------------------------------|
| 2 | .561 ^a | .315 | .309 | .60136 |
| Constant: TT | | | | |
| Dependent variable: GS | | | | |

From regression analysis shows that **R² correction = 0.309**

This shows that the independent variable "Efficiency of the AIS" explains 30.9% of the variation of the dependent variable "The degree of fraud and error reduction".

Table 16. Statistical parameters in 2 . regression model

| Model | Unnormalized coefficients | | Normalization coefficient | t | Sig. |
|-------|---------------------------|----------------|---------------------------|-------|------|
| | B | Standard error | Beta | | |
| 2 | (Constant) | 1.653 | .312 | 5.292 | .000 |
| | TT | .557 | .079 | .561 | .000 |

The sig value of the t-test with the independent variable “Efficiency of the technical information system” is 0.000 < 0.1. That can confirm that this variable has the meaning to explain the change of the dependent variable "The degree of fraud and error minimization".

From there, we have the sample regression equation rewritten with the unnormalized regression coefficient as follows:

$$GS = 1,653 + 0,557*TT + u$$

Specifically, in the condition that other variables remain unchanged, when the factor "Efficiency of the AIS" increases by 1 unit, the "Level of reducing fraud and errors" increases by 0.557 units.

4.2. Discussion

From the above analysis results, it is shown that the group of factors "Form of updating information & Legal environment" and the factor "Auditing activities" have a positive impact on the AIS, reducing fraud and errors in SMEs in the Northern provinces. In addition, the factor "Application of information technology" has a negative impact on the economic information system, reducing fraud and errors in SMEs in the Northern provinces. From there, we conclude to accept the hypothesis H1, H2, H3, H5 for the formal research model.

Firstly, the factor “Form of information updating & Legal environment” has the strongest positive impact on “Effectiveness of technical information system”. The two variables have the same characteristics and are expressed in common through a variable represented by "Accounting Information" which also includes the provisions in the Law, regulations, guiding circulars on accounting and Ethical Standards in accounting and auditing under the scope of “Legal environment”. It is easy to see in reality, if the enterprise has an effective, fast and timely form of updating information, besides a good legal environment with full observance of legal regulations on accounting, Auditing, the "Professional Ethical Standards" will have a positive impact on the accounting information system, reducing fraud and errors in enterprises. According to (Hang, 2013) and (Anh, 2015), two research papers simultaneously show that the update method to improve the knowledge of the accounting team reduces the possibility of errors due to misunderstandings about accounting system. Thus, recommendations related to the form of information updating of the accounting team: Businesses need to regularly organize weeks or months of training to improve their accountants'

capacity. Along with that, accountants need to actively update information about new accounting standards and also need to actively self-study and learn professional knowledge and accountants always need to hone their skills in using accounting standards software and update new information and regulations issued by the state. In addition to changing behavior, employee behavior can also be improved in a good way by creating a comfortable working environment. Besides, Strict compliance with the issued regulations and accounting standards will help businesses avoid errors and frauds within the business. Firstly, on the part of accountants, the accounting department should actively self-study accounting circulars and standards to apply in accordance with their business. Secondly, on the part of professional associations and enterprises themselves, the two sides can work together to provide full guidance on legal regulations, and can organize vocational training and training services for accountants both in terms of professional skills and compliance with current documents that are updated and changed regularly. Third, on the government side, the Ministry of Finance and relevant departments need to build a clear system of legal documents on accounting, creating a transparent legal environment and effective operation a transparent system that operates effectively and is trusted and adhered to by businesses for the common good.

Secondly, the factor "Audit activities" has a positive impact on "Efficiency of the AIS". This is also confirmed in the fact that if the enterprise carries out regular and effective independent audit activities, it will positively affect the AIS, reducing fraud and errors. Also (Hang et al., 2013) and (Anh, 2015) have shown that independent examination from qualified, experienced and competent experts will have obvious effects on the development of detect and prevent mistakes in SMEs. Strengthening the use of independent auditors to increase the objectivity of financial statements is necessary to create transparency in reports and to be consulted and given contributions by independent auditors independent and objective opinion. The use of periodic independent audits in combination with reward and punishment policies will increase the pressure to make accountants work more carefully and with fewer errors and do not create opportunities for unethical employees to commit fraud cheat.

Thirdly, the factor "Application of information technology" has a negative impact on "Efficiency of the technical information system". This can be understood that the application of advanced technology applications is not necessarily good for the AIS to reduce fraud and errors. According to (Deborah Beard and H. Joseph Wen, 2007) the use of Internet technologies has significantly increased the vulnerability of information systems. Besides, frequently changing accounting tools, following the rapid development of information technology is also a big challenge for businesses and accountants. The application of modern technology will help the data to be calculated and controlled more closely and accurately, avoiding errors and frauds from the accounting department. The research team suggested that businesses should invest in synchronously using software from the very beginning to maintain the accounting apparatus and save on training and conversion costs; can refer to some software with not too high cost with basic features according to the regulations on accounting and reporting of the Ministry of Finance.

Fourthly, the factor "Role of managers in accounting" is excluded in the process of analyzing research data. With the research team's results, the role of managers in accounting work does not really have a high influence on the AIS, which reduces fraud and errors in SMEs in the Northern provinces. In fact, this result is also explained clearly, leaders and managers do not really need to have a deep understanding of accounting operations. Intervening too deeply in professional accounting operations will only waste the resources of both employees and leaders.

Finally, the factor "Efficiency of the technical information system" has a strong positive influence on the "Level of reducing fraud and errors" in SMEs in the Northern provinces. Specifically, the research of (Hang, 2013) and additional research of (Anh, 2015) have shown that the effectiveness of the AIS can be assessed and accurately reflect the situation as well as production and business activities of enterprises.

5. Conclusion

In order to clarify the research objective "Effect of the AIS on the degree of fraud and error reduction in SMEs in the Northern provinces", the study has applied the quantitative research method. After the

process of using descriptive statistics of measurement variables, assessing the reliability of the scale, exploratory factor analysis - EFA, correlation analysis, multivariate regression by OLS method, the authors have It can be concluded that the degree of fraud and error reduction of the enterprise can be greatly affected by the AIS. Specifically, the factors affecting the effectiveness of the AIS that affect the degree of fraud and error minimization include: "The form of updating information of the accounting department", "Audit activities", "Information technology in accounting work" and "Legal environment". Through the obtained results, the authors have proposed and recommended a number of solutions to contribute to increasing the efficiency of the economic information system, thereby minimizing fraud and errors in small and medium enterprises in the Northern provinces. On the other hand, the proposed solutions need to focus on the participation of stakeholders. Hopefully the research paper can be the basis for accountants, businesses, professional associations and the State to jointly build an AIS transparent and efficient.

6. Appendix

Survey sheet

1. The extent to which fraud and errors are minimized

| | Assumption | Totally disagree | Disagree | Neutral | Agree | Totally agree |
|---|-------------------------------------------------------------------------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| 1 | The information provided by the AIS is useful. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 2 | The economic nature of transactions and events is properly reflected by the product of the AIS. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 3 | Products of AIS ensure materiality, reasonableness and truthfulness. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |

2. Effectiveness of the AIS

| | Assumption | Totally disagree | Disagree | Neutral | Agree | Totally agree |
|---|-------------------------------------------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| 1 | Information users are satisfied with the product of the AIS. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 2 | Time to respond to requests for information promptly and quickly. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 3 | Information is highly secure and reliable. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |

3. The form of updating information of the accounting department

| | Assumption | Totally disagree | Disagree | Neutral | Agree | Totally agree |
|---|------------------------------------------------------------------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| 1 | Training and retraining courses to improve the accounting profession are regularly held. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 2 | Enterprises regularly update accounting circulars, decisions and standards. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 3 | Information of the accounting department is updated in an efficient manner. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |

4. Auditing activities

| | Assumption | Totally disagree | Disagree | Neutral | Agree | Totally agree |
|---|-----------------------------------------------------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| 1 | Enterprises often use external control activities. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 2 | Through auditing, businesses can detect frauds and errors. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 3 | Enterprises pay attention to audit results. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 4 | Business results are more effective thanks to independent audit activities. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |

5. Application of information technology in accounting work

| | Assumption | Totally disagree | Disagree | Neutral | Agree | Totally agree |
|---|------------------------------------------------------------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| 1 | Enterprises regularly update advanced accounting tools. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 2 | Accountants are taught how to use tools and accounting tools are also easy to use. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 3 | Accounting operations are fully met by accounting tools. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 4 | The accounting work is fully equipped with infrastructure. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 5 | Accountants use software in accounting work. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |

6. The role of managers in the accounting system

| | Assumption | Totally disagree | Disagree | Neutral | Agree | Totally agree |
|---|-----------------------------------------------------------------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| 1 | Managers focus on building and effectively applying the AIS at the enterprise. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 2 | Managers communicate information clearly to accounting staff. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 3 | Accounting work is focused and concerned by managers. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 4 | Managers have knowledge of accounting. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 5 | Managers listen to the opinions of accountants to help improve the working environment. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |

7. Regulatory environment

| | Assumption | Totally disagree | Disagree | Neutral | Agree | Totally agree |
|---|---------------------------------------------------------------------------------------------------------------------------------------|----------------------------|----------------------------|----------------------------|----------------------------|----------------------------|
| 1 | Issues arising in reality at enterprises are fully and promptly promulgated by the accounting regimes and regulations in the Law. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 2 | Clarity in regulations of circulars guiding accounting work. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |
| 3 | Promulgating uniformly, there is no difference in the provisions in the standards, regimes and circulars guiding the accounting work. | <input type="checkbox"/> 1 | <input type="checkbox"/> 2 | <input type="checkbox"/> 3 | <input type="checkbox"/> 4 | <input type="checkbox"/> 5 |

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FORECAST OF GOVERNMENT BOND YIELDS BY MACHINE LEARNING

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ABSTRACT

This research aims to predict Government bond yields in Vietnam based on macroeconomic factors that are believed to affect the bond market. The study was conducted based on a dataset spanning from July 2006 to December 2019 and is based on two samples of 1-year and 5-year Government bonds, respectively, for short-term and long-term debt instruments. By using traditional predictive models such as automatic autoregressive moving average (Auto-ARIMA), Multiple Linear regression model (OLS); and some Machine Learning models such as Decision Tree model, Random Forest model and Support Vector Regression model. The research objective of the authors is to find the most effective model for forecasting Government bond yields. The results of the study show that Machine Learning models still have the advantage in both forecasting performance and model execution time. Among the machine learning methods implemented, the Support Vector Regression model is the model with the best predictive performance for short-term and long-term Government bond yields.

Keywords: Government bond yields, Machine Learning model, Vietnam.

1. Introduction

The Government bond market is an important part of the financial market, playing the role of an important long-term capital mobilization channel for the state budget, linking the issuance of Government bonds with restructuring Government debt, through focusing on issuing long-term bonds and diversifying the investor base (TRINH, NGUYEN, NGUYEN, & NGO, 2020). Government bonds and Government-guaranteed bonds are “commodities” of this market, with low-risk characteristics, making an important contribution to creating a common ground for yields in the financial market in general. Besides, when the Government bond market develops, it will contribute a lot to the Government in implementing policies to regulate the economy by macro policies (Valko, Marques, & Castellani, 2005).

Because of its low-risk and high-potential characteristics, the Government Bonds market possesses a risk-free term structure, creating a standard reference base for different economic entities in the financial market to Bond issue pricing of corporate bonds or other financial products (TRINH et al., 2020). In addition, according to the development trend of technology, Machine Learning models have the potential to become an effective assistant, powerful analytical tool, and promising in effective investment management (Gan, Wang, & Yang, 2020). With that, after reviewing typical studies on the topic of Government bonds, the team found that there was a lack of studies using data from developing country sources. However, it is possible to explain that problem, because data sources in developing countries are relatively new, thin and difficult to apply advanced techniques to research. Realizing the above problems, the team decided to conduct research on Machine Learning: Decision Tree, Random Forest and Vector Machine Regression, based on data sources from developing countries, specifically Vietnam, and at the same time, compared with the forecast results of linear regression models such as Auto-ARIMA and OLS, to find the most optimal solution in forecasting the volatility of Government bond yields.

The author's empirical study is based on a monthly dataset of the prices of Vietnamese Government bonds with par value of VND and fixed interest rates, from July 2006 to December 2019 combined with

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Vietnam's macro variables. The authors study short-term and long-term debt instruments with 1-year and 5-year terms, respectively. The macroeconomic data set includes key macro indicators including inflation rate, foreign exchange reserves, prime interest rates, foreign interest rates, stock returns, total surplus or deficit Government budget, public debt, current account balance. The dataset used by the authors is based on the dataset of TRINH et al. (2020) study on the factors determining the volatility of Vietnamese Government bond yields.

2. Theoretical framework

Forecasting Government bond yields has always been the interest of researchers for many decades. Therefore, there have been many classic theories of yield curve simulation. Typically, Ludvigson and Ng (2009) use the results of Nelson and Siegel's research to simulate the US bond curve. Reschreiter (2003) also applied arbitrage pricing (ATP) theory in UK Government bond yields and found that economic and financial risk factors are related such as inflation, changes in volatility slopes of the term structure, retail sales growth, and profitable stock market performance.

When establishing a model for forecasting Government bond yields, macroeconomic factors also play an important part in building a robust model. According to Ludvigson and Ng (2009), investors should be partially compensated for the risks posed by the macroeconomic downturn. In addition, Ludvigson and Ng (2009) also showed that the inclusion of macroeconomic components in the model will increase the forecast performance after combining 132 macro variables to increase the model performance. Besides, many research papers have also provided much evidence for this point such as Cooper and Priestley (2009) and Cieslak and Povala (2015). In addition, Ghysels, Horan, and Moench (2018) show that the ability to predict macro variables will be limited, while Campbell and Shiller (1991) argue that the current yield differential has predicted future excess returns and profits. However, in reality, in each country or in different economies, the macroeconomic variables that affect Government bond yields are different.

In addition to traditional research, groundbreaking studies using new and modern tools also support the research process, especially in predicting Government bond yields. The use of Machine Learning enables researchers to perform calculations that cannot be achieved by humans, decreasing the time and increasing productivity of model operation. Because of the effectiveness of these Machine Learning methods in forecasting output data, there have been many research papers that have applied this method to forecast future Government bond yields. Mullainathan and Spices (2017); Athey and Imbens (2019) based on the development of machine learning technical statistical properties and theoretical properties of deep neural networks, many papers have applied them to their research in the field of economics. Suimon (2018) built a yield curve model based on machine learning and demonstrated the yield term structure based on the relationship of the three yield periods of 5, 10 and 20 years of the yield curve for the three-factor Nelson-Siegel three-factor models. He then used Short-Term Memory (LSTM) to predict long-term yields. Extending this study and analysis, Suimon et al. (2019a, 2019b) combined the yields of two countries, Japan and the United States, into the neural network model. In addition, based on the theory of interest rate parity, they combined the Dollar - Yen exchange rate along with US and Japanese interest rates into the above neural network model. He then used Short-Term Memory (LSTM) to predict long-term yields. Extending this study and analysis, Suimon et al. (2019a, 2019b) combined the yields of two countries, Japan and the United States, into the neural network model. In addition, based on the theory of interest rate parity, they combined the Dollar - Yen exchange rate along with US and Japanese interest rates into the above neural network model.

3. Data and Research Methods

3.1. Data

The author's empirical study is based on a monthly dataset of Vietnamese Government bond prices with a par value of VND and fixed interest rates, from July 2006 to December 2019 combined with Vietnam's macro variables. The author's study is based on short-term and long-term debt instruments, respectively with 1-year and 5-year terms of Government bonds. Based on previous empirical studies on

Government bond yields, especially in Vietnam, the authors build a model based on two dependent variables are 1-year and 5-year Government bond yields and variables independent are the basic macroeconomic variables including inflation rate (CPI), foreign exchange reserves (FER), base rate (Baserate), foreign interest rate (FIR), stock return (stock return), total Government budget surplus or deficit (Fiscal), public debt (Govdebt), and current account balance (CurentAcc). The dataset used by the authors is based on the dataset of TRINH et al. (2020) studied the factors affecting the volatility of Vietnamese Government bond yields.

3.2. Research Methods

The authors divided into 2 settings to perform the forecast. Setup (1) uses representative models of traditional models such as Auto-ARIMA and Multiple Linear regression model for forecasting. Set up (2), authors forecast Government bond yields by using Machine Learning models with data of 1-year and 5-year bond yields combined with basic macro variables such as Random Forest, Decision Tree, and Support Vector Regression.

3.2.1. Moving average model combined with automatic autoregression

The process of the Autoregressive Integrated Moving Average (ARIMA) is understood as a model that combines three main factors: the autoregressive component AR (p), the stationarity of the time series I (d), and the moving average component MA (p). However, in this study, the authors use the Auto-ARIMA method to find out the parameters "p", "d", and "q" automatically based on finding the model that has the lowest AIC. The advantage of this method is to avoid data overfitting (Nguyen Anh Phong, 2020).

Autoregression (AR): The regression component includes the lags of the current variables. The p-order delay is the backward value p time step of the series. The delay will be long or short for AR depending on the parameter p.

$$(AR): AR(p) = \emptyset_0 + \emptyset_1 x_{t-1} + \emptyset_2 x_{t-2} + \dots + \emptyset_p x_{t-p}$$

Moving Average (MA): This process is understood as the process of moving or changing the average value of the series over time. As mentioned above, a series is stationary, so the mean change process is a white noise series. The MA process works by finding a linear relationship between the random components ϵ_t which should satisfy:

$E(\epsilon_t) = 0$ ensure that the series is stationary, not changing the mean over time.

$\sigma(\epsilon_t) = 0$ The variance of the series is constant.

$$\rho(\epsilon_t, \epsilon_{t-s}) = 0$$

The combination of MA, AR, and the stationary factor of the value chain I, identifies the model ARIMA(p,d,q):

$$\Delta x_t = \emptyset_1 \Delta x_{t-1} + \emptyset_2 \Delta x_{t-2} + \dots + \emptyset_p \Delta x_{t-p} + \theta_1 \epsilon_{t-1} + \theta_2 \epsilon_{t-2} + \dots + \theta_q \epsilon_{t-q}$$

In there:

Δx_t is the difference of order d and ϵ_t is the white noise series.

3.2.2. Multiple Linear regression

The authors used a traditional linear regression model to examine the influence of macro variables on Vietnamese Government bond yields with 1-year and 5-year maturities with the following regression formula:

For short-term debt instruments: $GB1Y = \beta_0 + \beta_1 GB5Y + \beta_2 CPI + \beta_3 FER + \beta_4 Baserate + \beta_5 FIR + \beta_6 Stockreturn + \beta_7 Fiscal + \beta_8 Govdebt + \beta_9 CurrentAcc$

For long-term debt instruments: $GB5Y = \beta_0 + \beta_1 GB1Y + \beta_2 CPI + \beta_3 FER + \beta_4 Baserate + \beta_5 FIR + \beta_6 Stockreturn + \beta_7 Fiscal + \beta_8 Govdebt + \beta_9 CurrentAcc$

Specifically:

β_0 : Constant.

$\beta_1, \beta_2, \dots, \beta_9$: The angle systems of the predictors of the respective macro variables.

GB5Y: Yield of 5-year Government bonds.

GB1Y: Yield of 1-year Government bonds.

CPI_t : is the inflation rate in month t.

FER_t : is non-gold monthly foreign exchange reserves (in USD) in month t.

$Baserate_t$: is the base rate of Vietnam in month t.

FIR_t : is the foreign interest rate (US interest rate) in month t.

$Stockreturn_t$: is the return of VN-Index in month t.

$Fiscal_t$: is overall budget surplus or deficit as a percentage of GDP in month t.

$Govdebt_t$: is general Government debt as a percentage of GDP in month t.

$CurrentAcc_t$: is current account balance as a percentage of GDP in month t.

Table 1. Expected impact of macro variables on Government bond yields

| Independent variance | Expectation |
|----------------------|-------------|
| CPI | + |
| FER | - |
| Baserate | + |
| FIR | + |
| Stockreturn | - |
| Fiscal | + |
| Govdebt | + |
| CurrentAcc | + |

Source: Synthesized from previous studies

3.2.3. Decision tree

The model is formed from subsets, each subset is a branch, and the branches are completely independent of each other, representing the value for an attribute to be checked. When the subset splits into smaller subsets, a decision node is formed. The node representing the entire data set is the root node. A special feature of decision trees is that they can handle both numerical and categorical data. Decision trees are often used in classification and regression problems. For the regression method, the model will predict a value instead of predicting a class in each node like the classification problem. The core of this method is to use a probability algorithm to separate the cases according to the set conditions and minimize the error. In Regression Decision Trees, the CART algorithm is used so that it tries to split the training set in a way that minimizes the MSE instead of trying to split the training set in a way that minimizes non-significant data points.

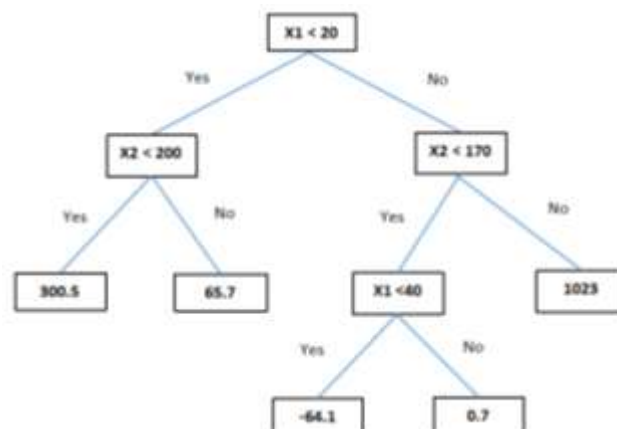


Figure 1. How the Decision Tree method works

Source: Author's synthesis

The cost function that the algorithm tries to minimize:

$$J(k, t_k) = \frac{m_{left}}{m} MSE_{left} + \frac{m_{right}}{m} MSE_{right}$$

$$\text{In that } \{MSE_{nodes} = \sum_{i \in nodes} (\hat{y}_{nodes} - y^{(i)})^2 \hat{y}_{nodes} = \frac{1}{m_{nodes}} \sum_{i \in nodes} y^{(i)}$$

3.2.4. Random Forest

Random forest is a supervised learning algorithm that works by building many decision trees based on different samples and making decisions according to the majority or the mean of the classes.

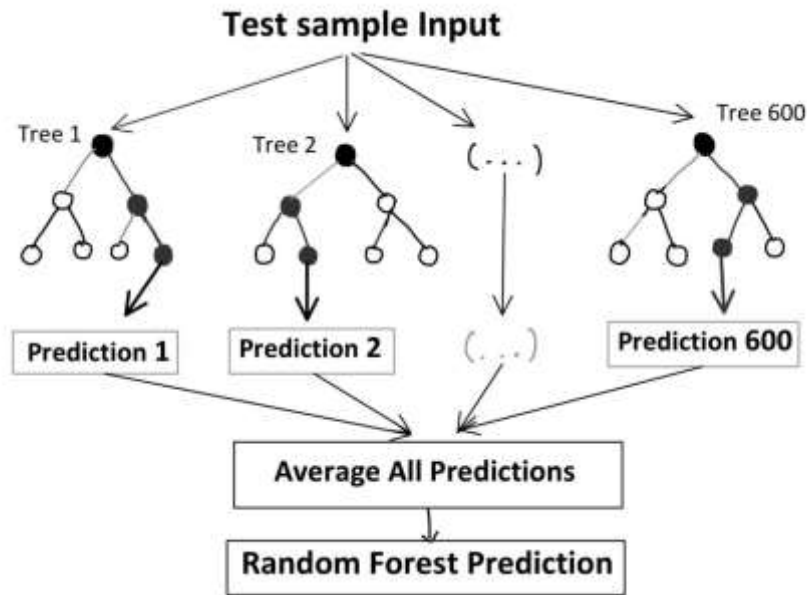


Figure 2. How the Random Forest method works

Source: Author's synthesis

The basic operation steps of Random Forest:

- Step 1: In Random Forest, n number of random records are taken from a data set of k number of records.
- Step 2: Individual decision trees are built for each sample.
- Step 3: Each decision tree will produce an output.
- Step 4: Final results are considered based on Majority or Mean Voting for classification and regression respectively.

To avoid correlation between trees, Random Forests increase the diversity of trees by growing them from different training data subsets generated through a process called Bagging. Bagging is a technique used to generate training data by resampling a random sample from the original data set with substitution, i.e. without removing the selected data from the input sample to generate the next subset $\{h(x, \theta_k), k = 1, \dots, K\}$, in which, $\{\theta_k\}$ are independent random Vectors with the same distribution. As a result, some data may be used many times during training, while others may never be used. Since the prediction result of the random forest, the model is to combine the results of the decision trees in the forest with low correlation, so the random forest has low bias and variance, achieving high stability.

3.2.5. Support Vector Regression

Support Vector Machines is one of the most popular and widely used algorithms for dealing with classification problems in machine learning. However, the use of support vector models in regression is not well documented. This algorithm acknowledges the presence of non-linearity in the data and provides a

proficient predictive model using supervised learning algorithms and these types of models are known as Support Vector Regression. In the Support Vector Regression method, the required line to fit the data is called the hyperplane. The goal of an SVM algorithm is to find a hyperplane in a space of size n that can unambiguously classify the data points. The data points on either side of the hyperplane closest to the hyperplane are called Support Vectors. These vectors affect the position and orientation of the hyperplane and thus help to solve the regression optimization problem. Some hyperparameters are used in SVR such as:

Hyperplane: These are decision boundaries used to predict the continuous output. The support vectors on either side of the hyperplane are used to draw the necessary line that shows the algorithm's prediction results.

Kernel: A set of mathematical functions to find a hyperplane in a higher-dimensional space to solve the problem of not being linearly separable for a data set containing two types of observations in a two-dimensional space. The most widely used kernels include functions such as Linear, Non-Linear, Polynomial, Radial Basis Function (RBF), and Sigmoid. Usually, each of these kernels is used depending on the dataset, and usually, the kernel used is RBF by default.

Boundary Line: These are two lines drawn around the hyperplane at a distance calculated by the factor ϵ (Epsilon). It is used to create a boundary between data points.

With a training data set $\{(x_1, y_1), \dots, (x_n, y_n)\} \subset \chi \times \mathbb{R}$ there are n number of observations included in the model training, where χ the input data domain is defined. In contrast to OLS, the objective function of SVR is to minimize the coefficients - more specifically, the L2 norm of the coefficient vector (L2-norm) - not the squared error. Instead, the error term is handled in the bound intervals known as the maximum error- ϵ (epsilon). That is, the deviation on the $y_{(i)}$ of the whole training data set is not greater than ϵ . For the nonlinear regression case, the function $f(x)$ can be defined as follows:

$$f(x) = \sum_{i=1}^n (a_i K(x_i, x) + b)$$

So that:

$$f(x) = \sum_{i=1}^n (a_i = 0, \text{ v\`a } C \geq a_i,$$

In that:

C : is a constant that determines the balance of error margin between the flatness of f and the accepted amount of excess deviation ϵ .

a_i, a_i^* : are Lagrange multipliers.

$K(x_i, x)$: is the Kernel function defined by the formula:

$K(x_i, x) = [\Phi(x_i), \Phi(x_j)]$ with Φ is the attribute mapping for the kernel K .

X_i is input points with $(a_i -$ are called SVs.

4. Results

The authors adopt Table 2 to show the correlation between macro variables for the Government bond yield variable and Table 3 to report error results from the models used including Auto-ARIMA, Multiple Linear regression model, Random Forest, Decision Tree, and Support Vector Regression.

Table 2. Correlation relationship between variables

| Government bond yield 1-year | | | | | | | | | | |
|------------------------------|-------|-------|-------|-------|----------|-------|-------------|--------|---------|------------|
| | GB5Y | GB1Y | CPI | FER | Baserate | FIR | Stockreturn | Fiscal | Govdebt | CurrentAcc |
| GB5Y | 1 | | | | | | | | | |
| GB1Y | 0.99 | 1 | | | | | | | | |
| CPI | 0.4 | 0.41 | 1 | | | | | | | |
| FER | -0.77 | -0.71 | -0.28 | 1 | | | | | | |
| Baserate | 0.32 | 0.36 | 0.09 | 0.16 | 1 | | | | | |
| FIR | 0 | 0.05 | 0.21 | 0.04 | 0.12 | 1 | | | | |
| Stockreturn | -0.07 | -0.08 | -0.15 | 0 | -0.16 | 0.02 | 1 | | | |
| Fiscal | 0.55 | 0.6 | 0.43 | -0.47 | 0.24 | 0.59 | -0.13 | 1 | | |
| Govdebt | -0.71 | -0.72 | -0.42 | 0.7 | -0.02 | -0.51 | 0.06 | -0.8 | 1 | |
| CurrentAcc | -0.44 | -0.48 | -0.36 | 0.41 | -0.05 | -0.52 | 0.11 | -0.62 | 0.7 | 1 |

Government bond yield 5-year

| | GB1Y | GB5Y | CPI | FER | Baserate | FIR | Stockreturn | Fiscal | Govdebt | CurrentAcc |
|-------------|-------|-------|-------|-------|----------|-------|-------------|--------|---------|------------|
| GB1Y | 1 | | | | | | | | | |
| GB5Y | 0.99 | 1 | | | | | | | | |
| CPI | 0.41 | 0.4 | 1 | | | | | | | |
| FER | -0.71 | -0.77 | -0.28 | 1 | | | | | | |
| Baserate | 0.36 | 0.32 | 0.09 | 0.16 | 1 | | | | | |
| FIR | 0.05 | 0 | 0.21 | 0.04 | 0.12 | 1 | | | | |
| Stockreturn | -0.08 | -0.07 | -0.15 | 0 | -0.16 | 0.02 | 1 | | | |
| Fiscal | 0.6 | 0.55 | 0.43 | -0.47 | 0.24 | 0.59 | -0.13 | 1 | | |
| Govdebt | -0.72 | -0.71 | -0.42 | 0.7 | -0.02 | -0.51 | 0.06 | -0.8 | 1 | |
| CurrentAcc | -0.48 | -0.44 | -0.36 | 0.41 | -0.05 | -0.52 | 0.11 | -0.62 | 0.7 | 1 |

Source: Author's calculation

Table 3. Accuracy of prediction

| Model | Government bond yield 1-year | | Government bond yield 5-year | |
|----------------------------|------------------------------|--------|------------------------------|--------|
| | RMSE | MAPE | RMSE | MAPE |
| Auto-ARIMA | 0.010538 | 33.06% | 0.010168 | 25.7% |
| Multiple Linear regression | 0.007031 | 21.4% | 0.003548 | 8.28% |
| Decision tree | 0.010737 | 9.3% | 0.002776 | 8.21% |
| Random forest | 0.006858 | 7.12% | 0.006185 | 4.34% |
| SVR – RBF | 0.018908 | 10.08% | 0.017017 | 9.0% |
| SVR – Linear | 0.003933 | 4.85% | 0.003818 | 4.52% |
| SVR – Polynomial | 0.015193 | 16.4% | 0.015247 | 14.12% |

Source: Model results from Python

The Auto-ARIMA model predicts 1-year and 5-year Government bond yields from May 2017 to September 2019 based on time series data from July 2006 to April 2017 showing the volatility trend of bond yields is shown in Figure 1 and Figure 2. However, the difference between the predicted value and the actual value is still relatively high, but Auto-ARIMA still forecasted the volatility trend for both terms. In addition, the report also showed that the forecast error of the 5-year period was smaller than that of the 1-year period. Previous studies by Ludvigson and Ng (2009) and Cieslak and Povala (2015) also show that incorporating macro variables into the model will increase forecasting efficiency. Therefore, the authors continue to experiment based on macro variables in Machine Learning models on this same data set to find a new model that can make better predictions.

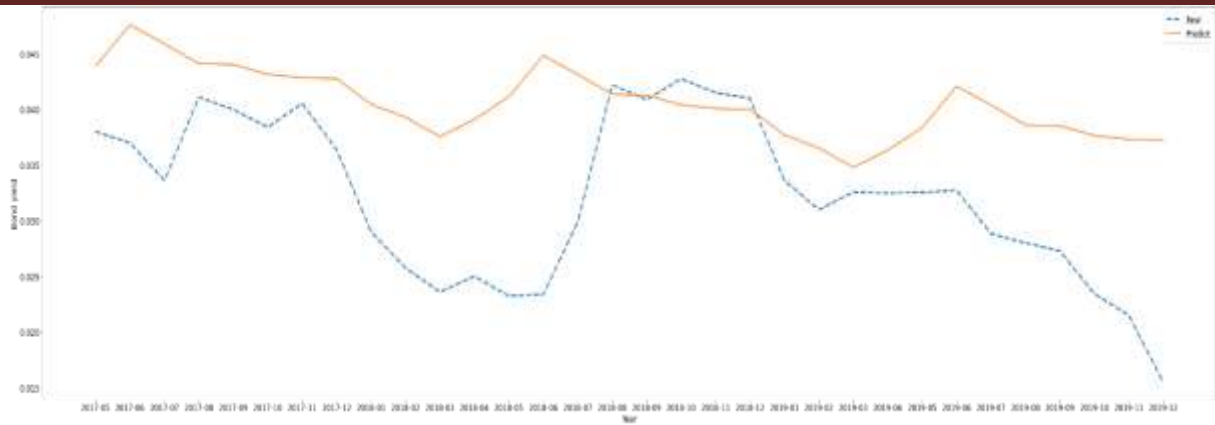


Figure 3. Actual and predicted 1-year Government bond yields by Auto-ARIMA

Source: Model results from Python

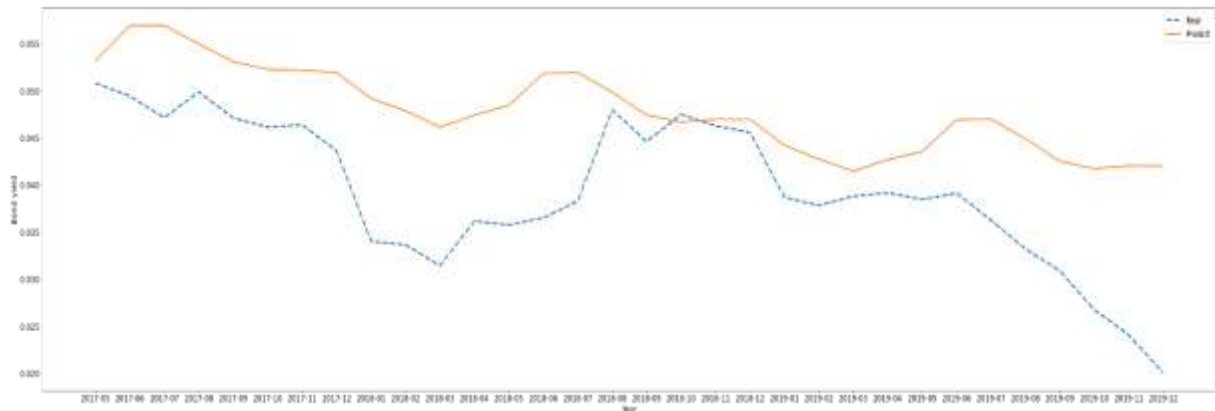


Figure 4. Actual and predicted 5-year Government bond yields by Auto-ARIMA

Source: Model results from Python

After running the Multiple Linear regression model incorporating macroeconomic variables, the authors obtained the results showing the relationship of the macro variables in Table 2. Through Table 2, we can find that macro variables are divided into two groups: the first group includes variables that have a negative effect and the other group has a positive effect on Government bond yields.

For 1-year Government bonds and 5-year Government bonds, most of them are influenced by the macro variables that the authors have included in the model. In which, variables such as the other yield variables of bonds, foreign exchange reserves, policy surplus or deficit, and public debt are the variables that have the strongest impact and are true to the expected sign shown in Table 1. However, two macro variables, US interest rates, and Vietnamese stock yields have negligible or almost no impact on Government bond yields. In addition, fiscal-related variables such as public debt and current account balances produce results contrary to the expectations in Table 1. This is contrary to the experimental results of previous studies. Giordano, Linciano, and Soccorso (2012) and Kameda (2014) show that when public debt increases, a current account deficit can help boost Government bond yields through a risk premium. However, there are still studies like NGUYEN (2019) and TRINH et al. (2020) that suggest that there may still be a relatively small negative relationship between the two variables for Government bonds.

When combining the macro variables and the Government bond yield value by the Multiple Linear regression model model, giving a forecast result of 1-year and 5-year Government bond yields that are closer to reality than shown in Figure 5 and Figure 6. This forecast result has improved in the study of forecasting bond yields of the same term of the Auto-ARIMA model.

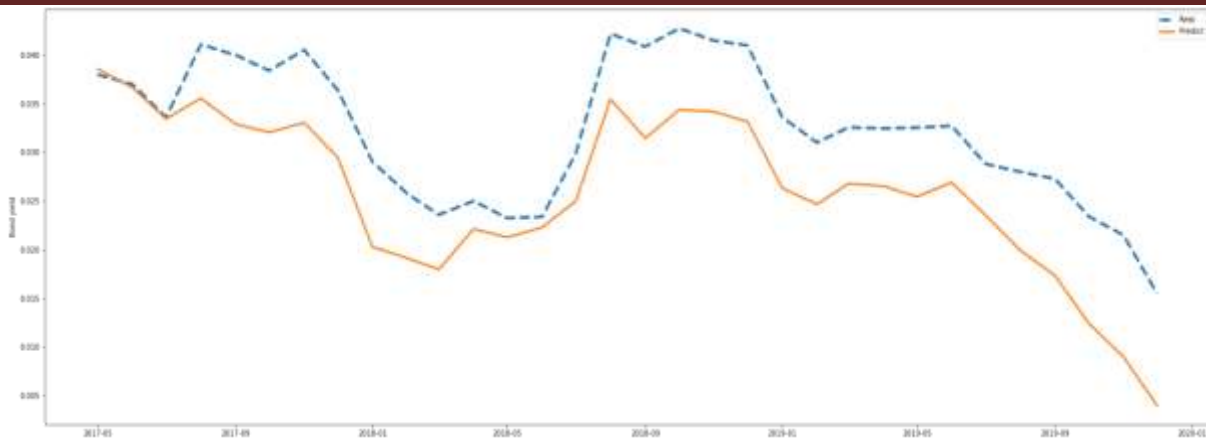


Figure 5. Actual and predicted 1-year Government bond yields by OLS

Source: Model results from Python

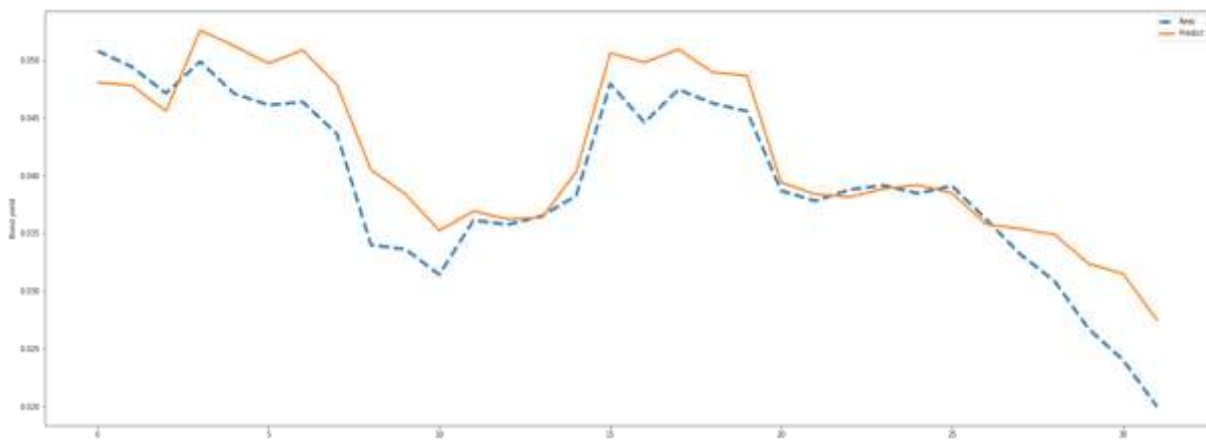


Figure 6. Actual and predicted 5-year Government bond yields by OLS

Source: Model results from Python

Through the above analysis, it can be seen that it is necessary to add macro variables to the process of analyzing and predicting Government bonds instead of just using past data of bond yields. Although this is a traditional method that has been published for a long time, it still gives acceptable results (Hoogteijling, 2020). In addition, this approach can not only improve the efficiency of the forecasting model, especially for long-term forecasts, but also help readers see clearly the relationship of macro variables and yield of Government bonds, from which it is possible to make judgments or make appropriate policies. However, this model still has certain limitations such as still having to follow the assumptions or not being able to optimize the residuals of the model well. Besides, with the advantages of model computation time as well as the high accuracy that Machine Learning models bring, that is the reason why the authors continue to experiment with predicting results with a number of Machine learning models. learning and expect that these Machine Learning models will provide better predictive results than traditional models.

After applying the Machine Learning model, the Decision Tree model gives better predictive results than the traditional regression model in the short and long term, this is clearly shown through two graphs: Figure 7 and Figure 8.

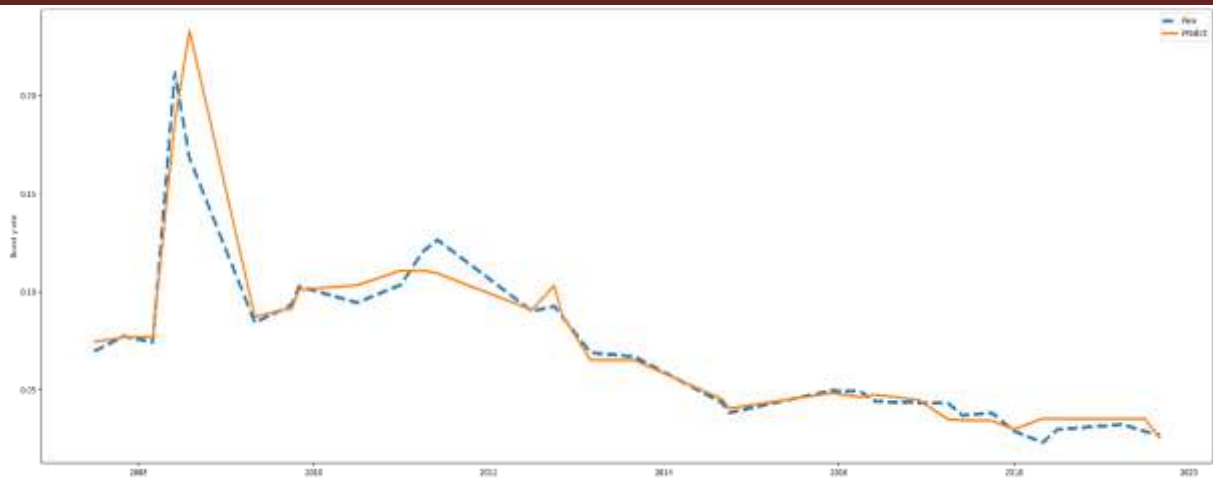


Figure 7. Actual and predicted 1-year Government bond yields using Decision Tree

Source: Model results from Python

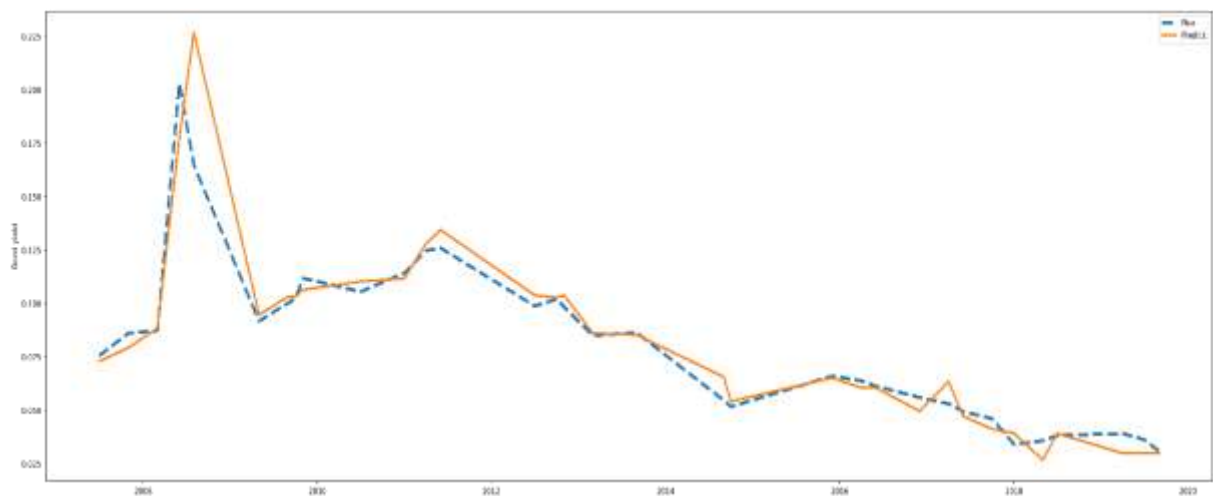


Figure 8. Actual and predicted 5-year Government bond yields using Decision Tree

Source: Model results from Python

According to the forecast results of the Random Forest model in the short and long term, shown in Figures 9 and 10, we can see that the forecast line is closer to the actual line. This shows that the accuracy of this model is higher than that of the Decision Tree model.

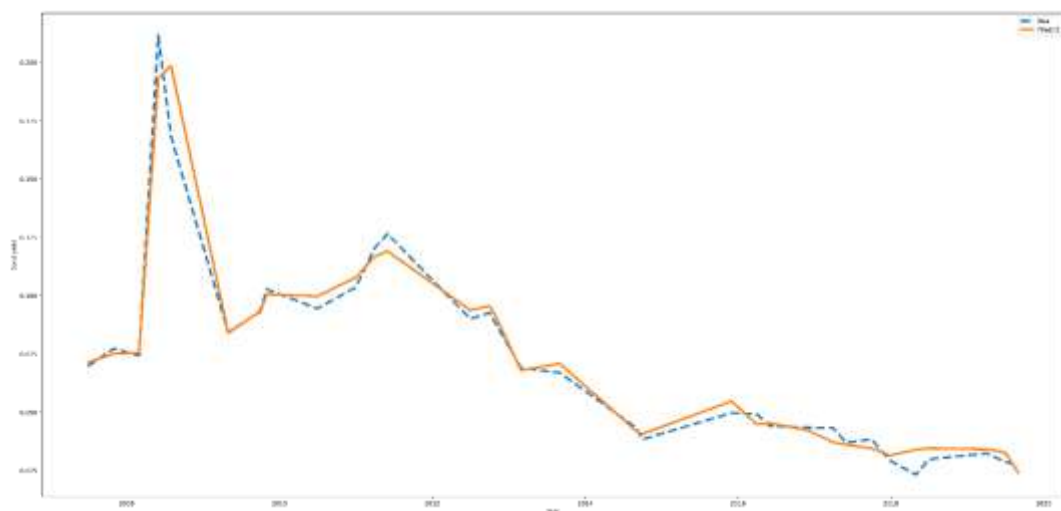


Figure 9. Actual and predicted 1-year Government bond yields by Random Forest

Source: Model results from Python

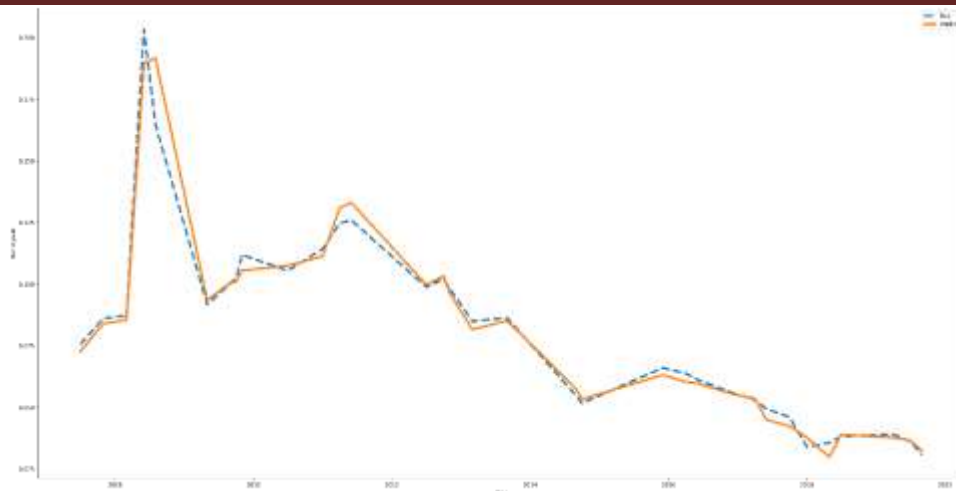


Figure 10. Actual and predicted 5-year Government bond yields by Random Forest

Source: Model results from Python

In summary, the Random Forest model has solved the problem that the Decision Tree has not been optimal in minimizing the error in the residuals. The authors' results are also similar to previous studies on the topic of comparing the predictive performance between these two models of Ganguli & Dunnmon, 2017. However, the two Machine Learning methods Decision Trees and Random Forests. However, there are many similarities and the way the two models work is relatively similar, the Random Forest model was developed based on the Decision Tree model for the purpose of improving the prediction performance of the model itself (Götze et al., 2020). In addition, another Machine Learning model, Support Vector Regression, has the outstanding advantages of excellent generalization ability, with high prediction accuracy. It is in contrast to traditional regression models that try to minimize the error of the coefficients of the equation in the model instead of trying to minimize the squared error in order to find a hyperplane that can fit the most data.

Through Figure 11 and 12, the shape of the kernel function directly affects the values obtained by SVR regression and both give different errors. The authors modeled all three kernel functions, namely RBF, linear and polynomial, in order to find the optimal kernel parameter with high generalizability in the three kernel parameters used in particular and find the optimal predictive model in general. The results of measuring deviations obtained after applying the three kernel parameters of the SVR model are recorded in Table 3. Therefore, when comparing the outputs for 1-year Government bonds and futures Government bonds At 5 years, a decreasing trend can be seen in the deviation value from the forecast observed in the use of the linear kernel and the radial basis function kernel.

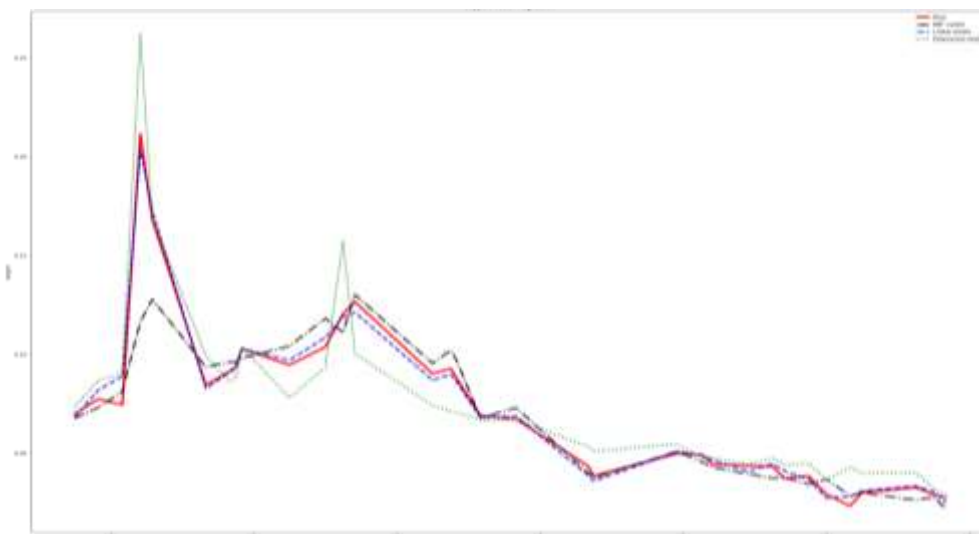


Figure 11. Actual and predicted 1-year Government bond yields by SVR

Source: Model results from Python

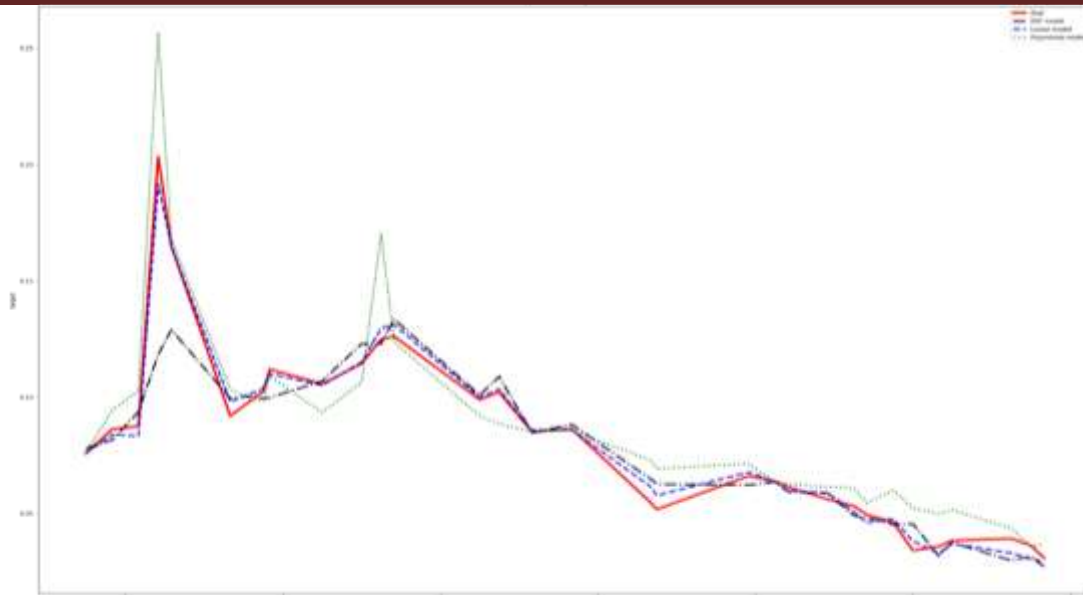


Figure 12. Actual and predicted 5-year Government bond yields by SVR

Source: Model results from Python

Through the calculation results, the authors conclude that using SVR with a linear kernel has better predictive power than the remaining kernels, meeting the author's desire for a parameter good kernel. In particular, it works more effectively for 5-year Government bonds. To consider the significance of the results, we need to compare these results with the bias values generated by the traditional models and also the Machine Learning models implemented in this article. Specifically, based on Table 3, for 1-year or 5-year Government bonds, the RMSE and MAPE indexes of the traditional models are higher than those of the SVR model in particular and other machine learning models tested. in this article in general. This shows that there are still limitations in the reliability and accuracy of traditional models even if these traditional models give forecasts for 5-year Government bonds that are different from the real ones has been minimized. Even more remarkable, although the Random Forest model has superior predictive power compared to the Decision Tree model, the Support Vector Regression model with kernel parameters is passed as the function kernel. radial basis and polynomial kernel. But when compared with the Support Vector Regression with linear kernel, the Random Forest still gives results with somewhat weaker model accuracy even though its MAPE index is better at Government bonds with a term of 5 years.

In addition, it is noted that although the MAPE index given in the 5-year Government bond of the Random Forest model (4.34%) is smaller than that of the Linear Nuclear Support Vector Regression (4.52%), but this difference does not affect the selection of the more optimal model. In general, the Support Vector Regression model with linear kernel parameters retains more stability and accuracy for both tenors of Government bonds than the Random Forest model.

5. Conclusion

5.1. Recommendations

Through the results obtained after implementing forecasting models, it can be seen that when combined with macro variables, the model is capable of giving good forecasting results of Government bond yields. This is shown more clearly when implementing on a Multiple Linear regression model, it will give more positive predictive results than when using a single time series variable with the Auto-ARIMA model. Besides, this study has contributed to reinforce the view that Machine Learning models will provide better predictive performance than traditional models. However, this method only brings high value to investors, and does not mean too much to policy makers, economic managers or State agencies. What policy makers are interested in is clarifying the effects of macro variables on Government bond yields so that they can make reasonable policies and adjustments to achieve their expected economic goals. Therefore, depending

on the purpose of use, analysts need to consider choosing an appropriate model for the decision-making process.

5.2. Conclusion

Through the forecast results provided by the models, both 1-year- and 5-year Government bond yields, the Support Vector Regression model shows that the difference to the reality is lowest and most stable. Besides, the research results also show that the 5-year Government bond yield forecast always returns better results than the 1-year term. This shows that the long-term forecast for Government bond yields is clearer, while the short-term forecast is more random.

Traditional models such as Auto-ARIMA, Multiple Linear regression model do well in forecasting the volatility trend of Government bond yields. Besides, they also show the correlation relationship between past Government bond yields and future yields through the Auto-ARIMA model or the correlations between macro variables and bond yields in a traditional linear regression model. However, this model has no advantage in giving high prediction accuracy, they still have relative deviation when compared with actual results. These models still have inherent limitations such as having to use many assumptions and not optimizing the residuals of the model. As for Machine Learning models, there will often be no assumptions, but mainly implementation of the "trial - error" method and will not care about the correlation relationship between the variables, which greatly improves the accuracy of the forecast

6. Appendix

Appendix A. Forecast results by Auto-ARIMA

| Time | Government bond yield 1-year | | Government bond yield 5-year | |
|---------|------------------------------|-------------|------------------------------|-------------|
| | Reality | Forecast | Reality | Forecast |
| 2017-05 | 0.038 | 0.043887759 | 0.05078 | 0.053156275 |
| 2017-06 | 0.037 | 0.047592825 | 0.0494 | 0.056894996 |
| 2017-07 | 0.0336 | 0.045908238 | 0.04712 | 0.056909442 |
| 2017-08 | 0.0411 | 0.044108181 | 0.04986 | 0.054934579 |
| 2017-09 | 0.04 | 0.044026615 | 0.04708 | 0.053043346 |
| 2017-10 | 0.0384 | 0.043156971 | 0.0461 | 0.052242871 |
| 2017-11 | 0.04054 | 0.042832672 | 0.04636 | 0.052174557 |
| 2017-12 | 0.0364 | 0.042776115 | 0.0436 | 0.051891294 |
| 2018-01 | 0.02902 | 0.040474959 | 0.034 | 0.049154181 |
| 2018-02 | 0.02575 | 0.039289503 | 0.03363 | 0.047845274 |
| 2018-03 | 0.0236 | 0.037549293 | 0.03143 | 0.046112685 |
| 2018-04 | 0.025 | 0.039088072 | 0.03613 | 0.047387081 |
| 2018-05 | 0.02325 | 0.041134404 | 0.03575 | 0.048431522 |
| 2018-06 | 0.02338 | 0.044839469 | 0.0365 | 0.051812111 |
| 2018-07 | 0.02988 | 0.043154883 | 0.03825 | 0.05190076 |
| 2018-08 | 0.0422 | 0.041354826 | 0.04795 | 0.049821577 |
| 2018-09 | 0.04088 | 0.04127326 | 0.04458 | 0.047403366 |
| 2018-10 | 0.04275 | 0.040403616 | 0.04745 | 0.04664054 |
| 2018-11 | 0.0415 | 0.040079316 | 0.04625 | 0.046948899 |
| 2018-12 | 0.041 | 0.04002276 | 0.04555 | 0.046928497 |
| 2019-01 | 0.03362 | 0.037721604 | 0.03868 | 0.044185699 |
| 2019-02 | 0.031 | 0.036536148 | 0.0378 | 0.042726733 |
| 2019-03 | 0.03257 | 0.034795937 | 0.03878 | 0.04143821 |
| 2019-04 | 0.03247 | 0.036334716 | 0.03915 | 0.042655296 |
| 2019-05 | 0.03255 | 0.038381049 | 0.03845 | 0.04353421 |
| 2019-06 | 0.03273 | 0.042086114 | 0.0391 | 0.046885997 |
| 2019-07 | 0.02883 | 0.040401527 | 0.03622 | 0.046969635 |
| 2019-08 | 0.028 | 0.038601471 | 0.03318 | 0.04488958 |
| 2019-09 | 0.02729 | 0.038519904 | 0.03086 | 0.042471217 |
| 2019-10 | 0.02343 | 0.03765026 | 0.02672 | 0.041708365 |
| 2019-11 | 0.0215 | 0.037325961 | 0.02405 | 0.042016719 |
| 2019-12 | 0.0155 | 0.037269404 | 0.02 | 0.041996317 |

Model results from Python

Appendix B. Forecast results by Multiple Linear regression model

| Time | Government bond yield 1-year | | Government bond yield 5-year | |
|---------|------------------------------|----------|------------------------------|----------|
| | Reality | Forecast | Reality | Forecast |
| 2017-05 | 0.038 | 0.03856 | 0.05078 | 0.04806 |
| 2017-06 | 0.037 | 0.03667 | 0.0494 | 0.0478 |
| 2017-07 | 0.0336 | 0.03345 | 0.04712 | 0.04557 |
| 2017-08 | 0.0411 | 0.03556 | 0.04986 | 0.05256 |
| 2017-09 | 0.04 | 0.03291 | 0.04708 | 0.05121 |
| 2017-10 | 0.0384 | 0.03207 | 0.0461 | 0.0497 |
| 2017-11 | 0.04054 | 0.03306 | 0.04636 | 0.05085 |
| 2017-12 | 0.0364 | 0.02946 | 0.0436 | 0.04786 |
| 2018-01 | 0.02902 | 0.02027 | 0.034 | 0.04049 |
| 2018-02 | 0.02575 | 0.01912 | 0.03363 | 0.03841 |
| 2018-03 | 0.0236 | 0.01797 | 0.03143 | 0.03524 |
| 2018-04 | 0.025 | 0.02213 | 0.03613 | 0.03693 |
| 2018-05 | 0.02325 | 0.02127 | 0.03575 | 0.03622 |

| | | | | |
|---------|---------|---------|---------|---------|
| 2018-06 | 0.02338 | 0.02229 | 0.0365 | 0.03637 |
| 2018-07 | 0.02988 | 0.02499 | 0.03825 | 0.0403 |
| 2018-08 | 0.0422 | 0.03546 | 0.04795 | 0.0506 |
| 2018-09 | 0.04088 | 0.03146 | 0.04458 | 0.04978 |
| 2018-10 | 0.04275 | 0.03437 | 0.04745 | 0.05091 |
| 2018-11 | 0.0415 | 0.03419 | 0.04625 | 0.04893 |
| 2018-12 | 0.041 | 0.03317 | 0.04555 | 0.04864 |
| 2019-01 | 0.03362 | 0.02633 | 0.03868 | 0.03941 |
| 2019-02 | 0.031 | 0.02466 | 0.0378 | 0.03838 |
| 2019-03 | 0.03257 | 0.0268 | 0.03878 | 0.03813 |
| 2019-04 | 0.03247 | 0.02653 | 0.03915 | 0.03885 |
| 2019-05 | 0.03255 | 0.02545 | 0.03845 | 0.03919 |
| 2019-06 | 0.03273 | 0.02691 | 0.0391 | 0.03847 |
| 2019-07 | 0.02883 | 0.02355 | 0.03622 | 0.03579 |
| 2019-08 | 0.028 | 0.01994 | 0.03318 | 0.0354 |
| 2019-09 | 0.02729 | 0.01734 | 0.03086 | 0.03489 |
| 2019-10 | 0.02343 | 0.01245 | 0.02672 | 0.03236 |
| 2019-11 | 0.0215 | 0.009 | 0.02405 | 0.03151 |
| 2019-12 | 0.0155 | 0.00397 | 0.02 | 0.0275 |

Model results from Python

Appendix C. Forecasting results by Decision Tree

| Time | Government bond yield 1-year | | Government bond yield 5-year | |
|---------|------------------------------|-------------|------------------------------|-------------|
| | Reality | Forecast | Reality | Forecast |
| 2007-07 | 0.06975 | 0.074544443 | 0.07559 | 0.07292548 |
| 2007-11 | 0.07733 | 0.076783919 | 0.08617 | 0.07934872 |
| 2008-03 | 0.0743 | 0.076820235 | 0.0873 | 0.088419708 |
| 2008-06 | 0.21167 | 0.186578767 | 0.20333 | 0.177977324 |
| 2008-08 | 0.16814 | 0.233123551 | 0.16475 | 0.226887109 |
| 2009-05 | 0.08435 | 0.08715814 | 0.09178 | 0.094757141 |
| 2009-09 | 0.09145 | 0.091043934 | 0.10028 | 0.103251998 |
| 2009-10 | 0.09358 | 0.091043934 | 0.10233 | 0.103251998 |
| 2009-11 | 0.10278 | 0.101115523 | 0.11191 | 0.106365554 |
| 2010-07 | 0.0945 | 0.103294472 | 0.10551 | 0.110300401 |
| 2011-01 | 0.10367 | 0.110908691 | 0.11431 | 0.111771372 |
| 2011-04 | 0.12038 | 0.110908691 | 0.12473 | 0.127927536 |
| 2011-06 | 0.1265 | 0.109407636 | 0.126 | 0.134510132 |
| 2012-07 | 0.0901 | 0.090813933 | 0.09883 | 0.103815871 |
| 2012-10 | 0.09267 | 0.103294472 | 0.10208 | 0.102847481 |
| 2012-11 | 0.08783 | 0.088634984 | 0.09833 | 0.103815871 |
| 2013-03 | 0.069 | 0.065162855 | 0.085 | 0.086041638 |
| 2013-09 | 0.067 | 0.065162855 | 0.08633 | 0.085342927 |
| 2014-09 | 0.04346 | 0.045334414 | 0.05472 | 0.065631916 |
| 2014-10 | 0.0384 | 0.040649672 | 0.05168 | 0.0541706 |
| 2015-12 | 0.04974 | 0.048457575 | 0.06604 | 0.065202883 |
| 2016-04 | 0.0492 | 0.046375467 | 0.06378 | 0.060483517 |
| 2016-06 | 0.04416 | 0.047610205 | 0.0613 | 0.060483517 |
| 2016-12 | 0.0435 | 0.044789676 | 0.056 | 0.049573816 |
| 2017-04 | 0.0432 | 0.034996508 | 0.0531 | 0.063584814 |
| 2017-06 | 0.037 | 0.034597034 | 0.0494 | 0.047306069 |
| 2017-10 | 0.0384 | 0.034294402 | 0.0461 | 0.041238314 |
| 2018-01 | 0.02902 | 0.029936503 | 0.034 | 0.039289277 |
| 2018-05 | 0.02325 | 0.03550493 | 0.03575 | 0.02674925 |
| 2018-07 | 0.02988 | 0.03550493 | 0.03825 | 0.039154438 |
| 2019-04 | 0.03247 | 0.035359667 | 0.03915 | 0.029875063 |
| 2019-07 | 0.02883 | 0.035359667 | 0.03622 | 0.029875063 |

| | | | | |
|---------|---------|-------------|---------|-------------|
| 2019-09 | 0.02729 | 0.025493867 | 0.03086 | 0.029875063 |
|---------|---------|-------------|---------|-------------|

Model results from Python

Appendix D. Forecast results by Random Forest

| Time | Government bond yield 1-year | | Government bond yield 5-year | |
|---------|------------------------------|-------------|------------------------------|-------------|
| | Reality | Forecast | Reality | Forecast |
| 2007-07 | 0.06975 | 0.071314514 | 0.07559 | 0.07274737 |
| 2007-11 | 0.07733 | 0.075161086 | 0.08617 | 0.084057788 |
| 2008-03 | 0.0743 | 0.075599539 | 0.0873 | 0.085474579 |
| 2008-06 | 0.21167 | 0.193344284 | 0.20333 | 0.189631949 |
| 2008-08 | 0.16814 | 0.198551369 | 0.16475 | 0.191697683 |
| 2009-05 | 0.08435 | 0.084011979 | 0.09178 | 0.093553642 |
| 2009-09 | 0.09145 | 0.09151265 | 0.10028 | 0.100637715 |
| 2009-10 | 0.09358 | 0.092920372 | 0.10233 | 0.101003987 |
| 2009-11 | 0.10278 | 0.100604317 | 0.11191 | 0.105508836 |
| 2010-07 | 0.0945 | 0.099750774 | 0.10551 | 0.10754184 |
| 2011-01 | 0.10367 | 0.107796303 | 0.11431 | 0.111325423 |
| 2011-04 | 0.12038 | 0.11673956 | 0.12473 | 0.13091373 |
| 2011-06 | 0.1265 | 0.119121878 | 0.126 | 0.133102167 |
| 2012-07 | 0.0901 | 0.093779605 | 0.09883 | 0.0997593 |
| 2012-10 | 0.09267 | 0.095634617 | 0.10208 | 0.103264869 |
| 2012-11 | 0.08783 | 0.090833907 | 0.09833 | 0.096480996 |
| 2013-03 | 0.069 | 0.067952637 | 0.085 | 0.081618796 |
| 2013-09 | 0.067 | 0.070924361 | 0.08633 | 0.085234075 |
| 2014-09 | 0.04346 | 0.042109205 | 0.05472 | 0.057494504 |
| 2014-10 | 0.0384 | 0.040713104 | 0.05168 | 0.053355682 |
| 2015-12 | 0.04974 | 0.05479856 | 0.06604 | 0.063159949 |
| 2016-04 | 0.0492 | 0.044804929 | 0.06378 | 0.060415485 |
| 2016-06 | 0.04416 | 0.045413461 | 0.0613 | 0.059770342 |
| 2016-12 | 0.0435 | 0.042303253 | 0.056 | 0.055553803 |
| 2017-04 | 0.0432 | 0.037137811 | 0.0531 | 0.053631244 |
| 2017-06 | 0.037 | 0.03614772 | 0.0494 | 0.045057812 |
| 2017-10 | 0.0384 | 0.034547887 | 0.0461 | 0.042394374 |
| 2018-01 | 0.02902 | 0.031537426 | 0.034 | 0.037818674 |
| 2018-05 | 0.02325 | 0.03408026 | 0.03575 | 0.029907547 |
| 2018-07 | 0.02988 | 0.034603934 | 0.03825 | 0.038930851 |
| 2019-04 | 0.03247 | 0.034185092 | 0.03915 | 0.037766209 |
| 2019-07 | 0.02883 | 0.032816348 | 0.03622 | 0.036630375 |
| 2019-09 | 0.02729 | 0.024186376 | 0.03086 | 0.032439333 |

Model results from Python

Appendix E. Forecast results by Support Vector Regression

| Government bond yield 1-year | | | | |
|------------------------------|---------|-------------|-------------|-------------|
| Time | Reality | RBF | Linear | Polynomial |
| 2007-07 | 0.06975 | 0.067546791 | 0.067725197 | 0.073243069 |
| 2007-11 | 0.07733 | 0.073086109 | 0.082010615 | 0.08689592 |
| 2008-03 | 0.0743 | 0.081174462 | 0.088768768 | 0.090195361 |
| 2008-06 | 0.21167 | 0.116417177 | 0.203551541 | 0.261829382 |
| 2008-08 | 0.16814 | 0.127730556 | 0.17262905 | 0.168581713 |
| 2009-05 | 0.08435 | 0.093523938 | 0.082659023 | 0.0991682 |
| 2009-09 | 0.09145 | 0.096134574 | 0.090905907 | 0.086007949 |
| 2009-10 | 0.09358 | 0.096164624 | 0.093048956 | 0.08803777 |
| 2009-11 | 0.10278 | 0.09797871 | 0.102664244 | 0.103575093 |
| 2010-07 | 0.0945 | 0.104071805 | 0.096866041 | 0.077809505 |
| 2011-01 | 0.10367 | 0.118100348 | 0.108437475 | 0.093376658 |

| | | | | |
|----------------|---------|-------------|-------------|-------------|
| 2011-04 | 0.12038 | 0.111020804 | 0.118670691 | 0.157344363 |
| 2011-06 | 0.1265 | 0.130116986 | 0.12119283 | 0.100382147 |
| 2012-07 | 0.0901 | 0.095286439 | 0.086746147 | 0.07398246 |
| 2012-10 | 0.09267 | 0.101989319 | 0.089733353 | 0.071219275 |
| 2012-11 | 0.08783 | 0.096783137 | 0.085889452 | 0.070391568 |
| 2013-03 | 0.069 | 0.067853912 | 0.067898462 | 0.066651895 |
| 2013-09 | 0.067 | 0.072822267 | 0.068700486 | 0.066781493 |
| 2014-09 | 0.04346 | 0.040170967 | 0.038638244 | 0.053213214 |
| 2014-10 | 0.0384 | 0.037298205 | 0.035748925 | 0.050887674 |
| 2015-12 | 0.04974 | 0.050818655 | 0.050661252 | 0.054470804 |
| 2016-04 | 0.0492 | 0.045618984 | 0.049090873 | 0.04757547 |
| 2016-06 | 0.04416 | 0.04268589 | 0.046253267 | 0.047542764 |
| 2016-12 | 0.0435 | 0.039297215 | 0.040666025 | 0.044070344 |
| 2017-04 | 0.0432 | 0.037207415 | 0.044488344 | 0.047297073 |
| 2017-06 | 0.037 | 0.03760305 | 0.040827142 | 0.043752421 |
| 2017-10 | 0.0384 | 0.034194209 | 0.03664173 | 0.044777722 |
| 2018-01 | 0.02902 | 0.036726903 | 0.027073171 | 0.036525369 |
| 2018-05 | 0.02325 | 0.02815737 | 0.027926918 | 0.042921552 |
| 2018-07 | 0.02988 | 0.029907986 | 0.03078229 | 0.039570154 |
| 2019-04 | 0.03247 | 0.026090864 | 0.033290444 | 0.040268973 |
| 2019-07 | 0.02883 | 0.027635584 | 0.03038692 | 0.031958836 |
| 2019-09 | 0.02729 | 0.021780927 | 0.02486533 | 0.028898418 |

Government bond yield 5-year

| Time | Reality | RBF | Linear | Polynomial |
|----------------|----------------|-------------|---------------|-------------------|
| 2007-07 | 0.07559 | 0.077848899 | 0.075814819 | 0.075695254 |
| 2007-11 | 0.08617 | 0.081567548 | 0.083812231 | 0.094368566 |
| 2008-03 | 0.0873 | 0.093514039 | 0.083221333 | 0.102540735 |
| 2008-06 | 0.20333 | 0.118271523 | 0.191542363 | 0.25667375 |
| 2008-08 | 0.16475 | 0.128824199 | 0.164747386 | 0.168005626 |
| 2009-05 | 0.09178 | 0.099438003 | 0.097880807 | 0.103192583 |
| 2009-09 | 0.10028 | 0.100571446 | 0.102509853 | 0.098402512 |
| 2009-10 | 0.10233 | 0.099035273 | 0.103547798 | 0.09864959 |
| 2009-11 | 0.11191 | 0.099767507 | 0.109992232 | 0.10886412 |
| 2010-07 | 0.10551 | 0.106755128 | 0.104949406 | 0.093252169 |
| 2011-01 | 0.11431 | 0.122839365 | 0.11502652 | 0.106329864 |
| 2011-04 | 0.12473 | 0.122789415 | 0.129503121 | 0.170130058 |
| 2011-06 | 0.126 | 0.133325353 | 0.131079731 | 0.123585118 |
| 2012-07 | 0.09883 | 0.100754545 | 0.099873058 | 0.091781684 |
| 2012-10 | 0.10208 | 0.108780133 | 0.103385821 | 0.088391845 |
| 2012-11 | 0.09833 | 0.103487475 | 0.099208211 | 0.087582086 |
| 2013-03 | 0.085 | 0.084534658 | 0.085705906 | 0.084980375 |
| 2013-09 | 0.08633 | 0.088237307 | 0.085913226 | 0.085602722 |
| 2014-09 | 0.05472 | 0.064756369 | 0.061513969 | 0.072862274 |
| 2014-10 | 0.05168 | 0.062570025 | 0.057634251 | 0.069165884 |
| 2015-12 | 0.06604 | 0.062102732 | 0.067668111 | 0.071342287 |
| 2016-04 | 0.06378 | 0.063511623 | 0.06341037 | 0.063179517 |
| 2016-06 | 0.0613 | 0.059225799 | 0.059648358 | 0.062586537 |
| 2016-12 | 0.056 | 0.058578543 | 0.0587559 | 0.061241105 |
| 2017-04 | 0.0531 | 0.049012994 | 0.050578128 | 0.060898061 |
| 2017-06 | 0.0494 | 0.04802658 | 0.045983938 | 0.054424153 |
| 2017-10 | 0.0461 | 0.045224061 | 0.047546992 | 0.059919177 |
| 2018-01 | 0.034 | 0.045380812 | 0.038028454 | 0.052166504 |
| 2018-05 | 0.03575 | 0.031651874 | 0.032747299 | 0.04980257 |

| | | | | |
|----------------------------------|---------|-------------|-------------|-------------|
| 2018-07 | 0.03825 | 0.037449622 | 0.036922337 | 0.051456774 |
| 2019-04 | 0.03915 | 0.02970815 | 0.032926683 | 0.043499227 |
| 2019-07 | 0.03622 | 0.031511654 | 0.030225839 | 0.035827794 |
| 2019-09 | 0.03086 | 0.027036894 | 0.029344163 | 0.036759372 |
| <i>Model results from Python</i> | | | | |

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THE NEXUS BETWEEN THE OIL PRICE, GOLD PRICE AND ASEAN+3'S STOCK MARKET INDEXES, AND THE CONTRIBUTION OF THE COVID-19 PANDEMIC

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ABSTRACT

The interconnection between the World Oil, Gold Price, and Stock Market has generated an epic amount of discussion for ages. The advent of COVID-19 which has struck every facet of life especially the economy has once again drawn a great concern among researchers regarding this relationship. For this reason, this paper centers on exploring the impact of World Oil Price and Gold Price on the Stock Index of some selected ASEAN countries together with India, Korea and Japan with the contribution of COVID-19. To conduct the research, monthly data from January 2010 to December 2021 is utilized, in which the period from January 2010 to February 2020 is counted as before COVID phase and the rest is during period phase. The results from the ARDL and VAR model indicate that five countries are observed to have slight long-term association between studied variables in two directions. In the meantime, collating the short run relationship in 9 countries excluding Philippines and India before and during COVID period reveals that COVID-19 did change the extent to which the Gold Price and Oil Price present influence on the Stock Market performance.

Keywords: Oil Price, Gold Price, Stock Market Indexes, Relationship, Macroeconomics factors.

1. Introduction

1.1. Rationale and Research Questions

Gold is a precious metal that acts as both an industrial commodity and a monetary or investment asset, used for the purpose of hoarding or exchanging. Gold is a liquid, counter-cyclical asset that can help investors accomplish their basic objectives of safety, liquidity, and return by acting as a long-term store of value (Yousef and Shehadeh, 2020). Besides, gold is also known as a leading indicator reflecting the level of inflation, and is always considered as a hedge against inflation, diversifying risks when a financial crisis occurs (Gokmenoglu and Fazlollahi, 2015). When there are fluctuations in the economy, the risk of investing in channels increases, investors will tend to look for gold. Gold is also kept in significant quantities by central banks and international financial organizations for diversification and economic security purposes.

Oil price can be considered as an indicator of volatility, because fluctuations in world oil price are influenced by the unexpected changes in supply and demand, leading to fluctuations of the exchange rate of an oil importing economy. Understanding the volatility of crude oil prices is critical because it can affect many sectors of the economy and contribute to economic instability in both exporting and importing countries (Gokmenoglu and Fazlollahi, 2015). In detail, most businesses use oil as an input fuel, therefore as the price of oil swings around the world, it affects firms' input costs, causing performance to fluctuate. This will have a direct impact on company stock indexes (Nguyen, 2016).

Instead of choosing to invest safely in gold and other precious metals, the emergence of the stock market offers diversification in the portfolio investment, which has greater appeal to investors. With a similar amount of money, investors can choose to invest in businesses that perform well, bring higher returns on

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investment, but also are possibly exposed to higher risks in comparison to traditional investments including gold.

Gold, Oil and Stock Market not only provide investors with different investment channels, but also reflect and simultaneously direct economic activities through their markets' transaction volume and prices. The movements of oil price, gold price and stock price coupled with their interactions serve as important economic indicators for policymakers in regulating the economy. As a result, the relationship between gold price, oil price and stock market has always been a topic of interest to researchers and policymakers.

Previous studies provide mixed findings about the relationship between the oil and gold markets with the stock market. Specifically, Gokmenoglu and Fazlollahi (2015) conducted research on the Interactions of Gold, Oil, and Stock Market in the United States, mentioning the long run and short run impact of gold and oil price on S&P 500 stock market price index. The stock markets of the ASEAN-5 countries were found to interact dynamically with their respective significant macroeconomic issues including GNP – Gross National Product, Money Supply, Consumer Price Index and Money Market Rate, according to Wongbangpo and Sharma (2001).

The long-run relationship is confirmed in Gokmenoglu (2015) indicated that Oil price would lead to a decrease 18% in stock market in long-run, Alamgir and Amin (2021) found the positive relationship between World Oil Price and Stock Market with the evidence from South Asia, Nguyen, Nguyen & Ta (2020) shared a similar result, Oil Price positively affect Vietnam Stock Market. Whereas short-term interaction is explored in other previous studies including Nguyen (2018) showed that in short-run, Gold Price produced no effect on Vietnam Stock Market Index, Tursoy (2017) demonstrated that Turkey experienced a negative relationship between gold price and stock price, and positive relationship between crude oil and stock prices.

Besides, the emergence of the unprecedented COVID-19 pandemic, affecting and changing various economies across the globe, has been suspected to distort the relationship between oil, gold and stock market. The research revolves around focusing on studying the relationship of macro variables, such as wealth or gold to the stock market, but focusing on developed economies. In particular, Singh et al. (2021) found the negative relationship between the exchange rates, stock market return and the number of COVID – 19 infections in G7 countries. Pak et al (2020) also agreed with Singh's results, by conducting research on the impact of the number of infection cases on the stock market in US, Italy, Spain, Germany, France, Iran and South Korea and revealed that the number of infection cases and stock market indexes experienced a negative interaction. In Asia, Arisandhi and Robiyanto (2022) studied the relationship only of gold price and currency rates on the stock market in 5 countries: Thailand, Singapore, Malaysia, Philippines and Indonesia, found that exchange rate was produced a positive correlation with stock price, and be considered as a better investment in compared with gold.

To be the best knowledge of the authors, there is no prior literature covering the relationship between oil, gold, and stock markets for ASEAN, and even ASEAN+3 markets. Moreover, a limited number of recent studies have just discovered the impact of the COVID-19 epidemic on the stock market, leaving the contribution of COVID-19 pandemic to the aforementioned relationship open for further discussion.

Therefore, we decided to carry the study entitled "*The nexus between the oil price, gold price and ASEAN+3's Stock Market Indexes, and the contribution of the COVID-19 pandemic*". The novelty of the study includes: (i) the study, by deploying various appropriate empirical models (VAR – Vector AutoRegression, VECM – Vector Error Correction Model, and ARDL – Auto Regressive Distributed Lag) into scrutinizing the relationship between the two commodities markets with the stock market, provide reliable findings to enrich the research field of finance and economics; (ii) the study makes an attempt to investigate the impact of the pandemic on the relationship; (iii) the dataset combines both macro variables with oil and gold prices to bring about the most objective result.

To successfully achieve those contributions, the study focuses on shedding lights on following research questions:

(i) Do world oil price and gold price have either a short run or long run relationship with the stock market of every single country in ASEAN+3?

(ii) How are these relationships different among countries?

(iii) Does COVID-19 have any impact on these relationships?

1.2. Organization of The Research

This research paper includes six chapters. Chapter 1 is the introduction which consists of three main parts, namely the rationale; research objectives, questions, and scope; organization of the study. Chapter 2 presents the theoretical framework related to the relationships between the Stock Market and the other five macroeconomic variables which are Oil Price, Gold Price, Consumer Price Index, Central Bank Policy Rate, and Exchange Rate. Chapter 3 reveals the international and ASEAN literature review based on the previous findings of several authors. Chapter 4 names an empirical framework that gives the research data description and methodology. Chapter 5 presents the empirical results combined with the analysis. Chapter 6, the final part, summarizes the main outcomes withdrawn in this paper as the base for the policy recommendations, and indicates the study limitations.

2. Theoretical framework

2.1. Stock Market and Its Relationship with World Oil Price

Oil has been the cornerstone of the economy in this modern world (Huang et al., 1995). It provides energy to the power industry, creates heat, generates electricity, and extracts fuel for running vehicles and planes. Moreover, it is also essential for the manufacturing of everyday life necessities including plastics, fertilizers, paints, medicines and so on. This demonstrates that oil can be widely used as an indicator to evaluate economic stability since the dependence of production on oil is ineluctable. Higher oil prices implicate higher production cost (Gisser and Goodwin, 1986), entailing the rise in price of products and services, the corollary is that input costs will also go up which then hurt the businesses' financial performance.

The definition of stock market, which is a gathering of transactions in which investors can buy and sell shares of any enterprises and other securities, indicates that the stock market index is determined by the investors' buying and selling decisions (Chen, 2022). These investors' decisions rely on their expectation or judgment on that company's performance. Following this logic, during the period of high oil price, the investors themselves perceive it as a risky and not suitable situation to make investment as they understand how oil price could impact on companies' robust growth. Besides, they also have to tighten consumption expenditure to afford higher energy sources, which impedes their decision of consuming products and investing in the stock market. All of these explain conventional beliefs that oil's volatility inversely correlates with the stock market index. However, this relationship is only right for nations having production activities that depend much on oil-importing. In contrast, the oil-exporting countries definitely bear fruits from selling oil at a higher price, which consequently raises government spending and investing activities, then intensifies the production (Filis, Degiannakis, & Floros, 2011). For such countries, the stock market responds positively to the change in the oil price.

2.2. Stock Market and Its Relationship with World Gold Price

For a long time, gold has been commonly known as either a shield against inflation or a safe investment channel because of its high liquidity and stable supply (Gokmenoglu and Fazlollahi, 2015). Unlike paper money that is printed easily, gold mining only makes a trivial adjustment to its supply over time, therefore, its value is not diminished much. Even though gold and the stock market are not directly correlated, throughout history, gold price is observed to surge during market wobbles (Mani, 2019). Whenever there are factors such as high inflation, increase in interest rate, fall in GDP and so on that stagger the economy, the stock market will be more likely to become less attractive for investors. Instead, they would prefer gold investment to secure their money due to its less varying value over the course of time. Ciner et al. (2013) wrote that gold can be utilized to diversify the portfolio as it has low association with other assets. Central banks also preserve gold for the same purpose and to buffer the economic downturn (Kaufmann and Winters, 1989). Since the demand for gold during this time spikes, followed by its higher price. This somehow explains what happened in the past when a positive change in the gold price indicates a

decline in the stock market. In other words, gold and the stock market price normally establish an inverse relationship.

2.3. Stock Market and Its Relationship with Other Control Variables

Other than the gold price and the oil price, some of other macroeconomic indicators are expected to induce some impact on the movement of the stock market such as Jamaludin et al. (2017) studies on the relationship between macroeconomics variables including inflation, money supply, exchange rate and stock market in selected ASEAN countries, Humpe and McMillan (2020) examine the long term correlation between interest rate, consumer price index, industrial production and stock price from G7 countries, so on. Therefore, to ensure the fitness of the empirical models presented beneath, this study incorporates some of the key macroeconomic indicators together with the gold and oil price to efficiently observe the movement of the stock markets and derive reliable findings and discussion.

Central Bank Policy Rate

Interest rate refers to the cost of using others' money, which can be understood as the compensation for the risk of default and lending service (Hall, 2022). Explanation for this is that the creditors bear the risk of not getting back the loan, hence, interest rate provides an indemnity for that possible loss. Along with the default risk is the inflation risk. The lenders have to suffer from the decline in the purchasing power of the money that they loan at the present. Because the price of goods and services may go up over time, a dollar today can buy more products than a dollar in the future. Therefore, interest rate is the expense that borrowers pay to acquire the ability of using the present value of others' money rather than accelerating money for years.

Interest rate is the central bank policy rate which is imposed on commercial banks' borrowings directly from the central bank in each country. Interest rate is one of the main concerns of investors when it comes to the stock market investing for a reason that it can have an immediate impact on stock price. In detail, when the government stipulates that the central bank increases the discount rate on commercial banks' loans to reduce the money supply or slow down the economy's growth, financial institutions are charged more to borrow. As a consequence, they will inflate the rate imposed on the public's borrowings. In terms of individuals, they will have less money to spend on their consuming goods and services. This means that businesses can sell less products to customers, which in turn diminishes their revenue. At the same time, higher interest rate also deters customers from borrowing money that may have been used to invest in the stock market. Both of these lead to a decrease in the company's stock price. In terms of corporations, as the interest rate rises, enterprises have to pay more for not only their new loans but also their existing debts, which make them less profitable followed by the decline in the company's stock price. Inversely, when the government enacted the expansionary fiscal policy requiring the central bank to loosen the discount rate to boost economic growth. In this case, both individual and corporation customers reap the benefit of this policy because they can exploit the lower interest rate to borrow more and take advantage of these loans' present value. Individual borrowers will choose to spend more on goods and services to facilitate their life and for the ones who have abundant money, they will pour it into the investment channels like the stock market. Meanwhile, businesses will employ their cheaper debt to stimulate merger & acquisition activities as its operation system, which promises a flourishing in the future cash flow. Therefore, either customers are more likely to allocate their money for investing or companies can enhance their business performance, the surge in the interest rate results in higher stock prices.

CPI

CPI stands for consumer price index which calculates by taking the total price of market basket in a given year divided by the total price of market basket in the base year then multiplied by 100 (Fernando, 2022). The market basket here consists of all goods and services exchanged in a particular economy which are separated into 8 prime groups: housing, apparel, food & beverages, transportation, education and communication, recreation, medical care and others. CPI is a prominent assessment of inflation (Walh, 1982; Bryan & Cechetti, 1993; Shaban et al., 2019) or deflation because the variation in CPI is the expression of the change in price of goods and services over years.

An increase in CPI can be interpreted as a sign of inflation, in contrast, a drop in CPI indicates the deflation. When inflation happens, it poses a threat to all businesses' growth, especially manufacturing companies due to the higher price of the input. Not to mention that the government may require the central bank to impose a higher interest rate on borrowers to constrain inflation, the ripple effect is as stated in the interest rate part that enterprises will feel less willing to execute outlays which are necessary for their expansion. The aftermath is businesses' profit being squeezed. Enough companies being hurt by this will cause the stock market to go down.

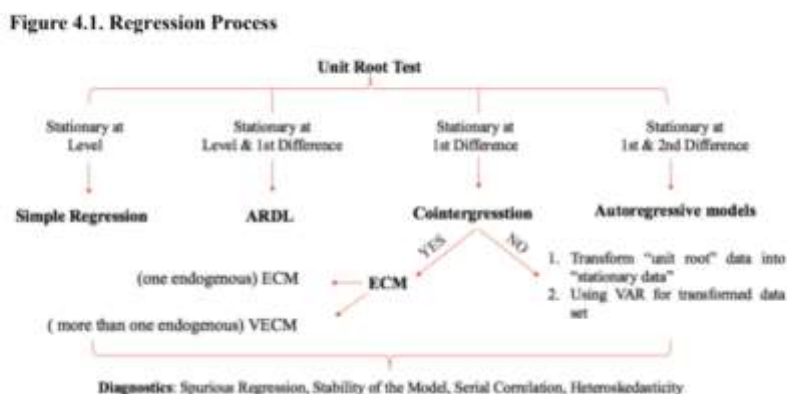
Exchange Rate

Exchange rate and stock market can have a two-way relationship (Wu, 2005). The common syllogism is that an increase in the domestic stock market gives foreign investors faith about that nation's robust economic health, hence, attracting them to invest in, consequently, the domestic currency will be appreciated. In contrast, when the stock market goes down, the faith vanishes and the foreign investors withdraw their investment away from that country, leaving that country's currency being undermined. So in this case, there is a positive relationship between the exchange rate and stock market. Second relationship is based on the idea that a firm's value can be significantly affected by the health of the national currency (Dornbusch & Fischer, 1980). It suggests that when a country's currency falters, its exported goods become cheaper internationally, which can help to fuel growth and lead to a potential increase in profits for companies whose earnings are export based. Therefore, which stock markets have myriads of either listed multinational or export-based companies, that stock market index will increase in the opposite direction with the increase in domestic currency because major of its listed companies' profits are made under foreign currency. The converse case happens for the stock markets in which the stock market contains more import firms than export ones.

3. Research method

The stationary characteristic of the original dataset and its transformation, as shown in the flowchart in Figure 4.1, explain the specific empirical technique to be used in estimating the equation. The initial stage in the regression process is to perform the Augmented Dickey-Fuller Test (ADF) and Phillips-Perron (PP) tests on the entire dataset (all variable series) to see whether there is a unit root process.

If the results of the unit root testing on Y series demonstrate that Y series are stationary at level (I(0)), the basic Ordinary Least Square (OLS) will be used for stationary Y and X series.



Source: Ngo Thi Hang (2017), Ngo et al. (2020)

Cointegration tests will be performed to assess whether the variables X and Y have a long-term relationship if the Y series are unit root processes (I(1)) at the level but stationary (I(0)) at the initial difference. Depending on the stationary feature of the X series, several tests and models will be applied. If X and Y (both series are I(1)) are non-stationary (I(1) at level, but stationary (I(0)) at the initial difference, the Johansen-Cointegration Test with Error Correction Model (ECM) is used. If the X series are stationary at the same level, the Autoregressive Distributed Lag (ARDL) model will be employed in combination with the Bounds Test. Bounds tests should be used initially to see if two variables are cointegrated. If these two tests reveal a cointegrating vector (a long-run relationship) between two variables, the next step is to use ECM

and ARDL to appropriately assess short- and long-run pass-through. The Vector Autoregressive Model (VAR) will be employed instead of ECM and ARDL if neither of these tests finds a cointegrating relationship between two variables.

In addition, if cointegration is observed but the regression findings from the ARDL and ECM models show no meaningful evidence for the projected long-run pass-through, this thesis will use VAR for variable series. The model's stability is determined using the CUSUM test. ECM, ARDL, and VAR models are explained in depth in the following subsections (4.2.1, 4.2.2, 4.2.3).

3.1.1. Error Correction Model – ECM

The error correction mechanism (ECM) devised by Engle and Granger (1987) is the next stage in our study process. The speed at which an endogenous variable returns to equilibrium following any change in exogenous variables is estimated using an error correction model, which demonstrates how to reconcile the short-run behavior of a time series economic variable with its long-run behavior (Pesaran, et al., 2001). The ECM is determined using the following equation:

$$\Delta y_t = \alpha' \Delta X_t + \sum_{j=1}^{p-1} \beta_j' \Delta Z_{t-j} + \pi_{yy} y_{t-1} + \pi_{yX} X_{t-1} + \gamma ECT_{t-1}$$

Where γ is the estimated coefficient of ECT-1 (the first lag of error correction term) and ECT are the estimated model's residuals.

The lag order is decided using a set of criteria that includes: LR (Sequential modified LR test statistics); FPE (Final prediction error); AIC (Akaike information criterion); SC (Schwarz information criterion); and HQ (Hannan-Quinn information criterion). The recommended lag order changes depending on the criterion utilized, therefore the lag length that is suggested the most frequently by multiple criteria is chosen for the regressing model in the end (2).

3.1.2. Autoregressive Distributed Lag – ARDL

A false regression can occur when a nonstationary series is regressed on another nonstationary time series. The purpose of the co-integration test is to see if there is a long-run equilibrium connection between variables that are integrated at least in first difference I. (1). If the time series variables are integrated at separate levels (I(0) and I(1)), the ARDL (autoregressive distributed lag) approach may be used to look for co integration.

The equation for the ARDL modified model is as follows:

$$\Delta y_t = \alpha_0 + \alpha_i \Delta X_t + \sum_{j=1}^{p-1} \beta_j' \Delta Z_{t-j} + \varepsilon_t$$

Where Δ is the difference operator, Y_t denotes the dependent variable, X_t denotes the independent variables, Z_t denotes the variable lags, $Z = f(X_t, Y_t)$, t denotes the trend term, and ε_t is the disturbance.

After that, the model's serial correlation and stability should be verified. The null hypothesis for testing co-integration is $\pi_{yy} = \pi_{xx} = 0$ (no co-integration), which is evaluated using the Wald test and should be rejected in terms of the long-run connection between variables. Narayan provided the F-statistics key values (2005). The presence of a significant F test indicates co-integration.

3.1.3. Vector Autoregressive Model – VAR

According to Isakova (2008), the VAR model is estimated as follows:

$$\Delta Y_t = A(L)\Delta Y_{t-1} + B(L)\Delta X_{t-1} + u_t$$

where Y denotes endogenous variables and X denotes exogenous variables, $A(L)$ and $B(L)$ denote coefficient matrices, and u denotes a vector of impulses.

In a VAR model, ordering variables play a critical role in the estimation process. The most exogenous variables are generally ordered first, followed by the least exogenous variables. This paper only looks at

VAR's variance decompositions (evaluate the contribution of variables in forecast error of one variable) and impulse response functions (trace the impact of one-time shock in one variable on current and future movements of other variables), which provide information on short-run dynamics or immediate interest rate pass-through, in an attempt to investigate the response of stock price to shocks to oil, gold price through a two-stage mechanism.

4. Results and discussion

4.1. Necessary tests

Unit Root Test

The empirical results for the variables used in this study are presented in this section. EVIEWS 12 software was used to do the data estimations and model tests. Except for CPI and the central bank's policy rate, the logarithmic form of time series variables like Oil Price, Gold Price, Exchange Rate (USD is used as the common denominator), and Stock Price are used to observe the percentage change of series and to apply formal tests of stationarity. The Augmented Dickey-Fuller Test and the Phillips-Perron Test are used to verify the time series' stationarity. Tables 1, 2 and 3 indicate the results of ADF and PP unit root tests of all series included in 3 different samples as mentioned earlier: the whole period (from January 2010 to December 2021), the period before COVID (from January 2010 to February 2020), and the period during COVID (from March 2020 to December 2021). However, sections 5.1 to 5.2.3 only focus on interpreting the results in the whole period. For the other periods, their tables can be found in the appendix 1.

Table 1. Unit Root Test for Time Series: Whole Period (January 2010 - December 2021)

| Country | Variable | Null Hypothesis: Variable has a unit root | | | | | | | | | |
|------------------|----------|-------------------------------------------|---------|---------|---------|------------|----------------------------------|---------|---------|---------|------------|
| | | Time Series at Level | | | | | Time Series at First Differences | | | | |
| | | ADF | | PP | | Conclusion | ADF | | PP | | Conclusion |
| | | t-stat. | p-value | t-stat. | p-value | | t-stat. | p-value | t-stat. | p-value | |
| The world market | LNOP | -2.03 | 0.27 | -2.04 | 0.27 | I(1) | -9.42 | 0.00 | -8.95 | 0.00 | I(0) |
| | LNGP | -1.70 | 0.43 | -1.62 | 0.47 | I(1) | -13.23 | 0.00 | -13.28 | 0.00 | I(0) |
| India | CPI | -3.19 | 0.02 | 3.20 | 0.02 | I(0) | -9.15 | 0.00 | -10.13 | 0.00 | I(0) |
| | PR | -0.85 | 0.80 | -0.87 | 0.79 | I(1) | -8.51 | 0.00 | -8.51 | 0.00 | I(0) |
| | LNER | -1.62 | 0.47 | -1.53 | 0.52 | I(1) | -9.82 | 0.00 | -9.94 | 0.00 | I(0) |
| | LNNSEI | -0.20 | 0.934 | 0.02 | 0.96 | I(1) | -12.68 | 0.00 | -12.81 | 0.00 | I(0) |
| Indonesia | CPI | -2.04 | 0.27 | -1.71 | 0.43 | I(1) | -8.87 | 0.00 | -8.92 | 0.00 | I(0) |
| | PR | -0.69 | 0.85 | -0.83 | 0.81 | I(1) | -7.90 | 0.00 | -8.06 | 0.00 | I(0) |
| | LNER | -1.10 | 0.72 | -1.10 | 0.72 | I(1) | -12.71 | 0.00 | -12.71 | 0.00 | I(0) |

| | | | | | | | | | | | |
|-------------|---------|-------|------|--------|------|------|--------|-------|---------|------|------|
| | LNIDDOW | -2.85 | 0.05 | -2.81 | 0.06 | I(1) | -11.41 | 0.00 | -11.55 | 0.00 | I(0) |
| Japan | CPI | -2.48 | 0.12 | -2.45 | 0.13 | I(1) | -10.07 | 0.00 | -9.99 | 0.00 | I(0) |
| | PR | -0.85 | 0.80 | -1.86 | 0.35 | I(1) | -8.51 | 0.00 | -10.00 | 0.00 | I(0) |
| | LNER | -1.03 | 0.74 | -1.16 | 0.69 | I(1) | -11.10 | 0.00 | -10.98 | 0.00 | I(0) |
| | LNN225 | -0.61 | 0.86 | -0.19 | 0.94 | I(1) | -11.33 | 0.00 | -11.54 | 0.00 | I(0) |
| Korea | CPI | -2.27 | 0.18 | -10.80 | 0.89 | I(1) | -5.80 | 0.00 | -4.77 | 0.00 | I(0) |
| | PR | -0.41 | 0.90 | -0.77 | 0.83 | I(1) | -4.48 | 0.00 | -12.43 | 0.00 | I(0) |
| | LNER | -4.73 | 0.00 | -4.72 | 0.00 | I(0) | - | - | - | - | - |
| | LNKOSPI | -1.46 | 0.55 | -1.46 | 0.55 | I(1) | -11.79 | 0.00 | -11.79 | 0.00 | I(0) |
| Malaysia | CPI | -3.74 | 0.01 | -2.80 | 0.06 | I(1) | -8.78 | 0.00 | -7.69 | 0.00 | I(0) |
| | PR | -0.89 | 0.79 | -1.11 | 0.71 | I(1) | -5.25 | 0.00 | -12.66 | 0.00 | I(0) |
| | LNER | 0.83 | 0.81 | -0.85 | 0.80 | I(1) | -11.53 | 0.00 | -11.53 | 0.00 | I(0) |
| | LNSP | -3.09 | 0.03 | -3.06 | 0.03 | I(0) | -12.48 | 0.00 | -12.62 | 0.00 | I(0) |
| Philippines | CPI | -2.93 | 0.04 | -2.37 | 0.15 | I(0) | - | - | -7.16 | 0.00 | I(0) |
| | PR | -0.86 | 0.80 | -1.24 | 0.66 | I(1) | -9.42 | 0.00 | -9.89 | 0.00 | I(0) |
| | LNER | 1.78 | 0.38 | -1.75 | 0.40 | I(1) | -6.65 | 0.000 | -6.66 | 0.00 | I(0) |
| | LNPSEI | -3.08 | 0.03 | -3.09 | 0.03 | I(0) | - | - | - | - | - |
| Singapore | CPI | -1.83 | 0.37 | -1.37 | 0.59 | I(1) | -2.997 | 0.037 | -12.025 | 0.00 | I(0) |
| | PR | -1.76 | 0.40 | -2.21 | 0.20 | I(1) | -11.85 | 0.00 | -18.65 | 0.00 | I(0) |
| | LNER | -2.32 | 0.17 | -2.25 | 0.19 | I(1) | -13.19 | 0.00 | -13.21 | 0.00 | I(0) |
| | LNSGXL | -2.38 | 0.15 | -2.22 | 0.20 | I(1) | -13.91 | 0.00 | -15.64 | 0.00 | I(0) |
| Thailand | CPI | -2.29 | 0.18 | -2.72 | 0.07 | I(1) | -11.32 | 0.00 | -16.31 | 0.00 | I(0) |
| | PR | -1.10 | 0.72 | -0.86 | 0.80 | I(1) | -8.66 | 0.00 | -9.34 | 0.00 | I(0) |

| | | | | | | | | | | | | |
|---------|-------|-------|------|-------|------|------|--|--------|------|--------|------|------|
| | LNER | -2.01 | 0.28 | -2.14 | 0.23 | I(1) | | -11.13 | 0.00 | -11.11 | 0.00 | I(0) |
| | LNSET | -3.25 | 0.02 | -3.27 | 0.02 | I(0) | | -11.01 | 0.00 | -10.99 | 0.00 | I(0) |
| Vietnam | CPI | -2.22 | 0.20 | -1.71 | 0.42 | I(1) | | -3.29 | 0.02 | -5.57 | 0.00 | I(0) |
| | PR | -1.45 | 0.56 | -1.21 | 0.67 | I(1) | | -4.83 | 0.00 | -7.98 | 0.00 | I(0) |
| | LNER | -3.56 | 0.01 | -4.16 | 0.00 | I(0) | | -12.77 | 0.00 | -12.88 | 0.00 | I(0) |
| | LNSP | 0.10 | 0.96 | 0.17 | 0.97 | I(1) | | -11.89 | 0.00 | -11.90 | 0.00 | I(0) |

Note: I(1) – Unit Root Process; I(0) – Stationary Process; OP: World oil price; GP: Gold price; PR: Central bank policy rate, ER: Exchange rate, SP: Stock index; LN – logarithm

Source: Authors' estimations.

Looking through tables, not all variables are non-stationary at level and stationary at first different. As presented in the methodology part, for variables are integrated at different levels (Y series is I(1) (not-stationary at level but stationary at the first difference series while X series could be I(0) or I(1)), the ARDL model is employed to figure out the long-run relationship. Results of unit-root test from Table 1 suggest that there are a total of 6 countries including Vietnam, Singapore, Korean, India, Japan, Indonesia that ARDL can be applied to explore long-run relationships between stock market and oil, gold markets, which is discussed in the below section.

4.2. Regression Results

4.2.1. Long-term relationship (ARDL Model)

Table 2. ARDL model: Whole period (January 2010-December 2021)

| Country | ARDL BOUND TEST | | | | LONG RUN RELATIONSHIP | | Short run Adjustment Speed (ECT) |
|-----------|-----------------|----------------|---------------|---------------|-----------------------|--------|----------------------------------|
| | F-statistic | F-critical 10% | F-critical 5% | F-critical 1% | LNOP | LNGP | CointEq(-1) |
| India | 8.344 | 2.080 | 2.390 | 3.060 | 0.120 | 0.384 | -0.614 |
| Indonesia | 2.974 | 2.08 | 2.39 | 3.060 | 0.567 | -0.504 | -0.085 |
| Japan | 4.521 | 2.080 | 2.390 | 3.060 | 0.107 | 0.485 | -0.214 |
| Korea | 9.196 | 2.080 | 2.390 | 3.060 | -0.023 | 0.466 | -0.208 |
| Vietnam | 2.843 | 2.080 | 2.390 | 3.060 | -0.101 | -0.816 | -0.083 |

Source: Authors' estimations.

The long-run relationship, between stock price index with the world oil price, world gold price and other control variables for all these 5 countries, namely Vietnam, Korea, Indonesia, India, and Japan in the entire research period (2010M01 – 2021M12) are investigated through using the ARDL model as these variables are integrated at different levels I(0) and I(1). There is a long-run relationship among the variables (Stock Price Index; LNOP; LNGP; PR; LNER; CPI) because the null hypothesis (H0): “no long-run relationship exists” is rejected as the value of F – statistic is 2.843, 9.196, 2.974, 8.344, 4.521, in these countries respectively, which is higher than the value of F-critical 5%.

As can be seen from the table, there are two types of relationships between the stock price index, oil price, and gold price, which are the positive and negative ones. Hence, the two groups of countries will be

examined separately according to the nature of the relationship. The first group will be these countries that witness a negative relationship between the variables, namely Vietnam, Korea, and Indonesia. Another will be the ones that demonstrate a positive relationship between these variables, which is India and Japan.

Vietnam is an outstanding country in the first group, which shows a negative relationship between both oil price and gold price on the stock market index. Through results from the long-run ARDL model coefficients, it is clear that a one percent rise in the oil price (LNOP) and gold price (LNGP) would lead to a decrease of approximately 0.101% and a decline of 0.816% in the stock price index in the long run. Since gold is seen as a classic stock market replacement. An increase in the price of gold may encourage investors to withdraw their funds from the stock market, resulting in a drop in the stock index. The findings are consistent with those of Korhan and Negar (2015), who discovered a negative link between the stock price index and the gold price. In terms of oil price, it has a direct and indirect impact on stock market volatility. The direct effect is explained by the fact that oil price volatility creates uncertainty in financial markets, which leads to a drop in stock prices. When oil prices rise, the indirect effect is stated as a fall in production output and an increase in the rate of inflation. This has an impact on the economy's macro factors, which in turn has an impact on the stock market. According to Jones and Kaul (1996), the price of oil has a negative influence on the stock market. Because of high input costs and difficulty selling output items, the company's real cash flow is reduced as a result of oil price volatility. Furthermore, the study indicated that oil price is a risk factor for the stock market by employing the arbitrage business model. In addition, Jones et al. (2004) discovered evidence that high oil prices will raise the economy's production costs, resulting in lower output and a lower projected return on the stock market.

In brief, it could be said that the impact of the global gold and oil price on the movement of Vietnam's stock market is relatively weak. The short-term disequilibrium relationship of those three markets is adjusted to the long-run one with the adjustment speed of only 8.3% which is considerably low as well.

The results of Korea and Indonesia also reveal the same pattern. One percentage increase in oil price leads to a decline of 0.023% in the stock price index of Korea. And one percent rise in the gold price in Indonesia leads to a decrease of 0.504% in the stock price index of this country.

For the second group of results, taking India as a representative, the result of the ARDL model reveals a positive relationship between the stock price index, oil price, and gold price. It indicates that a one percent increase in oil price and gold price would lead to a rise of 0.120% and 0.384%, respectively in the stock price index, with the adjustment speed of 61.4%. The findings are in line with those of Najaf and Najaf (2016), who looked at the influence of crude oil on the stock exchange. They used data from the previous 15 years and utilized Karl Pearson's coefficient of correlation to arrive at the conclusion that lower crude oil prices had a negative influence on the stock exchange. According to the findings, oil is the most important source of energy all over the world. They said that oil prices are the most important necessity of every country and that as a result, prices have an impact on the country's performance. The findings are consistent with those of Raza et al. (2016), who looked at the asymmetric influence of gold, oil, and their associated volatilities on developing market stock markets. Gold prices have a positive impact on stock market values in the growing BRIC nations, according to the empirical findings. Japan's results also showed the same outcome. One percent increase in oil price and gold price leads to a rise of 0.107% and 0.485% in the stock price index of this country. It supports the conclusions of Ta and partners (2020), Nguyen (2018), Hsing (2011), Kuwornu (2011), and Rahman et al. (2009), about the positive relationship between oil prices and stock indexes.

For ARDL/VECM models along with VAR approaches, the regression models have been checked for common regression issues including the autocorrelation, heteroskedasticity, and the stability of the model. The results of tests, LM and CUSUM tests confirm that the estimated regressors are reliable to be relied on to withdraw appropriate findings coupled with producing valuable policy recommendations. The details of each test on different samples and models are presented in Appendix.

4.2.2. Short-term relationship (VAR Model)

For models that fail to explore the long-term interaction between stock market and oil, gold markets, the short-run relations are scrutinized and deeply discussed in this section.

a) Impulse Response

The impulse response is applied to demonstrate the stock market index's response to short-run shocks in oil and gold prices, using logarithms with variables and observations over a period of 10 months. During the whole study period, the reaction of stock indexes to changes in oil and gold prices experienced different patterns in different country cases. To be specific, in Singapore, when the oil price increased 0.14% in the first period, the stock price index saw a slight decrease in 0.02%. This can be understandable for the response as mentioned in the theoretical framework, oil price increase directly impacts the input of business, leading to the reduction in profits of oil production and use by enterprises. While Philippines' stock market slightly and negatively reacts to a shock of the oil price, the stock markets of Thailand, Malaysia and Philippines witness a contrasting response in its stock market indexes.

A striking feature to note is that, there is a positive relationship between gold price and stock market indexes, where an increase in gold price also leads to a growth in the stock indexes of all four countries. In detail, for the first month, gold price increased 0.06%, as a response, the stock price increased from the range of 0.002% to 0.01%. This results somewhat contrary to the usual theoretical framework, when the price of gold and stock indexes have an inverse relationship, gold has always been "a safe haven" for investor.

However, from the second month, gold price and stock market returned to their inherent negative relationship, seeing the decline in gold price and the rise of stock indexes in countries such as Thailand, Singapore, in the third month for Malaysia and in the fourth month for the Philippines.

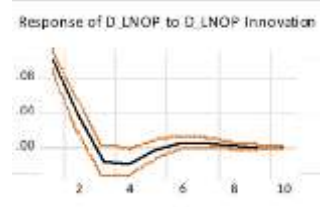
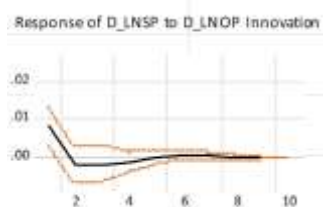
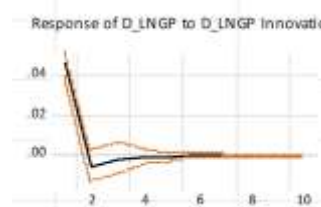
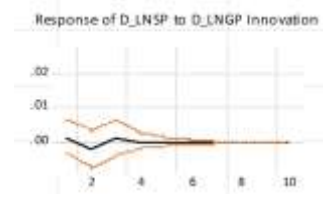
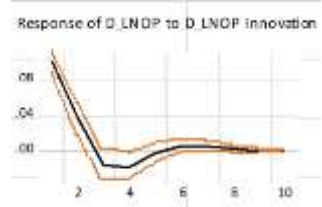

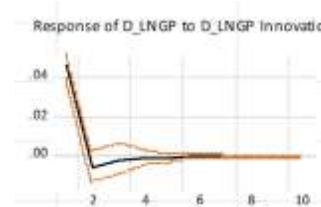

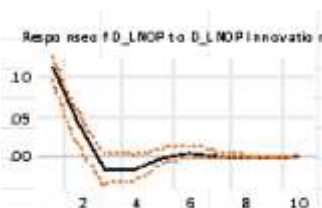
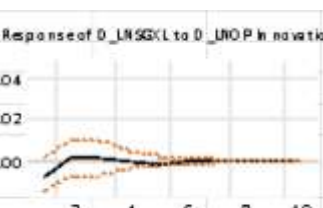
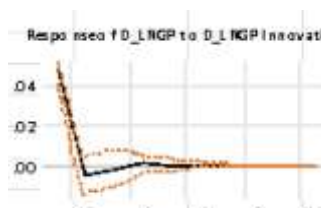
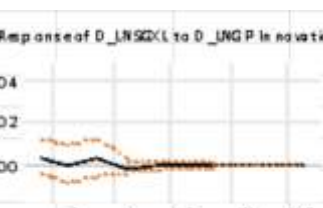
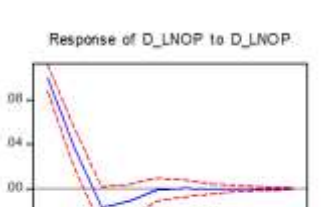
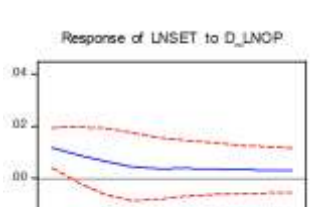
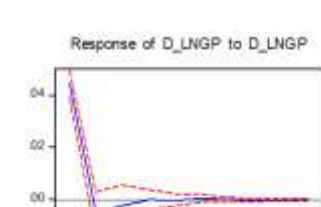
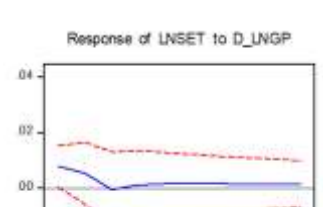
b) Variance Decomposition

The variance decomposition shows how much percentage change in stock price is explained by the change in price of world oil and gold price during a 10-month period. The first noticeable feature is that the world oil price, compared with the gold price, takes more responsibility for the variation in the stock price of all four countries, which is quite reasonable.

As mentioned in the theoretical framework, oil and stock markets are more strongly correlated. This result is also consistent with some other studies. The study of Quynh and Linh (2019) indicated that in the short term, oil price moved in the same direction with the VN index while gold price did pose an impact but not significant on the Vietnamese stock market from 2000 to 2018. With the endeavor to study about the nexus between oil, gold and S&P 500 during COVID-19 period, Hung and Vo (2021) found out that the movement of gold price weakly connected with the alteration of S&P 500. In contrast, this index interacted strongly and positively with crude oil price.

Next noteworthy point is that the oil and gold price's extent of impact differs among countries. Shock to both the world oil price and gold price made the greatest and lowest contribution to the variability of the Philippines and Singapore's stock index, respectively. Specifically, in the first month, world oil price accounts for 27.554% of the volatility in the Philippines' stock price. For the gold price, although its shock only contributes a small percentage, this number grows considerably after 2 years to reach 7.663% in the last month. Meanwhile, the gold and oil market in return has nearly 13 and 7 times lower contribution to Singapore stock price's fluctuation, which are 2.057% and 1.112% in month 10.

Table 3. Impulse response: Whole period (Jan 2010-Dec 2021)

| Countries | Oil price to oil price | Stock market to oil price | Gold price to gold price | Stock market to gold price |
|-------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------|
| Malaysia |  |  |  |  |
| Philippines |  |  |  |  |
| Singapore |  |  |  |  |
| Thailand |  |  |  |  |

The last remarkable point is that most of the contribution of gold and oil price shock to the change in stock price of different nations experience an upward trend over a 10 month period except for the oil price shock for Philippines and Thailand as well as gold price shock for Thailand. All of these adjustments all help come to the final interpretation that the Philippines is the country whose stock price is affected the most by stock price and oil price, in which the impact of oil in the stock market is eclipsed as time passes by, which is the same to Thailand but in terms of both gold and oil price. Last but not least, Singapore's stock index has the lowest dependence on the movement of oil prices.

Table 4. Variance Decomposition

| Period | Malaysia | | Philippines | | Singapore | | Thailand | |
|--------|----------|--------|-------------|--------|-----------|--------|----------|--------|
| | D_LNOP | D_LNGP | D_LNOP | D_LNGP | D_LNOP | D_LNGP | D_LNOP | D_LNGP |
| 1 | 7.223 | 0.184 | 27.554 | 0.365 | 1.938 | 0.606 | 6.386 | 2.851 |
| 2 | 7.896 | 0.343 | 25.776 | 0.325 | 2.019 | 0.589 | 4.994 | 2.066 |
| 3 | 7.806 | 0.376 | 22.279 | 2.717 | 2.056 | 1.050 | 4.194 | 1.455 |
| 4 | 8.554 | 0.820 | 22.798 | 3.381 | 2.048 | 1.111 | 3.578 | 1.172 |
| 5 | 8.366 | 1.094 | 21.733 | 7.303 | 2.057 | 1.110 | 3.182 | 1.019 |
| 6 | 8.324 | 1.284 | 21.992 | 7.466 | 2.057 | 1.112 | 2.939 | 0.922 |
| 7 | 9.480 | 1.267 | 22.908 | 7.394 | 2.057 | 1.112 | 2.764 | 0.856 |
| 8 | 9.392 | 1.652 | 22.949 | 7.599 | 2.057 | 1.112 | 2.630 | 0.805 |
| 9 | 9.382 | 1.691 | 22.919 | 7.661 | 2.057 | 1.112 | 2.528 | 0.766 |
| 10 | 9.430 | 1.688 | 22.896 | 7.663 | 2.057 | 1.112 | 2.448 | 0.735 |

Notes: The letter "D" in D_LNOP and D_LNGP denotes the first difference of the attached time series.

All of these variables are testified to be stationary at level, which is shown in Appendix 1.

Sources: Author's estimations.

c) The contribution of the COVID-19 pandemic to the interaction between stock market and oil, gold markets

For 6 countries that showed long-term relationships (Vietnam, South Korea, Indonesia, India, Japan and Singapore), the ARDL models indicate no statistically significant results for sub-samples from the announcement of the COVID-19 pandemic, March 2020 (2020M03), to the end of 2021 (2021M12).

It could be said that the existence of the pandemic and its severe observed impacts have made long-term relationships among these markets (stock price & world oil and gold price) no longer maintained in these economies. Eventually, the short-run dynamics among those markets are examined. Of which, India and Philippines are excluded due to the insufficient database for the second sub-samples (2020M3 to 2021M12), which makes it incomparable to analyze the contribution of the COVID-19 pandemic to the interaction between the stock market and oil, and gold prices in these countries. The COVID-19 pandemic has made the effect of the world oil price shock on the stock price movements of five countries including Indonesia, Japan, Malaysia, Singapore and Vietnam significantly stronger. One of noticeable evidence for this finding is that while before the pandemic, world oil price accounts for only 0.864% of the volatility in the Indonesia' stock price, the figure increases into 23.499% for the period after the COVID-19 spreading. Similar responses to oil price shocks after COVID-19 have been observed in other countries' stock markets. The impact of oil price shocks to the volatility of the South Korean stock market has been larger as well, rising from 9.203% to 28.305%, 3 times higher than before the epidemic period. Those figures of Malaysia (6.762 to 15.748), Vietnam (6.095 to 20.011), Singapore (1.095 to 22.657), and Japan have proved the same point. This fits the fact that the weak performance of businesses and the damaged income of households make both businesses and households more sensitive to the changes in the oil price which constitutes a major expense as well as price of most products consumed in the economies. This, then, is reflected in the investors' investment behavior in the stock market followed by the volatility of the stock market prices.

Regarding the gold price shocks, the volatility on Singapore, Thailand and Vietnam's stock prices witnesses a rise in the contribution of the world gold price shock. Specifically, world gold price accounts for only 2.899% of the volatility in the Vietnam' stock price which increases significantly into 35.875% in the same last month between before COVID - 19 period (2010M01 - 2020M02) and during COVID-19 period (2020M03 - 2021M12). While South Korea's stock market suffers a decrease in reaction to shock to the world gold price, in detail, world gold price makes up 19.186% in the last month of before COVID - 19 period which declines into only 4.427% in the last month of during COVID-19 period. Besides, the contribution of COVID-19 pandemic on the effect of the world gold price shock on the Indonesia's stock price do not change too much, in detail, the impact of world gold price on Indonesia's stock price fluctuated at around 6% in almost months between before and during COVID-19 period.

5. Conclusion & Recommendations

A synthesis of key points and practical and managerial implications are crucial elements of conclusion section.

With the support of the cointegration test, ARDL, and VAR models, the study empirically investigates the influence of oil price, gold price on the stock price index from January 2010 to December 2021 coupled with scrutinizing the contribution of the COVID-19 pandemic to the reaction of the stock market towards the shocks generated from the global oil and gold markets. The empirical results in Vietnam, Korea, Indonesia, India, and Japan reject the null hypothesis that there is no long-run association between the variables, whether negative or positive, for the whole sample period, while the results for the remaining countries show no evidence to reject that null hypothesis.

The study's major contribution is to provide empirical evidence for the theoretical premise that the results of the impacts of oil price and gold price on the stock price index of emerging or oil-exporting nations are inconsistent, similar to the findings of Asaad and Marane (2020), Parsva and Lean (2017), Mustafa (2020)). Furthermore, according to the research period division, the data reveals an influence with distinct signals of oil price, and gold price on the stock price index in the long term. Oil prices, according to research, have a critical influence in fostering economic growth and stabilizing inflation. Because the economy is still very sensitive and largely dependent on oil, a shock in oil prices might have a detrimental impact on the economy's stable development, pushing it into recession or catastrophe. Furthermore, changes in the price of oil not only affect the price of the economy, resulting in cost-push inflation, which destabilizes the economy, raises costs, and has a direct impact on people's lives, but also expands the gap between the affluent and the poor.

It is recommended that the government should be proactive in making national budget revenue and expenditure plans, appropriate state budget revenue structure, and develop economic development plans with petroleum as input with low prices so that they can take advantage of opportunities from the sharp drop in oil prices. In addition, step by step there are plans to limit the influence of oil prices on the economy such as being more proactive in developing other budget revenue sources from crude oil, reducing the proportion of crude oil in total budget revenue, as well as having reasonable policies to control gasoline prices to help the economy develop sustainably and limit the impact of oil price shocks. When it comes to the gold price, investors may react to changes in the gold price by noting that gold is a very excellent stock substitute since it is more readily available and can be used to hedge against inflation. When the gold price fluctuates, it has the greatest influence on the stock market.

Although the paper establishes the long-term and short-term relationships between stock indexes, oil prices, and gold prices, it still has certain shortcomings that could be addressed by future research. To begin with, using a market representative index will fail to capture the unique effects of the independent variables on individual stocks or industry groupings. Second, research data is scarce, particularly in the post-COVID era, resulting in inadequate study findings. And last but not least, COVID-19 indicators, such as confirmed cases or death ratios, might be used as a gauge or proxy for the impact of a pandemic on stock market performance.

Table 5. Variance Decomposition: Before COVID (January 2010-February 2020)

| Period | Indonesia | | Japan | | Korea | | Malaysia | | Singapore | | Thailand | | Vietnam | |
|--------|-----------|--------|--------|--------|--------|--------|----------|--------|-----------|--------|----------|--------|---------|--------|
| | D_LNOP | D_LNGP | D_LNOP | D_LNGP | D_LNOP | D_LNGP | D_LNOP | D_LNGP | D_LNOP | D_LNGP | D_LNOP | D_LNGP | D_LNOP | D_LNGP |
| 1 | 0.842 | 6.429 | 3.441 | 6.179 | 9.203 | 3.448 | 6.762 | 0.855 | 1.095 | 3.215 | 8.531 | 4.096 | 6.095 | 0.614 |
| 2 | 0.830 | 6.474 | 3.282 | 10.061 | 8.301 | 6.938 | 6.905 | 1.345 | 1.334 | 3.003 | 8.104 | 3.452 | 7.199 | 0.840 |
| 3 | 0.862 | 6.601 | 3.664 | 9.554 | 7.399 | 8.628 | 7.089 | 3.351 | 3.693 | 2.965 | 8.113 | 3.404 | 8.747 | 1.052 |
| 4 | 0.863 | 6.601 | 3.654 | 9.495 | 6.587 | 10.430 | 7.077 | 3.415 | 3.685 | 3.007 | 8.188 | 3.709 | 8.112 | 2.462 |
| 5 | 0.864 | 6.602 | 3.662 | 9.514 | 5.991 | 12.101 | 7.076 | 3.419 | 3.683 | 3.007 | 8.299 | 3.635 | 7.889 | 2.727 |
| 6 | 0.864 | 6.602 | 3.660 | 9.508 | 5.554 | 13.711 | 7.079 | 3.421 | 3.679 | 3.007 | 8.310 | 3.624 | 8.272 | 2.769 |
| 7 | 0.864 | 6.602 | 3.662 | 9.505 | 5.228 | 15.241 | 7.081 | 3.422 | 3.679 | 3.009 | 8.317 | 3.629 | 8.205 | 2.833 |
| 8 | 0.864 | 6.602 | 3.663 | 9.505 | 4.990 | 16.677 | 7.080 | 3.425 | 3.679 | 3.011 | 8.316 | 3.627 | 8.366 | 2.843 |
| 9 | 0.864 | 6.602 | 3.663 | 9.507 | 4.839 | 17.998 | 7.083 | 3.423 | 3.679 | 3.011 | 8.311 | 3.629 | 8.333 | 2.848 |
| 10 | 0.864 | 6.602 | 3.663 | 3.012 | 4.789 | 19.186 | 7.082 | 3.420 | 3.679 | 3.012 | 8.308 | 3.631 | 8.322 | 2.899 |

Sources: Author's estimations.

Table 6. Variance Decomposition: During COVID (March 2020-December 2021)

| Period | Indonesia | | Japan | | Korea | | Malaysia | | Singapore | | Thailand | | Vietnam | |
|--------|-----------|--------|--------|--------|--------|--------|----------|--------|-----------|--------|----------|--------|---------|--------|
| | D_LNOP | D_LNGP | D_LNOP | D_LNGP | D_LNOP | D_LNGP | D_LNOP | D_LNGP | D_LNOP | D_LNGP | D_LNOP | D_LNGP | D_LNOP | D_LNGP |
| 1 | 23.499 | 3.334 | 7.404 | 4.115 | 28.305 | 0.536 | 15.748 | 5.018 | 22.657 | 2.441 | 1.697 | 8.957 | 20.011 | 18.243 |
| 2 | 20.110 | 4.451 | 7.681 | 6.370 | 14.549 | 4.306 | 13.420 | 13.946 | 11.829 | 1.569 | 4.439 | 8.271 | 19.770 | 20.446 |
| 3 | 20.255 | 6.068 | 8.201 | 6.208 | 8.221 | 6.195 | 14.934 | 14.806 | 11.312 | 10.004 | 4.162 | 8.630 | 22.907 | 19.549 |
| 4 | 20.189 | 6.126 | 8.187 | 6.209 | 6.356 | 3.947 | 11.935 | 29.833 | 11.109 | 9.901 | 4.602 | 8.542 | 23.101 | 19.239 |
| 5 | 20.179 | 6.180 | 8.181 | 6.224 | 5.293 | 2.801 | 11.409 | 29.002 | 11.259 | 10.796 | 4.552 | 8.564 | 22.989 | 19.116 |
| 6 | 20.177 | 6.186 | 8.193 | 6.220 | 4.350 | 2.561 | 12.049 | 29.218 | 11.231 | 10.788 | 4.625 | 8.546 | 22.121 | 22.313 |
| 7 | 20.177 | 6.188 | 8.193 | 6.219 | 3.960 | 2.828 | 13.015 | 30.038 | 11.233 | 10.783 | 4.618 | 5.546 | 27.155 | 22.034 |
| 8 | 20.177 | 6.188 | 8.192 | 6.220 | 3.616 | 3.785 | 12.771 | 30.962 | 11.229 | 10.780 | 4.631 | 5.545 | 21.638 | 29.514 |
| 9 | 20.177 | 6.188 | 8.193 | 6.220 | 3.494 | 4.241 | 12.624 | 30.857 | 11.228 | 10.783 | 4.631 | 8.544 | 37.585 | 29.024 |
| 10 | 20.178 | 6.188 | 8.193 | 6.220 | 3.612 | 4.427 | 12.989 | 30.869 | 11.228 | 10.785 | 4.633 | 8.544 | 21.765 | 35.875 |

Appendix

Appendix 1. Unit-Root Test Results of Sub-Samples

Table 1.1. Unit Root Test for Time Series: Before COVID (January 2010-February 2020)

| Country | Variable | Null Hypothesis: Variable has a unit root | | | | | | | | | |
|-------------|----------|-------------------------------------------|---------|---------|---------|------------|----------------------------------|---------|---------|---------|------------|
| | | Time Series at Level | | | | | Time Series at First Differences | | | | |
| | | ADF | | PP | | Conclusion | ADF | | PP | | Conclusion |
| | | t-stat. | p-value | t-stat. | p-value | | t-stat. | p-value | t-stat. | p-value | |
| | LNOP | -1.62 | 0.47 | -1.37 | 0.60 | I(1) | -8.25 | 0.00 | -7.91 | 0.00 | I(0) |
| | LNGP | -2.11 | 0.24 | -2.11 | 0.24 | I(1) | -12.23 | 0.00 | -12.27 | 0.00 | I(0) |
| India | CPI | -2.59 | 0.10 | -2.95 | 0.052 | I(1) | -7.99 | 0.00 | -8.60 | 0.00 | I(0) |
| | PR | -0.85 | 0.80 | -0.84 | 0.79 | I(1) | -8.51 | 0.00 | -8.51 | 0.00 | I(0) |
| | LNER | -1.12 | 0.70 | -1.02 | 0.74 | I(1) | -8.22 | 0.00 | -8.28 | 0.00 | I(0) |
| | LNNSEI | -1.39 | 0.58 | -1.42 | 0.64 | I(1) | -9.82 | 0.00 | -11.55 | 0.00 | I(0) |
| Indonesia | CPI | -2.44 | 0.13 | -2.06 | 0.26 | I(1) | -8.43 | 0.00 | -8.19 | 0.00 | I(0) |
| | PR | -1.18 | 0.68 | -1.33 | 0.62 | I(1) | -7.11 | 0.00 | -7.27 | 0.00 | I(0) |
| | LNER | -0.724 | 0.836 | -0.737 | 0.832 | I(1) | -11.44 | 0.00 | -11.45 | 0.00 | I(0) |
| | LNIDDOW | -2.59 | 0.10 | -2.60 | 0.10 | I(1) | -11.08 | 0.00 | -11.20 | 0.00 | I(0) |
| Japan | CPI | -2.32 | 0.17 | -2.28 | 0.180 | I(1) | -9.16 | 0.00 | -9.12 | 0.00 | I(0) |
| | PR | - | - | -1.55 | 0.50 | I(1) | - | - | -8.89 | 0.00 | I(0) |
| | LNER | -1.04 | 0.74 | -1.14 | 0.70 | I(1) | -10.03 | 0.00 | -10.11 | 0.00 | I(0) |
| | LNN225 | -0.92 | 0.78 | -1.18 | 0.68 | I(1) | -10.17 | 0.00 | -10.11 | 0.00 | I(0) |
| Korea | CPI | -3.86 | 0.00 | -10.20 | 0.00 | I(0) | | | | | |
| | PR | -0.30 | 0.92 | -0.69 | 0.85 | I(1) | -4.27 | 0.00 | -11.42 | 0.00 | I(0) |
| | LNER | -4.66 | 0.00 | -4.66 | 0.00 | I(0) | - | - | - | - | - |
| | LNKOSPI | -3.11 | 0.03 | -3.02 | 0.04 | I(0) | - | - | - | - | - |
| Malaysia | CPI | -3.17 | 0.02 | -2.64 | 0.09 | I(1) | -8.37 | 0.00 | -8.17 | 0.00 | I(0) |
| | PR | -4.69 | 0.00 | -4.66 | 0.00 | I(0) | -10.95 | 0.00 | -11.09 | 0.00 | I(0) |
| | LNER | -0.63 | 0.86 | -0.65 | 0.85 | I(1) | -10.54 | 0.00 | -10.56 | 0.00 | I(0) |
| | LNSP | -3.72 | 0.01 | -4.58 | 0.00 | | -3.85 | 0.01 | -5.69 | 0.00 | I(0) |
| Philippines | CPI | -2.62 | 0.01 | -2.1 | 0.25 | I(1) | -6.59 | 0.00 | -6.36 | 0.00 | I(0) |
| | PR | -1.81 | 0.38 | -2.11 | 0.24 | I(1) | -8.43 | 0.00 | -8.88 | 0.00 | I(0) |
| | LNER | -1.59 | 0.47 | -1.35 | 0.58 | I(1) | -3.89 | 0.01 | -7.85 | 0.00 | I(0) |
| | LNPSEI | -2.88 | 0.05 | -2.84 | 0.06 | I(1) | -8.36 | 0.00 | -8.51 | 0.00 | I(0) |
| Singapore | CPI | -1.85 | 0.36 | -1.39 | 0.59 | I(1) | -3.09 | 0.03 | -11.71 | 0.00 | I(0) |

| | | | | | | | | | | | |
|----------|--------|-------|------|-------|------|------|--------|------|--------|------|------|
| | PR | -0.22 | 0.93 | -1.50 | 0.53 | I(1) | -10.72 | 0.00 | -18.35 | 0.00 | I(0) |
| | LNER | -2.04 | 0.27 | -1.85 | 0.31 | I(1) | -12.29 | 0.00 | -12.31 | 0.00 | I(0) |
| | LNSGXL | -3.31 | 0.02 | -3.21 | 0.02 | I(0) | - | - | - | - | - |
| Thailand | CPI | -1.77 | 0.40 | -1.89 | 0.34 | I(1) | -8.82 | 0.00 | -8.78 | 0.00 | I(0) |
| | PR | -0.93 | 0.78 | -1.27 | 0.64 | I(1) | -7.76 | 0.00 | -8.30 | 0.00 | I(0) |
| | LNER | -1.72 | 0.42 | -1.80 | 0.38 | I(1) | -9.97 | 0.00 | -9.92 | 0.00 | I(0) |
| | LNSET | -3.34 | 0.02 | -3.31 | 0.02 | I(0) | -9.22 | 0.00 | -9.22 | 0.00 | I(0) |
| Vietnam | CPI | -2.12 | 0.24 | -1.68 | 0.44 | I(1) | -3.84 | 0.00 | -4.52 | 0.00 | I(0) |
| | PR | -1.61 | 0.48 | -1.38 | 0.59 | I(1) | -4.38 | 0.00 | -6.85 | 0.00 | I(0) |
| | LNER | -3.01 | 0.04 | -3.45 | 0.01 | I(0) | -11.78 | 0.00 | -11.91 | 0.00 | I(0) |
| | LNSP | -0.69 | 0.84 | -0.61 | 0.86 | I(1) | -10.55 | 0.00 | -10.60 | 0.00 | I(0) |

Notes: I(1) – Unit Root Process; I(0) – Stationary Process.

Source: Author's estimations.

Table 1.2. Unit Root Test for Time Series: During COVID (March 2020-December 2021)

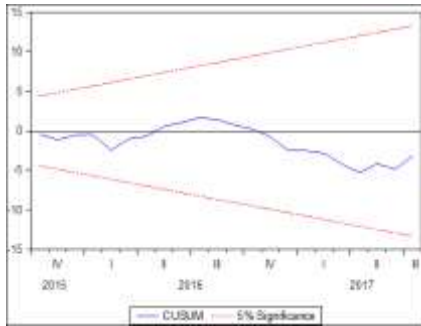
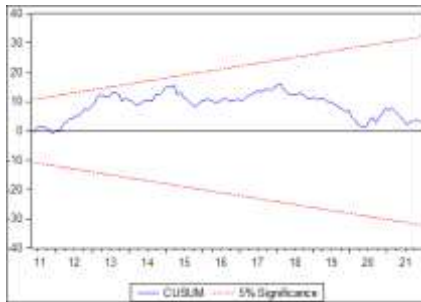
| Country | Variable | Null Hypothesis: Variable has a unit root | | | | | | | | | |
|-----------|----------|-------------------------------------------|---------|---------|---------|------------|----------------------------------|---------|---------|---------|------------|
| | | Time Series at Level | | | | | Time Series at First Differences | | | | |
| | | ADF | | PP | | Conclusion | ADF | | PP | | Conclusion |
| | | t-stat. | p-value | t-stat. | p-value | | t-stat. | p-value | t-stat. | p-value | |
| | LNOP | -1.81 | 0.37 | -1.28 | 0.62 | I(1) | -4.06 | 0.01 | -3.52 | 0.02 | I(0) |
| | LNGP | -2.74 | 0.08 | -2.71 | 0.09 | I(1) | -4.84 | 0.00 | -4.85 | 0.00 | I(0) |
| India | CPI | -2.38 | 0.16 | -2.38 | 0.16 | I(1) | -6.13 | 0.00 | -6.13 | 0.000 | I(0) |
| | PR | - | - | - | - | - | - | - | - | - | - |
| | LNER | -3.59 | 0.01 | -3.64 | 0.01 | I(0) | -5.25 | 0.00 | -5.50 | 0.00 | I(0) |
| | LNNSEI | -0.55 | 0.86 | -0.37 | 0.90 | I(1) | -5.11 | 0.00 | -5.20 | 0.00 | I(0) |
| Indonesia | CPI | -2.59 | 0.11 | -2.59 | 0.11 | I(1) | -3.86 | 0.01 | -3.86 | 0.01 | I(0) |
| | PR | -4.05 | 0.01 | -6.46 | 0.00 | I(0) | | | | | |
| | LNER | -3.33 | 0.03 | -3.40 | 0.02 | I(0) | -4.99 | 0.00 | -6.36 | 0.00 | I(0) |
| | LNIDDOW | -1.65 | 0.44 | -1.77 | 0.39 | I(1) | -3.88 | 0.01 | -3.88 | 0.01 | I(0) |
| Japan | CPI | -1.21 | 0.65 | -1.30 | 0.61 | I(1) | -4.16 | 0.00 | -4.16 | 0.00 | I(0) |
| | PR | - | - | -1.865 | -0.35 | I(1) | - | - | -10 | 0 | I(0) |
| | LNER | -0.06 | 0.94 | -0.06 | 0.94 | I(1) | -4.31 | 0.00 | -4.31 | 0.00 | I(0) |
| | LNN225 | -1.16 | 0.67 | -1.07 | 0.71 | I(1) | -4.28 | 0.00 | -5.86 | 0.00 | I(0) |
| Korea | CPI | -4.13 | 0.00 | -4.11 | 0.00 | I(0) | - | - | - | - | - |
| | PR | -3.13 | 0.04 | -3.83 | 0.00 | I(0) | - | - | - | - | - |
| | LNER | -1.18 | 0.66 | -1.36 | 0.58 | I(1) | -3.63 | 0.01 | -3.61 | 0.01 | I(1) |

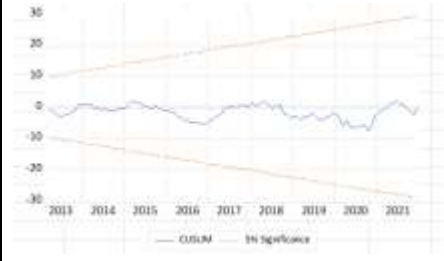
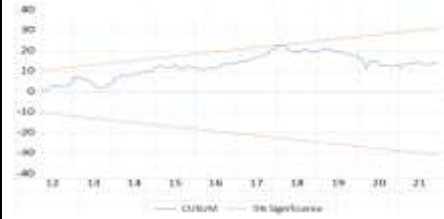
| | | | | | | | | | | | | |
|-------------|---------|--------|------|--------|------|------|--|-------|------|-------|------|------|
| | LNKOSPI | -1.29 | 0.61 | -2.35 | 0.00 | I(1) | | -3.73 | 0.01 | -3.21 | 0.00 | I(1) |
| Malaysia | CPI | -1.72 | 0.41 | -1.11 | 0.69 | I(1) | | -3.55 | 0.02 | -2.59 | 0.11 | I(1) |
| | PR | -3.63 | 0.01 | -5.93 | 0.00 | I(0) | | -1.38 | 0.57 | -5.23 | 0.00 | I(1) |
| | LNER | -1.91 | 0.32 | -1.89 | 0.33 | I(1) | | -5.03 | 0.00 | -5.00 | 0.00 | I(0) |
| | LNSP | -3.72 | 0.01 | -4.58 | 0.00 | I(0) | | -3.85 | 0.01 | -5.69 | 0.00 | I(0) |
| Philippines | CPI | -1.56 | 0.49 | -1.19 | 0.66 | I(1) | | -5.35 | 0.00 | -8.92 | 0.00 | I(0) |
| | PR | -7.27 | 0.00 | -12.63 | 0.00 | I(0) | | - | - | - | - | - |
| | LNER | -1.30 | 0.61 | -1.33 | 0.60 | I(1) | | -4.39 | 0.00 | -4.39 | 0.00 | I(0) |
| | LNPSEI | -2.06 | 0.26 | -2.09 | 0.25 | I(1) | | -4.92 | 0.00 | -5.14 | 0.00 | I(0) |
| Singapore | CPI | -0.23 | 0.92 | 0.78 | 0.99 | I(1) | | -2.77 | 0.08 | -2.64 | 0.10 | I(1) |
| | PR | -5.15 | 0.00 | -5.27 | 0.00 | I(0) | | | | | | |
| | LNER | -1.46 | 0.53 | -1.42 | 0.55 | I(1) | | -4.24 | 0.00 | -4.32 | 0.00 | I(0) |
| | LNSGXL | -1.93 | 0.32 | -1.93 | 0.31 | I(1) | | -5.19 | 0.00 | -5.25 | 0.00 | I(0) |
| Thailand | CPI | -1.94 | 0.31 | -2.04 | 0.27 | I(1) | | -4.65 | 0.00 | -4.65 | 0.00 | I(0) |
| | PR | -12.86 | 0.00 | -30.83 | 0.00 | I(0) | | -1.70 | 0.42 | -4.23 | 0.00 | |
| | LNER | -1.06 | 0.71 | -1.08 | 0.71 | I(1) | | -4.66 | 0.00 | -4.66 | 0.00 | I(0) |
| | LNSSET | -1.23 | 0.64 | -0.91 | 0.76 | I(1) | | -4.92 | 0.00 | -6.34 | 0.00 | I(0) |
| Vietnam | CPI | -2.53 | 0.12 | -2.55 | 0.12 | I(1) | | -3.41 | 0.02 | -3.41 | 0.02 | I(0) |
| | PR | -9.35 | 0.00 | -6.63 | 0.00 | I(0) | | -5.14 | 0.00 | -5.12 | 0.00 | I(0) |
| | LNER | -1.50 | 0.52 | -1.43 | 0.55 | I(1) | | -5.90 | 0.00 | -6.01 | 0.00 | I(0) |
| | LNSP | -1.83 | 0.36 | -2.48 | 0.13 | I(1) | | -5.09 | 0.00 | -8.50 | 0.00 | I(0) |

Notes: I(1) – Unit Root Process; I(0) – Stationary Process.

Source: Author's estimations.

Appendix 2. Serial correlation LM Test, Heteroskedasticity test for ARDL model (Whole Period: 2010M01-2021M12)

| Countries | Heteroskedasticity Test: Breusch-Pagan-Godfrey | | | Breusch-Godfrey Serial Correlation LM Test | | CUSUM Test |
|-----------|------------------------------------------------|---------------|---------------------|--------------------------------------------|---------------|---------------------------------------------------------------------------------------|
| | F-statistic | Obs*R-squared | Scaled explained SS | F-statistic | Obs*R-squared | |
| India | 1.34 | 13.66 | 6.21 | 0.77 | 2.44 |  |
| Indonesia | 1.42 | 16.63 | 13.67 | 0.07 | 0.16 |  |
| Japan | 0.94 | 15.44 | 15.00 | 1.38 | 3.31 |  |

| | | | | | | |
|---------|------|-------|-------|------|------|-------------------------------------------------------------------------------------|
| Korea | 1.63 | 21.50 | 21.91 | 0.08 | 0.19 |  |
| Vietnam | 2.79 | 46.42 | 42.98 | 1.92 | 4.48 |  |

Appendix 3. Lag Structure and Cointegration Relationship

Table 3.1. Lag Structure

| Lag Structure | India | Indonesia | Japan | Korea | Malaysia | Philippines | Singapore | Thailand | Vietnam |
|----------------------------|-------|-----------|-------|-------|----------|-------------|-----------|----------|---------|
| Sample 1 (Whole Period) | 1 | 2 | 1 | 1 | 2 | 3 | 2 | 2 | 2 |
| Sample 2 (Before Covid) | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| Sample 3 (After Covid) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

Source: Author's estimations

Table 3.2. Cointegration Relationship

| Country | | VECM | | ARDL | |
|-------------|--------------|------------------|-------------|------------------------|-------------------------------------|
| | | EC | Probability | Bound Test F-statistic | F-critical at 5% significance level |
| India | Whole period | -5.099 | 0.000 | 8.344 | 2.390 |
| | Before Covid | -5.099 | 0.000 | 8.344 | 2.390 |
| | After Covid | 2.444 | 0.001 | 1.553 | 2.560 |
| Indonesia | Whole period | -1.677 | 0.028 | | |
| | Before Covid | 0.417 | 0.032 | | |
| | After Covid | - | - | | |
| Japan | Whole period | No Cointegration | 0.313 | 4.521 | 2.390 |
| | Before Covid | -3.039 | 0.029 | 5.255 | 2.390 |
| | After Covid | -0.374 | 0.000 | 15.309 | 2.790 |
| Korea | Whole period | -0.092 | 0.003 | 9.196 | 2.390 |
| | Before Covid | -0.003 | 0.089 | 6.596 | 2.390 |
| | After Covid | - | - | - | - |
| Malaysia | Whole period | -0.131 | 0.3848 | 2.970 | 2.390 |
| | Before Covid | -0.052 | 0.1212 | 3.461 | 2.390 |
| | After Covid | - | - | - | - |
| Philippines | Whole period | -0.320 | 0.095 | 7.130 | 2.390 |
| | Before Covid | - | - | - | - |
| | After Covid | - | - | - | - |
| Singapore | Whole period | -0.218 | 0.111 | 1.878 | 2.39 |
| | Before Covid | -0.14 | 0.144 | 1.858 | 2.39 |
| | After Covid | | | | |
| Thailand | Whole period | -1.583 | 0.038 | - | - |
| | Before Covid | -1.148 | 0.041 | | |
| | After Covid | - | - | | |
| Vietnam | Whole period | -0.023 | 0.162 | 2.843 | 2.39 |
| | Before Covid | -0.007 | 0.153 | 2.884 | 2.39 |
| | After Covid | - | - | - | - |

Appendix 4. Impulse Response of Sub-samples

Table 4.1. Impulse response: Before COVID (January 2010-February 2020)

| Countries | Oil price to oil price | Stock market to oil price | Gold price to gold price | Stock market to gold price |
|-----------|------------------------|---------------------------|--------------------------|----------------------------|
| Indonesia | | | | |
| Japan | | | | |
| Korea | | | | |
| Malaysia | | | | |

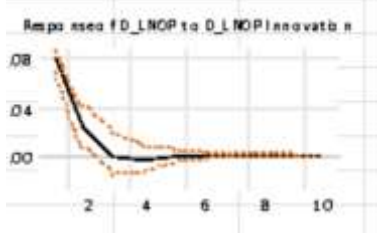

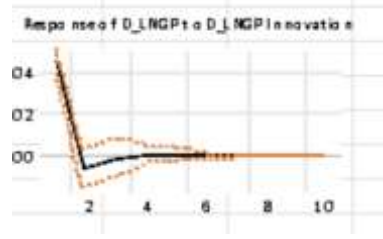
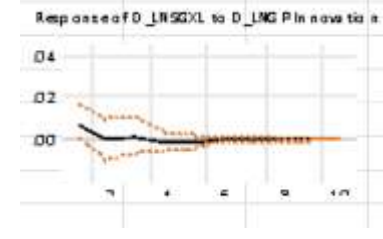
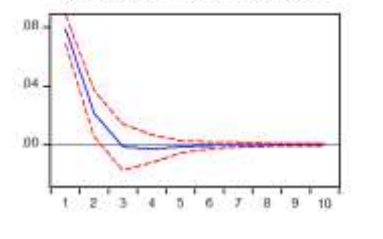
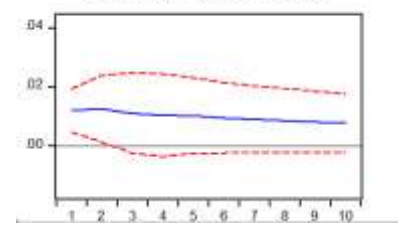
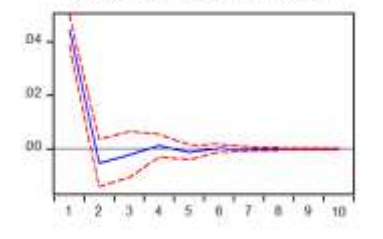
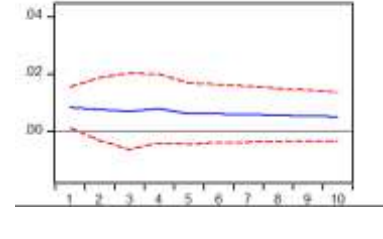
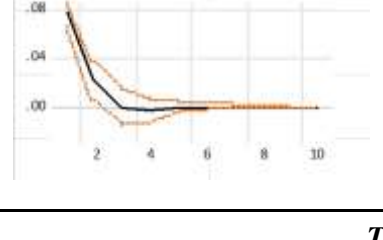
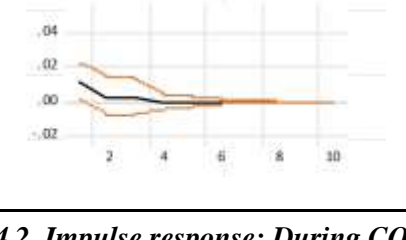
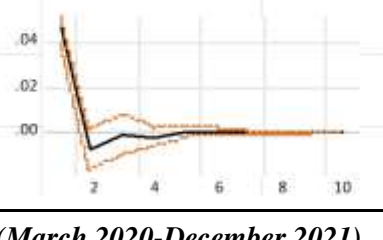
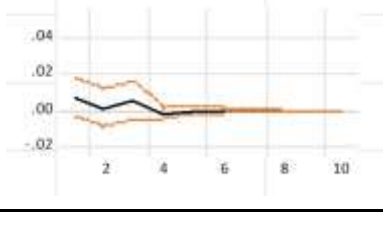
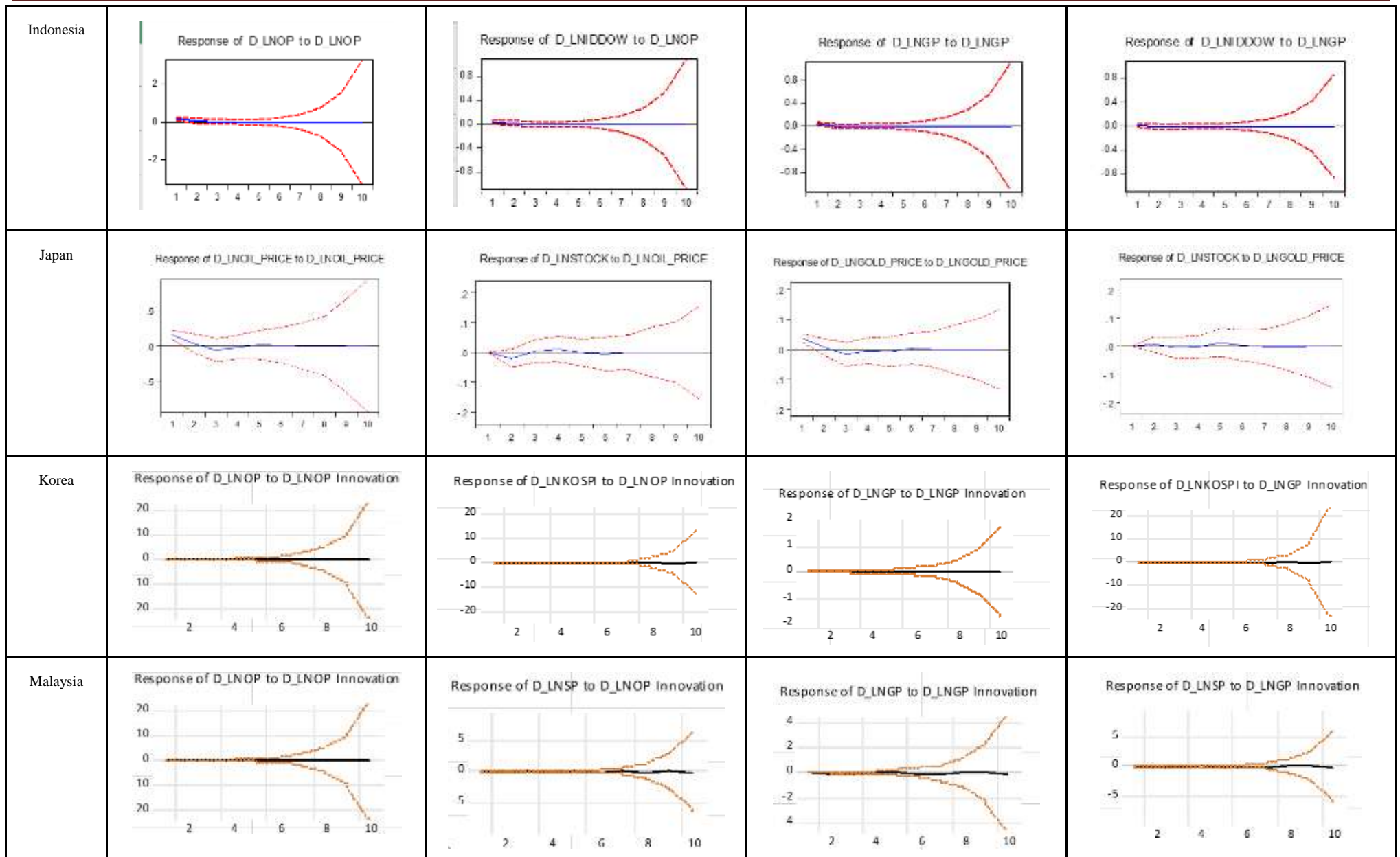
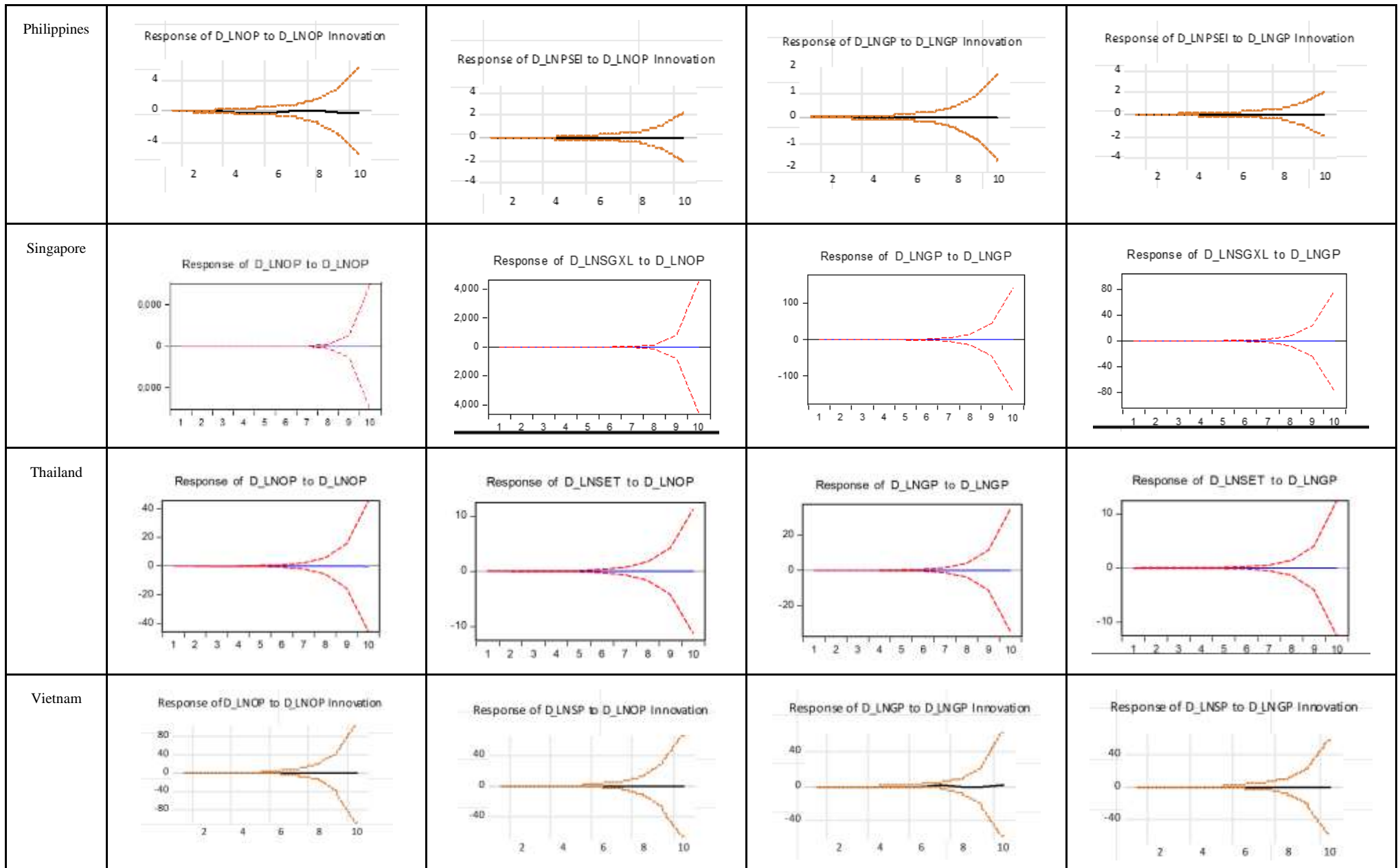
| | | | | |
|-------------|------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|
| Philippines | None | None | None | None |
| Singapore |  |  |  |  |
| Thailand |  |  |  |  |
| Vietnam |  |  |  |  |

Table 4.2. Impulse response: During COVID (March 2020-December 2021)

| | | | | |
|-----------|------------------------|---------------------------|--------------------------|----------------------------|
| Countries | Oil price to oil price | Stock market to oil price | Gold price to gold price | Stock market to gold price |
|-----------|------------------------|---------------------------|--------------------------|----------------------------|





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THE IMPACTS OF CAPITAL INFLOWS ON BANK LENDING IN VIETNAM

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ABSTRACT

This article explores the relationship of capital inflows with lending activities of 13 Vietnamese commercial banks in the period from 2008q1 to 2021q4 using the systematic GMM estimation method. With an unbalanced panel database, the authors build a model to measure the impact of variables on the ratio of capital inflows to GDP (including total capital inflows, foreign direct investment, capital indirect, and other investment capital) to credit growth rate and risk provision ratio for bank loans, which incorporates the use of control variables at the bank level and at the macroeconomic level; then performed advanced analysis to understand the impact of the Covid-19 pandemic on the research relationship. From the obtained results, the author makes conclusions and some recommendations to improve the credit efficiency of Vietnamese commercial banks in terms of the volatility of capital inflows.

Keywords: capital flows, bank credit, Vietnamese commercial bank.

1. Introduction

Along with the benefits of capital flows in terms of integration trends in developing countries, economists and policymakers also need to take the shortcomings of capital flows into account. The capital flows can affect various aspects of the economy, especially these flows are closely related to the economic and financial situation of countries (Koepe, 2019). According to research by Yi (2021), from capital supply aspects, capital flows are strongly influenced by external factors such as recession or economic crisis of the country, which can make change to the destination of capital flows; meanwhile, from the perspectives of capital needs, capital inflows are very attractive to the host countries: A large capital inflow can even revive a country's economy and save the banking system from bankruptcy and a severe economic recession. In general, it can be seen that capital flows are volatile and easily affected in some aspects, however, they also have a strong impact on the growth and stability of the economy, not only in a single country but also on a global scale. Thus, understanding the characteristics and mechanisms of capital flows has become an important puzzle for trade, financial stability, and economic opportunities.

In the banking sector, capital flows studies have not received much attention. Meanwhile, the financial stability of banks is one of the significant contributors to the stability of the economy. Against the backdrop of the expanding banking sector with its extensive network of branches and subsidiaries worldwide, cross-border banking flows in terms of capital inflows increased dramatically from the early 1990s to the GFC has also dispersed after the GFC (Milesi-Ferretti and Tille, 2011; Broner et al., 2013; Choi & Fucceri, 2019). However, this relationship has not received sufficient attention from global scholars, especially regarding the influence of capital flows on bank lending at the individual bank level. Given that the principal contribution of lending activities to banks' operation, yet, according to our research, there are a few studies have done related to the above issues: Dinger & Kaat (2020) uses individual bank-level data to learn about capital inflows and their relationship to credit supply and loan quality; Ali & Iness (2020) found a relationship between financial stability and capital flows at the bank level, using economic indicators (GDPG, Trade, Inflation, Interest rate). Using practical methods and consequences from prior papers, our hypothesis ideas are based on the potential reciprocal relationship between bank lending and capital flows in Vietnam in the period from 2008 to 2021.

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The rest of the paper is organized as follows. Section 2 provides a brief review on the impacts of capital flows on the bank lending emerging countries. Section 3 presents our dataset and methodology, while the empirical results are discussed in Section 4 and the section 5 concludes our study.

2. Literature review

With the principal purpose of the study is to examine the relationship between capital flows and bank lending, the study approaches 3 main contents of previous studies as following parts:

Impacts of capital flows on emerging markets

Several studies have been conducted to understand the impact of capital flows on macroeconomics situation in developing countries. The growing liberalization and integration into international financial markets have led to significant waves of capital inflows to the emerging markets in recent years. While they are typically considered as a blessing for economic growth, they also bring risks and raise important policy issues to the recipient countries (Koepke, 2019). Early literature addresses effects of capital inflows to the emerging countries at the macro-level. Foreign capital can bring several benefits to facilitate economic growth, such as the relaxation of credit constraints (Henry, 2007), enhancing the capital allocation efficiency and productivity of the host countries (Bonfiglioli, 2008; Bakeart et al., 2011). However, capital inflows can also slow the productivity growth by a shift in economic resources from tradable to nontradable sectors (Benigno et al, 2015), exposing the emerging markets to significant swings in the availability of foreign capital, especially during volatile periods (Calvo and Reinhart, 2000; Obstfeld, 2012). Yet, the impacts of capital inflows to the macroeconomic volatility of emerging markets depend on type of capital flows (Henry, 2011; Igan et al., 2020), country characteristics (Milesi-Ferretti and Tille, 2011) and the level of the financial development (Kose, Prasad, and Terrones 2003).

In terms of the effect of capital inflows to financial stability in the emerging markets, despite a large body of literature, however, previous studies show mixed evidence. Some papers stated that rising of capital inflows offers greater access to capital and increases investment resources in firms, which result in lower credit risks and more stable financial system (Kaminsky et al, 2008; Ahmed and Zlate, 2014). Nevertheless, others believe that financial openness in emerging markets leads to exposure to the global uncertainty (Hlaing and Kakinaka, 2019), increasing competition and risk-taking in the banking system, following by financial instability and crises (Daniel and Jones, 2007). Baum et al. (2017) show that the impacts of capital inflows are not homogeneous across countries, but significantly varies between country-specific financial and macroeconomic characteristics.

Impacts of capital flows on banking lending

Another strand of the literature is examining the capital inflows influence on bank lending. Contributing a considerable role to the health of the economy in overall and to the profitability of each bank in particular, it is crucial to understand and control well factors affecting bank lending.

In terms of banks' credit quantity, Angelopoulou & Gibson (2009) argue that increasing foreign capital lowers domestic interest rates and consequently enhance the bank lending. Capital flows, particularly in the form of portfolio investments, also boost the price of assets, thereby raising collateral values and thereby increasing bank credit (Kim & Yang, 2011). Furthermore, capital inflows are linked to stronger market expectations and business creditworthiness, thus, leading to bank credit expansion via the market confidence channel (Borio & Disyatat, 2010). Dinger & Kaat (2020) shows that cross-border capital inflows are associated with higher loan volume and higher loan-to-asset ratios, while Mara et al. (2021) explore that the probability of credit expansion significantly increases by capital inflows. Orhangazi (2014) used a Logit model to examine the link between private capital flows and bank credit to the private sector in Turkey from 2003 to 2013, concluding that net private capital inflows have a positive relationship with fast credit expansion time. Blanchard et al. (2016) use the Mundell-Fleming model to show that capital flows cause currencies to appreciate and tend to lead to cycles of currency expansion and credit booms. Instead of using inherent findings from existing documents, our paper re-examines the relationship between capital inflows and the bank lending expansion and we still expect to observe the similar results with prior research.

In addition to the bank's volume, capital inflows can also affect the bank's credit risk. The empirical evidence from extant literature, however, remains inconclusive. Since international capital inflows are

similar to lax monetary policy, increasing in the foreign capital can amplify bank's credit risks as highlighted by the bank risk-taking channel of monetary transmission as banks could lessen their lending standards as a result of increasing loanable funds at lower price (Acharya and Naqvi, 2012, Bekaert et al., 2013; Ioannidou et al., 2015). Rumondor and Bary (2020) examine the effect of capital flows on banks' risk-taking behavior by examining 15 Indonesian listed banks as well as international institutions, including 11 EME banks, from 2010Q1 to 2017Q3. Mainstream banks in Indonesia have also proven to be less risky than smaller banks, probably because the majority of the country's large banks are state-owned. The portfolio investment influences risk-taking behavior, which is evidence in the cross-country analyses. Yang Zhao and Zichun Xu (2021) used bank-level data from 50 Chinese commercial banks between 2005 and 2018, as well as the system GMM estimation method and classical banking risk-taking model by Delis and Kouretas (2011), to find that the "international risk-taking channel effect" exists in China's commercial banking system, with the more open the capital account, the greater the risk tolerance of the larger banks. Since the findings of previous are still controversial, our study aims clarify the capital inflows influence on bank risk-taking behaviour. Thus, we contribute to the existing literature with a comprehensive of investigation about the inflows influence of capital on bank lending, both on quantity and quality.

Given the context of the Vietnamese financial market, this country is supposed to be affected intensely by the volatility of capital inflows. Being one of the most prevailed emerging markets, a recipient nation like Vietnam, therefore, has been receiving large amount of capital in various types. Moreover, the Vietnamese banking system has not matured with sufficient resilience in terms of dealing with uncertainty. Although the vitality of banking industry towards the economy in general and the existing defects of banks, to our best knowledge, investigation about capital inflows and bank or bank lending in particular are limited, showing a large gap of research to fill. Our paper aims to examine the impacts of capital inflows on bank lending in terms of credit expansion and credit quality in the Vietnamese commercial banks. Our findings claim the hypothesis and reveal the distinction between various types of capital flows in terms of their influence on bank lending activities.

Impacts of capital flows during crisis period

Capital flows are known for their sensitive responses to uncertainties, as can be observed during the Great Recession in the 2008 (Choi & Furceri, 2019; Ferretti & Tille, 2011; Broner et al., 2013). When banks experience instability, lending in banks will be severely affected in terms of domestic lending and cross-border lending, as well as lending from foreign institutions (Kleimeier et al., 2013; Ivashina & Scharfstein, 2010; Ferretti & Tille, 2011; Cetorelli & Goldberg, 2011). During the GFC period, lending at banks mainly depended on the economic potential of bank and its partners. However, this has changed during the Covid-19 pandemic, the credit changes according to the context of the country in which its bank operates because every activity during the pandemic is managed by the country to hedge and mitigate the risk that Covid-19 may pose to the health of its citizens. Consequently, the impacts of capital inflows to the bank lending and credit risk-taking would be different during crisis periods. Interestingly, our paper figured out the contrast influence of capital inflows to the bank lending in Vietnam between the GFC and the Covid-19 outbreak. Hence, we highlight in this paper the uncommon features of the Covid-19 crisis compared to the GFC (Berger and Demirgüç-Kunt, 2021), since the former has emerged from a medical health crisis in global and becomes an economic crisis rather than resulting form a banking crisis as in the latter.

3. Research method

3.1. Data

Our research uses disproportionate quarterly data collected from the first quarter of 2008 and updated to the end of the fourth quarter of 2021 in Vietnam. Data on capital flows are obtained from the International Monetary Fund's database. In addition, nominal GDP growth and domestic credit to the private sector are also sourced from the World Bank's website. Other macro data and bank-level data for 13 joint-stock commercial banks listed in Vietnam (Appendix A), with total assets accounting for approximately 70% of the total assets of the banking sector. These data are collected from the S&P Capital IQ platform and website cafef.vn.

3.2. Research model

To evaluate the impact of capital inflows on credit activities of Vietnamese commercial banks, the research team proposes the following regression equation:

$$\text{Loan}_{i,t} = \alpha + \beta \text{Loan}_{i,t-1} + \gamma \text{CF}_{j,t} + \theta \text{Bank}_{i,j,t-1} + \eta \text{M}_{i,j,t-1} + \tau_i + \varepsilon_{i,t} \quad (1)$$

Where $\text{Loan}_{i,t-1}$ is the loan growth rate (LoanGrowth) or the ratio of loan loss provisions over net interest income (llpRatio) of bank i , in quarter t ; $\text{CF}_{j,t}$ are capital inflows to GDP ratios, including total capital inflows (CI), foreign direct investment (FDI), portfolio investment (PI) and other investment (OI); $\text{Bank}_{i,j,t-1}$ and $\text{M}_{i,j,t-1}$ are vectors representing the control variables for bank characteristics and macroeconomic variables; τ_i is unobservable individual effect; $\varepsilon_{i,t}$ is the errors term.

Our research selected the credit growth rate and the credit risk provision ratio to reflect the lending activities of commercial banks, including both development aspects according to the volume of loans, as well as the quality of the bank's credit portfolio. Previous studies by Zhao & Xu (2021), Orhangazi (2014), Blanchard et al. (2016) and Davis (2014) have shown the relationship and impact of capital flows on the expansion of bank credit. Along with that, the research of Rummondor & Bary (2020), Zhao & Xu (2021), Miranda & Rey (2015) have also shown a potential relationship between capital flows the bank's risk-taking behaviours.

We also decompose the total capital inflows into its components including foreign direct investment (FDI), portfolio investment (PI) and other investment (OI) according to the nature of capital flows from the background study of Calvo et al. (1993). Similar to previous studies, we scale capital inflows by the current GDP (see, e.g., Dinger & Kaat, 2020; Samarina & Bezemer, 2016). The research team expect to find a positive relationship of capital flow on credit growth and negative relationship risk provision ratio of banks in Vietnam in this study.

In addition, for bank-level variables, the authors use the logarithm of total asset (TA). We also add income diversification (incDiver), equity to assets ratio (ETA) and return on assets (ROA) due to the degree of income diversification and the return on assets ratio reflect financial performance through lending activities and the level of risk as well as the credit quality of the bank reflect through the ratio of capital to total assets. The macro variables consist of standard covariates including the real GDP Growth (GDGP) to proxy for the economic growth, the ratio of domestic bank credit to GDP (CreditGDP) to proxy for the structure of financial system the ratio of international trade to GDP (tradeGDP) to proxy for the financial openness (Dinger and von Hagen, 2009; Ioannidou et al., 2015) and the consumer price index reflecting the country's inflation rate (CPI). These indicators that reflect the general situation of the Vietnamese economy are used to research more universally and meaningfully.

3.3. Methodology

Referring to the two-step GMM model of Ali & Iness (2020), the authors use the systematic GMM estimation method (sys-GMM), due to the small size of sample. This is a method built on the assumption that there is no correlation between the errors, the variance of the error is constant, the instrumental variables have a significant effect, and that these changes have an impact on the correlation of the model. Therefore, the use of this estimation method reduces bias and controls the potential endogenous correlation between lagged dependent variable and regression errors.

The selection of instrumental variables in the model is re-tested through Sargan/Hansen statistics and Arellano-Bond statistics. Sargan/Hansen tests with hypothesis H_0 : the instrumental variable is strictly exogenous, that is, the instrumental variable is not correlated with the errors. The Arellano-Bond test is used to evaluate the series autocorrelation of numbers in terms of first difference. Therefore, the results of first order series autocorrelation of first order errors AR(1) are ignored while second order series autocorrelation of errors AR(2) is performed based on the differences. first order of errors to detect first order series autocorrelation of errors with hypothesis H_0 : no autocorrelation occurs.

3.4. Descriptive statistics

Table 1 lists variables based on criterias including mean, minimum and maximum values, as well as standard deviation. The average LoanGrowth is 4%, while the standard deviation is up to 12%, showing the

disparity in lending performance among Vietnamese banks. Similarly, the mean of the *llpRatio* ratio is 29% while the standard deviation of this variable is 52%, indicating that there is a big difference in the credit risk tolerance of commercial banks. Total capital inflow fluctuates quite strongly when standard deviation, minimum and maximum values of variable *CI* are 0.89; 0.9 and 5.76, in which, the component of other investments (*OI*) fluctuated the most with standard deviation of 0.77. In addition, the independent variables controlling for banking and macroeconomic characteristics are considered not to have significant differences.

Table 1. Descriptive statistics

| Variable | Mean | Std.dev | Min | Max |
|------------|-------|---------|-------|-------|
| LoanGrowth | 0.04 | 0.12 | -2.17 | 0.52 |
| llpRatio | 0.29 | 0.55 | -6.96 | 2.84 |
| CI | 2.41 | 0.89 | 0.9 | 5.76 |
| FDI | 1.5 | 0.27 | 0.85 | 1.99 |
| PI | 0.16 | 0.27 | -0.54 | 1.11 |
| OI | 0.75 | 0.77 | -0.44 | 3.74 |
| TA | 19.18 | 1 | 16.39 | 21.25 |
| IncDiver | 0.09 | 0.07 | -0.25 | 0.42 |
| ETA | 0.08 | 0.03 | 0.03 | 0.26 |
| ROA | 0 | 0 | -0.02 | 0.02 |
| GDPG | 0.06 | 0.02 | -0.06 | 0.08 |
| CPI | 0.06 | 0.05 | 0 | 0.23 |
| CreditGDP | 1.16 | 0.17 | 0.95 | 1.48 |
| TradeGDP | 0.41 | 0.07 | 0.26 | 0.57 |

Source: Authors' own calculation

Appendix B presents the correlation matrix between the variables in the research model. There is a serious multicollinearity problem found between *CI* and *OI* with a correlation coefficient of up to 90.5%. To increase the accuracy of the study, the authors include the variables of capital flows in the quantitative model in turn. Therefore, for each dependent variable, there will be 4 separate models for capital inflow variables (*M1*, *M2*, *M3* and *M4*). In addition, *TradeGDP* and *CreditGDP* have a positive correlation with each other expressed through the correlation coefficient 0.701, confirming that the openness of the economy contributes to increasing domestic credit to the private sector and vice versa. The remaining variables used in the study are correlated with each other in the range (-0.5; 0.5), showing that the possibility of multicollinearity is low.

4. Results and discussion

4.1. Baseline results

The baseline results about the general relationship between international capital inflows and the bank lendings in Vietnam is reported in table 2. For bank credit expansion, at 1% significance level, total capital inflows have a positive effect on loan growth and bank's credit risks with the regression coefficients are 1.435 and 2.315 respectively. This finding is consistent with the literature and state that international capitals can enhance the bank lending capacity (Kim and Yang, 2011; Borio and Disyatat, 2010; Dinger & Kaat, 2020), but may cause risk-taking in the Vietnamese banking system.

Related to the bank-specific variables, the results show that the higher capital- to- assets ratio is associated with the faster bank credit growth while the increase in *ROA* will lead to the decrease in loan growth and increase in the ratio of loan loss provisions over net interest income. From the set of macroeconomic variables, we observe that the bank lending will be improved with higher growth rate and lower credit risk-taking if the economy has high *GDPG*, which is in the line with Borio and Disyatat (2010). The financial openness *tradeGDP* is indicated to exposure The findings also indicates that the bank risk-taking exposures by the higher rate of financial openness *tradeGDP* and can be reduced by the higher *CPI* (Daniel and Jones, 2007).

After using the sys-GMM method to solve the potential endogenous problems, the Sargan test results confirm that the tools can be considered valid because the hypothesis H0 is accepted: the instrumental variable is not correlated with error term; Arellano-Bond test shows that the model is quite good because there is no autocorrelation between errors.

Table 2. Baseline results

| | loanGrowth | llpRatio |
|--------------------------|----------------------|----------------------|
| Loan _{t-1} | -0.267*** (0.099) | 0.007 (0.017) |
| CI | 1.435*** (0.497) | 2.315*** (0.806) |
| TA _{t-1} | 0.001 (0.002) | 0.015 (0.012) |
| incDiver _{t-1} | 0.040 (0.065) | -0.750 (0.481) |
| ETA _{t-1} | 0.472* (0.270) | -1.601 (0.981) |
| ROA _{t-1} | -3.044* (1.611) | 45.726* (23.630) |
| GDPG _{t-1} | 0.368*** (0.104) | -5.514*** (1.220) |
| CreditGDP _{t-1} | 0.016 (0.026) | -0.231 (0.151) |
| CPI _{t-1} | -0.073 (0.078) | -1.061*** (0.326) |
| TradeGDP _{t-1} | -0.167 (0.110) | 1.381*** (0.235) |
| N | 13 | 13 |
| Sargan test | 4.872 | 2.254 |
| AR test (2) | 0.275 | 0.671 |

Table 3 presents the Sys-GMM estimation results of the base equation (1). Dependent variable Loan_{i,t-1} is the credit growth rate or credit risk provision ratio to net interest income of bank *i*, in quarter *t*; The main regressor is the total capital inflows over the nominal GDP (CI); Bank_{i,j,t-1} and M_{i,j,t-1} are vectors representing control variables for bank characteristics and macroeconomic variables. The Sargan test is used to determine the appropriateness of the instrumental variables in the GMM estimator. AR (2) is the p-value of Arellano and Bond (1991) for first-order series autocorrelation of errors. The number in parentheses is the standard error. *, **, *** represent significance at 10%, 5%, and 1%, respectively.

Source: Authors' own calculation

4.2. Heterogenous impacts of different type of capital inflows

The authors decompose the capital inflows into the foreign direct investment (FDI), the portfolio investment (PI) and other investment (OI) inflows and report the regression results in Table 3. The first three columns cover results for the bank lending growth rate and the last three columns provide results for the loan loss provision ratio.

In terms of bank capacity, at 1% significance level, the regression coefficients of FDI and OI are positive while PI represents portfolio investment flows causing negative effects on credit expansion at banks. The results are found to be consistent with the reality of capital status of FDI enterprises in Vietnam and other developing markets. The amount of investment capital of these organizations does not only come from parent corporations or foreign bank loans, but most of the proportion is from credit loans at local banks. Besides, with the characteristics of OI mainly including loans and bank deposits, the large amount of OI capital will also help accelerate the growth of bank credit in Vietnam. This finding is consistent with the

results of the logit model in the study of Mirza et al (2021) when learning about the Indonesian commercial banking system and suggesting that the total capital inflow and the composition of FDI and OI have a positive and significant impact on the profitability of credit expansion of the Indonesian commercial banks. With the dependent variable *llpRatio* representing the bank's credit risk provision ratio to net interest income, the positive effect of other investment (OI) is shown, meanwhile, the relationship between the components of FDI, PI and the dependent variable was found to be not statistically significant. This contradicts the conclusion of Rummondor & Bary (2020) that PI is the most important factor in improving the risk-taking behavior of banks and the opinion that FDI can increase the stability of banks instead of other fluctuating flow forms by Ali & Iness (2020).

Among the bank-level variables, only the return on asset ROA is statistically significant in the model with the dependent variable *llpRatio*. The coefficients of this variable are all positive, showing that the more profitable commercial banks are, the more likely they are to face losses. At the 1% significance level, the regression coefficients of the GDPG and CPI variables both have a negative relationship with the credit risk provision ratio, showing that the risk reduction when the economy is growing well will reduce the bank risk. In addition, the openness of the economy expressed by the variable TradeGDP has a positive relationship with the dependent variable *llpRatio* at 1% significance level. The higher GDPG also relates to improve the lending capacity of the Vietnamese commercial banking system.

Table 3. Impacts of different capital inflows

| | Dependent variable: loanGrowth | | | Dependent variable: llpRatio | | |
|--------------------------|--------------------------------|----------------------|----------------------|------------------------------|----------------------|----------------------|
| | FDI | PI | OI | FDI | PI | OI |
| Loan _{t-1} | -0.269*** (0.100) | -0.270*** (0.102) | -0.266*** (0.100) | 0.008 (0.016) | 0.009 (0.016) | 0.007 (0.016) |
| Capital inflows | 4.959*** (1.524) | -2.970*** (0.869) | 1.538*** (0.545) | 3.591 (8.472) | -11.122 (9.867) | 3.466*** (0.943) |
| TA _{t-1} | -0.0001 (0.002) | 0.002 (0.002) | 0.002 (0.002) | 0.014 (0.014) | 0.016 (0.012) | 0.016 (0.012) |
| incDiver _{t-1} | 0.060 (0.063) | 0.044 (0.062) | 0.04 (0.066) | -0.739 (0.473) | -0.732 (0.467) | -0.757 (0.482) |
| ETA _{t-1} | 0.432 (0.264) | 0.485* (0.261) | 0.484* (0.267) | -1.619 (0.984) | -1.590 (0.996) | -1.579 (0.980) |
| ROA _{t-1} | -2.984* (1.597) | -2.586 (1.748) | -2.806* (1.629) | 46.032** (23.437) | 46.478** (23.584) | 45.870* (23.641) |
| GDPG _{t-1} | 0.555*** (0.159) | 0.883*** (0.180) | 0.490*** (0.124) | -5.093*** (1.183) | -4.252*** (1.617) | -5.442*** (1.155) |
| CreditGDP _{t-1} | -0.007 (0.030) | 0.051* (0.027) | 0.037 (0.030) | -0.236 (0.155) | -0.137 (0.173) | -0.193 (0.154) |
| CPI _{t-1} | 0.003 (0.074) | -0.013 (0.077) | -0.077 (0.076) | -0.979*** (0.306) | -0.917*** (0.299) | -1.088*** (0.328) |
| TradeGDP _{t-1} | -0.144 (0.114) | -0.283** (0.116) | -0.221* (0.125) | 1.369*** (0.285) | 1.062*** (0.282) | 1.283*** (0.225) |
| N | 13 | 13 | 13 | 13 | 13 | 13 |
| Sargan test | 3.937 | 6.477 | 2.068 | 3.417 | 3.161 | 2.094 |
| AR test (2) | 0.186 | 0.836 | 0.153 | 0.855 | 0.867 | 0.682 |

Table 3 presents the Sys-GMM estimation results of the base equation (1). Dependent variable $Loan_{i,t-1}$ is the credit growth rate or credit risk provision ratio to net interest income of bank i , in quarter t ; $CF_{j,t}$ are components of capital inflows to GDP ratios, including foreign direct investment (FDI), portfolio investment (PI) and other investment (OI); $Bank_{i,j,t-1}$ and $M_{i,j,t-1}$ are vectors representing control variables for bank characteristics and macroeconomic variables. The Sargan test is used to determine the appropriateness of the instrumental variables in the GMM estimator. AR (2) is the p-value of Arrelano and Bond (1991) for first-order series autocorrelation of errors. The number in parentheses is the standard error. *, **, *** represent significance at 10%, 5%, and 1%, respectively.

Source: Authors' own calculation

4.3. Robustness test - The impacts of Covid-19 pandemic

The Covid-19 pandemic, which broke out at the end of 2019, is a crisis for the world's health, thereby greatly affecting the economies of countries. For developing countries, especially in times of economic crisis, capital inflows fluctuate and affect the behavior of units in the financial market, especially banks. The study further explores the impact of capital flows on Vietnamese bank lending activities during the COVID-19 pandemic.

Table 4. Impacts of Covid-19 pandemic

| | Dependent variable: loanGrowth | | | | Dependent variable: llpRatio | | | |
|--------------------------|--------------------------------|----------------------|----------------------|----------------------|------------------------------|------------------------|----------------------|-----------------------|
| | CI | FDI | PI | OI | CI | FDI | PI | OI |
| Loan _{t-1} | -0.267*** (0.099) | -0.274*** (0.099) | -0.267*** (0.103) | -0.263*** (0.101) | 0.006 (0.018) | 0.004 (0.019) | 0.009 (0.017) | 0.003 (0.017) |
| Capital inflows | 1.292** (0.586) | 4.015** (1.865) | -0.468*** (1.555) | 1.456*** (0.563) | 0.705 (0.730) | -3.266 (9.007) | -12.385 (12.600) | 2.667*** (1.015) |
| Covid | -0.036* (0.021) | -0.137*** (0.039) | -0.029** (0.013) | -0.033*** (0.013) | -0.465*** (0.116) | -1.487*** (0.303) | 0.103* (0.054) | -0.166** (0.074) |
| TA _{t-1} | 0.002 (0.002) | 0.00001 (0.002) | 0.001 (0.002) | 0.002 (0.002) | 0.019* (0.012) | 0.019 (0.013) | 0.016 (0.013) | 0.023** (0.012) |
| incDiver _{t-1} | 0.044 (0.067) | 0.062 (0.065) | 0.055 (0.066) | 0.039 (0.068) | -0.725 (0.466) | -0.737 (0.459) | -0.729 (0.446) | -0.742 (0.480) |
| ETA _{t-1} | 0.471* (0.270) | 0.437 (0.271) | 0.481* (0.256) | 0.486* (0.265) | -1.615 (0.985) | -1.581 (0.980) | -1.603 (1.001) | -1.570 (0.974) |
| ROA _{t-1} | -3.051* (1.598) | -3.186** (1.611) | -2.343 (1.762) | -2.783* (1.619) | 44.978* (23.584) | 43.883* (23.273) | 46.813** (23.440) | 44.416* (23.927) |
| GDPG _{t-1} | 0.454* (0.256) | 1.115*** (0.424) | 0.574** (0.269) | 0.151 (0.263) | -1.230 (1.257) | 2.700 (1.761) | -2.808 (1.849) | -5.552*** (1.425) |
| CreditGDP _{t-1} | 0.019 (0.021) | -0.002 (0.029) | 0.077*** (0.019) | 0.054** (0.025) | -0.301** (0.154) | -0.271* (0.155) | -0.198 (0.182) | -0.13 (0.153) |
| CPI _{t-1} | -0.072 (0.080) | -0.006 (0.075) | 0.011 (0.081) | -0.078 (0.078) | -1.112*** (0.317) | -1.076*** (0.299) | -0.914*** (0.275) | -1.208*** (0.322) |
| TradeGDP _{t-1} | -0.183 (0.122) | -0.223* (0.132) | -0.268** (0.119) | -0.220 (0.138) | 0.837*** (0.184) | 0.326 (0.263) | 1.016*** (0.277) | 0.860*** (0.199) |
| CI*Covid | 2.256*** (0.776) | 10.668*** (3.149) | 4.069* (2.393) | 4.863*** (1.452) | 41.614*** (8.163) | 124.497*** (25.204) | 25.284 (19.642) | 77.577*** (14.743) |
| N | 13 | 13 | 13 | 13 | 13 | 13 | 13 | 13 |
| Sargan test | 1.346 | 3.220 | 5.162 | 1.225 | 1.349 | 0.160 | 1.553 | 0.128 |
| AR test (2) | 0.113 | 0.132 | 0.363 | 0.467 | 0.696 | 0.636 | 0.755 | 0.232 |

The robustness test results report in table 4 regarding the effect of capital flows on a bank's lending during Covid-19 in Vietnam. The dummy Covid is included and takes on the value 1 for the pandemic period (from 2020Q1 to 2021Q2). The variables included in the baseline were kept unchanged and additional explanatory variables were established, including the interaction variables in the CI*Covid form and still using the Sys-GMM estimate. The Sargan test is used to determine the appropriateness of the instrumental variables in the GMM estimator. AR (2) is the p-value of Arrelano and Bond (1991) for first-order series autocorrelation of errors. The number in parentheses is the standard error. *, **, *** denote significance levels at the 10%, 5%, and 1%, respectively.

Source: Authors' own calculation

The test results of Sargan and AR(2) show that the research model sys-GMM is reliable. It can be seen that the variable loanGrowth has a negative relationship with CI, FDI and OI while being negatively affected by PI. However, capital inflow during the Covid period has a positive impact on credit growth at Vietnamese commercial banks, as shown by the regression coefficients of the CF*Covid-type interactive variables are all positive and larger than the regression coefficient of capital inflow variables before Covid. This is explained by the argument that, during the Covid period, due to being heavily affected by the epidemic, domestic enterprises downsized or stopped operating, rarely needing loans to expand business production, leading to

bank credit growth reducing dependence on domestic. At that time, bank credit for projects with foreign elements helps to ensure safety for both borrowers and lenders.

With the dependent variable *llpRatio*, the total capital inflow, especially the 2 components FDI and OI, has a positive impact on lending risk in the presence of Covid, while no effect from PI is found. Besides, when Covid occurs, the risk of credit loss has a positive relationship with ROA and a negative relationship with CPI variable. This result means that when the Vietnamese economy is adversely affected by the Covid epidemic, capital flows from outside, especially FDI inflows (regression coefficient is 124,497 at 1% significance level) increase credit risk at commercial banks because at this time, credit almost entirely depends on external factors.

5. Conclusion and recommendation

The research results bring meaning and new findings in the relationship between capital flows and credit activities at banks, especially in the context of a developing economy like Vietnam. For the development of bank loans, most of the capital inflows into Vietnam have a positive impact on the bank's lending activities. With the general economy still vulnerable, the research team found a positive impact of economic growth on the ability to expand credit activities of banks. Simultaneously, the bank's provision for credit risks was also found to have a positive relationship with the bank's profitability. Therefore, from the perspective of bank administrators, individual bank should raise the level of provision for loan risks in proportion to the growth in profitability of the bank to ensure that risks can be controlled. GDP and CPI are also found to have an inverse relationship with the credit provision ratio. Thereby, it can be seen that a good economy will create conditions for banks and the main activities of credit institutions: lending, developing well with little risk.

In addition, when examining the relationship of capital flows to banks' lending activities during the COVID-19 pandemic, the research team believes that bank managers need to pay special attention to added to the bank's risk as the bank's credit growth mainly depends on foreign capital inflows, especially for large banks. In the context that the economy still has many weaknesses and is susceptible to external influences, banks need to pay attention to the level of risks they are facing, thereby minimizing negative effects on not only banks but also for the whole economy. Therefore, it is also the responsibility of the Government and functional agencies, to update legal documents in accordance with the actual situation to monitor and prevent non-standard acts, which may cause problems. bring risks to the bank itself and the whole domestic system. Furthermore, the Government and functional agencies also need to create conditions and improve economic development, in parallel with the development of the banking system.

Appendix A. List of Vietnamese banks in the research

| STT | Bank name | Stock code |
|-----|------------------------------------------------------------------------|------------|
| 1 | Asia Commercial Joint Stock Bank | ACB |
| 2 | Joint stock Commercial Bank for Investment and Development of Viet Nam | BID |
| 3 | Vietnam Joint Stock Commercial Bank for Industry And Trade | CTG |
| 4 | Vietnam Export Import Bank | EIB |
| 5 | Ho Chi Minh City Development Joint Stock Commercial Bank | HDB |
| 6 | Military Commercial Joint Stock Bank | MBB |
| 7 | National Citizen Commercial Joint Stock Bank | NVB |
| 8 | Saigon-Hanoi Commercial Joint Stock Bank | SHB |
| 9 | Saigon Thuong Tin Commercial Joint Stock Bank | STB |
| 10 | Technological and Commercial Join-stock Bank | TCB |
| 11 | Tien Phong Commercial Joint Stock Bank. | TPB |
| 12 | Joint Stock Commercial Bank for Foreign Trade of Vietnam | VCB |
| 13 | Vietnam Prosperity Joint- Stock Commercial Bank | VPB |

Appendix B. Correlation matrix

| | CI | FDI | PI | OI | loanGrowth | llpRatio | TA | ETA | incDiver | ROA | GDPG | CPI | creditGDP | tradeGDP |
|------------|--------|--------|--------|--------|------------|----------|--------|--------|----------|--------|--------|--------|-----------|----------|
| CI | 1.000 | | | | | | | | | | | | | |
| FDI | 0.461 | 1.000 | | | | | | | | | | | | |
| PI | 0.274 | 0.017 | 1.000 | | | | | | | | | | | |
| OI | 0.905 | 0.182 | -0.037 | 1.000 | | | | | | | | | | |
| loanGrowth | 0.147 | 0.121 | -0.029 | 0.137 | 1.000 | | | | | | | | | |
| llpRatio | 0.017 | 0.084 | -0.093 | 0.021 | -0.174 | 1.000 | | | | | | | | |
| TA | -0.030 | 0.093 | -0.040 | -0.053 | -0.166 | 0.279 | 1.000 | | | | | | | |
| ETA | -0.031 | -0.050 | -0.010 | -0.015 | 0.068 | -0.085 | -0.401 | 1.000 | | | | | | |
| incDiver | 0.079 | 0.179 | -0.001 | 0.031 | 0.073 | 0.079 | 0.291 | 0.205 | 1.000 | | | | | |
| ROA | 0.052 | 0.097 | 0.071 | 0.004 | 0.078 | -0.184 | 0.134 | 0.354 | 0.470 | 1.000 | | | | |
| GDPG | 0.412 | 0.232 | 0.255 | 0.309 | 0.246 | -0.247 | -0.086 | -0.102 | 0.006 | -0.089 | 1.000 | | | |
| CPI | 0.025 | -0.114 | 0.139 | 0.021 | 0.011 | -0.170 | -0.290 | 0.089 | -0.240 | 0.074 | -0.010 | 1.000 | | |
| creditGDP | -0.066 | 0.207 | -0.030 | -0.138 | -0.103 | 0.151 | 0.430 | -0.167 | 0.285 | 0.145 | -0.042 | -0.430 | 1.000 | |
| tradeGDP | 0.051 | 0.170 | -0.118 | 0.041 | -0.044 | 0.159 | 0.400 | -0.192 | 0.219 | -0.010 | 0.238 | -0.485 | 0.701 | 1.000 |

Source: Authors' own calculation

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STOCK MARKET REACTION TO COVID-19 PANDEMIC: EVIDENCE FROM AN EMERGING MARKET

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ABSTRACT

This paper examines the reaction of the Vietnamese stock market toward the COVID-19 pandemic through the GARCH (1,1) model. Specifically, this study examines how the number of COVID-19 infection cases and deaths in Vietnam affects the volatility of VN-Index, VN30-Index, HNX-Index and HNX30-Index during the period from January 1, 2020 to March 31, 2022. After controlling the trading volume variables and day-of-the-week effect, the results indicate that the number of COVID infection cases in Vietnam has a negative impact on the mean returns and positive impact on the volatility of the Vietnamese stock market, and significant from 5% to 1%. On the other hand, the figures for that of COVID deaths in Vietnam are statistically insignificant. Furthermore, the results confirmed the mean-reverting process for all market indices.

Keywords: COVID-19, Stock market reaction, GARCH

1. Introduction

By the end of 2019, the globe was surprised by an unknown disease that damages the respiratory system. This disease originally occurred in Wuhan city, Hubei province of China, and has spread throughout the world to this day. It was initially identified as the new coronavirus (i.e., 2019-nCoV), but on March 11, 2020, the World Health Organization (WHO) declared it a pandemic and named it coronavirus disease 2019 (COVID-19). This pandemic is not only a global health crisis but also a major global economic recession. The harsh measures imposed, such as closing borders, sealing off cities, stay-at-home orders, and lockdowns severely hit many countries' economies and financial markets. The situation generated by COVID-19, both in terms of the outbreak's spread and severity, as well as the government's response, creates economic uncertainty and significant financial losses. Market volatility reflects investors' reactions to such a crisis (Ali et al. 2020; Ashraf 2020; Baker et al. 2020; Mzoughi et al. 2020; Shanaev et al. 2020; Sharif et al. 2020).

Volatility in the stock market is a major concern in equity markets around the world, attracting massive attention from both researchers and investors. Because there are numerous issues with an unexpected market crash arising from a political or financial crisis, most emerging equities markets are typically characterized by high price volatility. In times of crisis, such as the Asian financial crisis of 1997 and the global financial crises, higher stock price volatility and its effects on investors in emerging economies are evident. Examining stock price volatility to gain a better understanding is, thus, a fascinating topic on its own merit. Stock returns are usually extremely volatile, which means that their values fluctuate quickly and variably over time. In most circumstances, the greater the volatility, the higher the risk.

A growing number of studies are looking at the effects of the pandemic outbreak on major financial markets but overlooking the developed markets. However, there is a shortage of research on countries that have a rapidly growing emerging market or have successfully controlled the disease outbreak, and there is little research on those economies demonstrating signs of recovery in the stock market, such as Vietnam. Therefore, this study attempts to measure the stock market volatility throughout the Vietnamese stock market during the COVID-19 pandemic. In addition, until now, when the world has come to the third year of the

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pandemic and the COVID vaccine has been widely vaccinated in Vietnam as well as the whole world. How has the stock market reacted?

This research uses the daily closing prices and trading volumes of four main indices (VN-Index, VN30-Index, HNX-Index and HNX-30 Index) in two exchanges (HOSE and HNX) on Vietnam's stock market covering the period from January 1, 2020 to December 31, 2022 and the daily number of COVID-19 confirmed cases as well as deaths in Vietnam from January 23, 2020 (the first day of confirmed COVID-19 case) to March 31, 2022. In this study, the reaction of the Vietnam stock market during the COVID-19 pandemic is evaluated by the GARCH (1,1) model. I expect that the international community, authorities, and economic agents can use these empirical findings to prepare for unwanted circumstances, especially pandemics. Additionally, this research can contribute to the academic literature on the stock market and financial system stability.

2. Literature review

Stock price volatiles over time according to current conditions and information. Changes in stock prices can be influenced by both internal and external factors. The outbreak of a disease is a type of negative news that can impact prices in the stock market. The impact of various diseases such as SARS, H7N9, Ebola on stock market performance has been studied in the past. The majority of findings show the significant negative impact of diseases on global's stock market. Most recently, the occurrence of COVID-19 has created a serve turmoil in the global economic activity (Baldwin & Di Mauro, 2020), and being expected to be the largest economic shock in human history (Insaideo et al. 2021). Broadly, Xu (2021) noticed an adverse effect of a rise in the COVID-19 cases on the financial market and besides some publications show no significant impact of COVID-19 to the financial market (Onali 2020; Takyi and Bentum-Ennin 2020), the negative impacts of the disease outbreaks on stock markets worldwide have been documented in various studies. Specifically, the stock market dropped sharply as a result of frantic stock price reactions to COVID-19.

Albulescu (2020) aims to find out if the number of COVID-19 cases and the related death rates inside and outside China have had an impact on the financial market volatility index (VIX). He finds that only new cases outside of China impacted the VIX when he runs a simple regression on data from January 20, 2020, to February 28, 2020. He also discovered that the death rate influenced the VIX in a positive and significant way. The spread of COVID-19 raises financial market volatility, according to other findings of this study.

Baker et al. (2020) discovered that stock market volatility was higher during the COVID-19 pandemic than it was during the Spanish flu pandemic in 1918–1919 and the influenza pandemics in 1957–1958 and 1968 by evaluating stock market movement in the United States from 1900 to April 2020. During the outbreak of COVID-19, stock market volatility in the United States was substantially higher than during the outbreaks of any other diseases such as bird flu, SARS, Middle East respiratory syndrome, and Ebola. According to the study, the government limitations on commercial activity and restrictions on consumers are the major reasons for increased volatility.

Sharma (2020) also shows that COVID-19 infects stock price volatility, but the effect differs by nation, with the stock market in high-income countries initially overreacting and rebounding faster than the stock market in low-income countries. Engelhardt et al. (2020) suggested that stock price volatility trends in response to COVID-19 depend on confidence: low volatility occurs in high confidence countries. The traditional GARCH model was used to test stock volatility with indicators based on stock price behavior and past volatility (Endri et al., 2020; Gokcan, 2000; Emenogu et al., 2020). Fakhfekh et al. (2021) also used the GARCH model to examine the dynamics of Tunisia's sectoral stock market index volatility during COVID-19. In order to examine return volatility on the Malaysian and Singapore stock exchanges, Yong et al. (2021) use a variety of GARCH models, including the GARCH, PGARCH, EGARCH, TGARCH, and GARCH-M standards. Using daily closing price data from the stock market index from July 1, 2019 to August 31, 2020, the event period is separated into two parts: before and during the COVID-19 epidemic. Empirical evidence shows that both stock markets have persistence, and that persistence has diminished during the pandemic. According to empirical study, volatility persistence increases after COVID-19 across all series.

Zaremba et al. (2020) examine that if the government responds to COVID-19, it mitigates international stock market volatility. They provide evidence of the countries where governments take rigorous actions to curb the spread of COVID-19, which causes an increase in stock market volatility. Measures may include the information campaigns and termination of public events. In addition, Onali (2020) reports that the U.S. stock market's volatility increases in response to the increase in positive cases and deaths in multiple countries. There is potential for variation in volatility across industries, for example, higher rated Environmental and Social firms exhibit lower stock return volatility (Albuquerque et al., 2020). Specifically, Haroon and Rizvi (2020) examine whether COVID-19 news coverage causes volatility shifts. Changes in volatility are identified, with the most significant influence on transportation, automobile, energy and travel & leisure industries. However, the majority of the industries they investigated showed no substantial changes in volatility as a result of media coverage and news sentiment.

Research in Vietnam, among others, was carried out by Dao and Christopher (2020); Hung, Hue and Duong (2021). Anh et al. (2020) demonstrates that the daily increase of COVID-19 cases has a negative influence on stock returns in Vietnam. The analysis also reveals that the stock market in Vietnam behaved differently before and after the nationwide lockdown. Though COVID-19 had a large negative impact on Vietnam's stock returns before the lockdown, the lockdown period had a significant positive impact on the overall market and several economic sectors in Vietnam. During the COVID-19 epidemic, the financial sector was the hardest damaged on the Vietnam stock market. Hung et al. (2021) studied the impacts of COVID-19 on the performance of the Vietnamese Stock Market, using a random-effect model (REM) on panel data of stock returns of 733 listed companies on both HOSE and HNX from 2 January 2020 to 13 December 2020. According to the findings, the number of daily COVID-19 confirmed cases in Vietnam has a negative impact on the market's stock returns. When compared to the impact during the lockdown period, the pre-lockdown and second-wave impacts were more severe. The effects varied by industry, with the financial sector being the most impacted. The financial sector was expected to absorb some of the negative shocks affecting the real sector due to strong government control and influence over the bank-dominated financial system. During the pandemic, stock market movements reflected these expectations.

According to Vo et al. (2021), the figure for global COVID-19 cases and deaths has a stronger influence on the Vietnamese stock market volatility compared to that of Vietnam COVID data during the period from January 31, 2020 to March 16, 2021. What is more, the impact of the number of COVID-19 infections is clearer and greater than the number of deaths. This empirical study also mentions that through the quick, timely and drastic implementation of social distancing, isolation, epidemic prevention measures and the implementation of the message "5K" in the community, Vietnam has achieved success in fighting against the epidemic, thereby reducing the impact on the stock market. Besides, Matthew S. Yiu and Andrew Tsang (2021) find that the global COVID-19 development has more impact on the ASEAN5 (including Vietnam) stock market daily returns than that of the local COVID-19 situation. In general, the COVID-19 development does not increase the volatility of ASEAN5 stock markets during the pandemic in 2020 but for a longer sample period, the empirical results show that the current pandemic has a significant impact on the returns and volatilities of the ASEAN5 stock markets. Moreover, the findings suggest that a loose monetary policy of the regional authorities could help in reducing the stock market volatility during the pandemic. In addition, Izani et al. (2020) study results ascertain that market volatilities are affected by domestic events, notably, the COVID-19 government intervention measures. In most sample countries, the government measures significantly reduce market volatility in the domestic equity markets. Specifically, the Vietnam equity market has low volatility over the short and medium-term horizons and low, medium, and high volatility over the medium and long-term horizons. However, the government measures on the Vietnamese ground appear to significantly reduce market volatility. Moreover, international events have also triggered market volatilities. Xue Gao et al. (2021); Ning et al. (2021) also reveals the same conclusion.

3. Methodology

In this study, the GARCH model (1,1) with robust standard errors is used to assess the impact of COVID-19 on Vietnam stock market returns and volatility when controlling for the effect of the trading volume factor and the week-day effect (control variables). Market returns are measured through the return of 4 main indices in the Vietnam market: VN-Index, VN30, HNX-Index, HNX30. Market volatility is measured by the variance of the returns of these indices after controlling for the impact of COVID-19 and control

variables related to trading volume and week-day effects. Specifically, the estimated model is presented in the conditional mean equation (1) and the conditional variance equation (2) below:

$$y_t = \alpha_0 + \alpha_1 X_t + \alpha_2 \text{Volumes}_t + \sum \beta_i D_i + \epsilon_t \quad (1)$$

$$\sigma_t^2 = \exp(\lambda_0 + \lambda_1 X_t) + \gamma_0 \epsilon_{t-1} + \gamma_1 \sigma_{t-1}^2 \quad (2)$$

Where y_t and Volumes_t are the first-difference of the price and trading volume (in logs) of the VN-Index, VN30-Index, HNX-Index and HNX30-Index at time t , respectively, ϵ_t are the innovations, σ_t^2 is the conditional variance, and D_i are day-of-the week dummies. The variables related to Vietnam's COVID-19 reported cases and deaths are represented by X_t , which is calculated by taking to the first-difference in $\ln(1+x_t)$, where \ln represents the natural logarithm function and x_t is either the cumulative (i.e., since records began) reported number of cases (COVID Cases) or the cumulative reported number of deaths (COVID Deaths) at time t . Importantly, the impact of COVID-19 cases and deaths is estimated by extending the common GARCH(1,1) model with a multiplicative heteroscedasticity component (Harvey (1976), Judge et al. (1985)).

Equation (1) is the conditional mean equation, estimating the impact of COVID-19 and controlled variables on the Vietnam stock market - expressed by the y_t variable; equation (2) is the conditional variance equation, estimating the impact of COVID-19 on the Vietnam stock market volatility - measured by the σ_t^2 variable. σ_t^2 is the conditional variance of estimated error ϵ_t from equation (8).

This study examines the effects of the COVID-19 pandemic on daily four main stock indices. The daily stock data start from 02 January 2020, which was the first trading day of the Vietnam stock market in 2020. The end date of the daily stock data is 31 March 2022. The stock index prices and volumes are collected from <https://www.investing.com/>. The daily number of confirmed cases and deaths in Vietnam are from the World Health Organization - WHO's website (<https://www.who.int/>) for the COVID-19 update. In total, there are 1,113 observations in the study.

The returns of all the market indices were calculated through the natural log difference approach using the below formula:

$$R_{at} = \ln\left(\frac{p_{at}}{p_{a,t-1}}\right)$$

where R_{at} is the daily logarithmic returns of index a ; P_{at} is the price of index a at the end of the day t and $P_{a,t-1}$ is the price of the index a at the end of the day $t-1$.

4. Empirical Results and Discussions

4.1. Empirical results

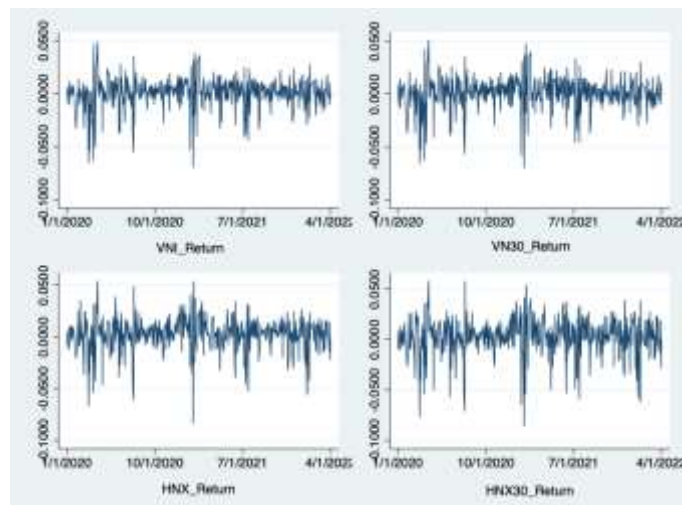


Figure 4. 1. Time plot of daily returns of all indices

(January 2020-March 2022)

Figure 4.1 shows the daily returns of all the indices over the period from January 2020 to March 2022. It can be seen from graphs that all four indices fluctuated during the research period. There were periods when all indices dropped tremendously such as the period between middle March – early April, 2020; end of July – early August, 2020; March 2021, July 2021, corresponding to new community outbreaks in Vietnam.

The graphs in **Figure 4.1** provide an insight into the volatility during the current coronavirus period with all Vietnam’s market indices taken into consideration. Furthermore, all the graphs seem to exhibit volatility clustering, which occurs when a period of high volatility is followed by further high volatility period, and a period of low volatility is followed by further low volatility one (Mandelbrot, 1963). Therefore, volatility in the current period will affect future periods of volatility. Furthermore, all return series seem to be mean reverting, which signifies stationarity.

Table 4.1. The impact of the number of COVID-19 cases and deaths on the VN Index from January 1, 2020 to March 31, 2022.

$$y_t = \alpha_0 + \alpha_1 X_t + \alpha_2 \text{Volumes}_t + \sum \beta_i D_i + \epsilon_t \quad (1)$$

$$\sigma_t^2 = \exp(\lambda_0 + \lambda_1 X_t) + \gamma_0 \epsilon_{t-1} + \gamma_1 \sigma_{t-1}^2 \quad (2)$$

| Particulars | VN Index | HET | ARCH | VN Index | HET | ARCH |
|-----------------|-----------------------|------------------------|--------------------|-----------------------|-------------------------|--------------------|
| VNI_Vol | -0.0007 (-3.14)*** | | | -0.0007 (-3.13)*** | | |
| COVID Cases | -0.0194 (-3.92)*** | 8.2044 (8.41)*** | | | | |
| COVID Deaths | | | | .01151 (1.56) | -1.2918 (-0.15) | |
| ARCH Effect | | | .2140 (4.84)*** | | | .2297 (4.04)*** |
| GARCH Effect | | | .6550 (5.80)*** | | | .5426 (5.16)*** |
| Constant | .0018 (2.11)** | -9.2982 (-60.64)*** | | .0014 (1.66)* | -11.3984 (-12.19)*** | |
| Weekday dummies | YES | NO | NO | NO | NO | NO |

Notes: The column VN Index reports the results for the conditional mean equation. The column ARCH reports the results for the conditional variance equation, where ARCH Effect is ϵ_{t-1} in eq. (1) and GARCH Effect is σ_{t-1}^2 in eq. (2). The column HET reports the results for λ_0 and λ_1 . Figures in () indicate the value of Z-statistics.

*** Significant at 1% level; ** significant at 5% level; * significant at 10% level.

Table 4.1 presents the impact of the COVID variables in terms of confirmed cases and deaths in Vietnam on the VN-Index. The results reveal that in the mean equation, while the daily increase in the number of COVID-19 confirmed cases in Vietnam (COVID Cases) is negatively associated with the VN-Index returns at 1% significance level, the figure for COVID deaths are found statistically insignificant for the VN-Index returns. Moreover, the trading volume variable (VNI_Vol) is negative and significant at 1%.

In terms of the conditional variance equation, the coefficient of COVID cases variable is 8.204447 and significant at 1% level, indicating that the number of COVID cases in Vietnam increase the volatility of VN-Index. Moreover, both coefficients of ARCH and GARCH terms are positive and statistically significant at 1%, which means that previous days VN-Index returns information affect the volatility of VN-Index and

previous days variance of VN-Index returns can influence today's volatility of this indices. However, the coefficient on total deaths (COVID Deaths) is insignificant for the VN-Index volatility.

Table 4.2. The impact of the number of COVID-19 cases and deaths on the VN30 Index from January 1, 2020 to March 31, 2022.

$$y_t = \alpha_0 + \alpha_1 X_t + \alpha_2 \text{Volumes}_t + \sum \beta_i D_i + \epsilon_t \quad (1)$$

$$\sigma_t^2 = \exp(\lambda_0 + \lambda_1 X_t) + \gamma_0 \epsilon_{t-1} + \gamma_1 \sigma_{t-1}^2 \quad (2)$$

| Particulars | VN30 Index | HET | ARCH | VN30 Index | HET | ARCH |
|-----------------|---------------------|------------------------|--------------------|--------------------|------------------------|--------------------|
| VN30_Vol | .0093 (4.59)*** | | | .0097 (4.81)*** | | |
| COVID Cases | -.0350 (-2.56)** | 5.2601 (6.46)*** | | | | |
| COVID Deaths | | | | .0124 (1.06) | -.53664 (-0.09) | |
| ARCH Effect | | | .3280 (5.65)*** | | | .2656 (4.78)*** |
| GARCH Effect | | | .2289 (2.34)** | | | .6089 (4.97)*** |
| Constant | .0016 (1.40) | -9.6931 (-45.59)*** | | .0008 (0.69) | -11.1273 (-9.21)*** | |
| Weekday dummies | YES | NO | NO | NO | NO | NO |

Notes: The column VN30 Index reports the results for the conditional mean equation. The column ARCH reports the results for the conditional variance equation, where ARCH Effect is ϵ_{t-1} in eq. (1) and GARCH Effect is σ_{t-1}^2 in eq. (2). The column HET reports the results for λ_0 and λ_1 . Figures in () indicate the value of Z-statistics.

*** Significant at 1% level; ** significant at 5% level; * significant at 10% level.

A similar pattern can be seen in **Table 4.2** when the COVID cases variable affects the VN-30 index in both equations, conditional mean and conditional variance. It impacts negatively on the conditional mean and positively on the conditional variance equation, with 5% and 1% significant respectively. The results also reveal the negative relationship between the number of daily deaths and the returns on VN30-Index, however, is found statistically insignificant. It is due to the characteristics of the data used in the model. That is, the COVID-19-related deaths recorded in Vietnam are relatively low, and most of them occurred in the elderly or those with preexisting morbidity. Furthermore, the trading volume variable (VNI_Vol) is positive and significant at 1% level. The coefficients for ARCH and GARCH terms are also positively statistically significant, indicating that the fluctuation for VN30-Index is influenced by historical news and volatility.

Table 4.3. The impact of the number of COVID-19 cases and deaths on the HNX Index from January 1, 2020 to March 31, 2022.

$$y_t = \alpha_0 + \alpha_1 X_t + \alpha_2 \text{Volumes}_t + \sum \beta_i D_i + \epsilon_t \quad (1)$$

$$\sigma_t^2 = \exp(\lambda_0 + \lambda_1 X_t) + \gamma_0 \epsilon_{t-1} + \gamma_1 \sigma_{t-1}^2 \quad (2)$$

| Particulars | HNX Index | HET | ARCH | HNX Index | HET | ARCH |
|-----------------|----------------------|------------------------|--------------------|-------------------|-------------------------|--------------------|
| HNX_Vol | .0111 (6.18)*** | | | .0117 (6.69)*** | | |
| COVID Cases | -.0388 (-2.62)*** | 4.3167 (3.77)*** | | | | |
| COVID Deaths | | | | .01275 (1.33) | -69.4958 (-0.76) | |
| ARCH Effect | | | .4401 (7.04)*** | | | .3206 (5.77)*** |
| GARCH Effect | | | .0383 (0.52) | | | .5736 (8.09)*** |
| Constant | .0036 (2.92)*** | -9.2224 (-60.43)*** | | .0026 (2.49)** | -10.7320 (-19.74)*** | |
| Weekday dummies | YES | NO | NO | NO | NO | NO |

Notes: The column HNX Index reports the results for the conditional mean equation. The column ARCH reports the results for the conditional variance equation, where ARCH Effect is ϵ_{t-1} in eq. (1) and GARCH Effect is σ_{t-1}^2 in eq. (2). The column HET reports the results for λ_0 and λ_1 . Figures in () indicate the value of Z-statistics.

*** Significant at 1% level; ** significant at 5% level; * significant at 10% level.

The effect of the COVID-19 variables to the HNX-Index is shown in **Table 4.3**. Similar to the results for the VN-Index and the VN30-Index, the number of COVID-19 confirmed cases has a negative impact on the returns of the HNX-Index, with the significant at 1%. Moreover, total cases also raise the volatility of the HNX-Index since the coefficient is 4.31667 and significant at 1% level. The coefficients on total deaths (COVID Deaths) are, on the other hand, insignificant for both the conditional mean and the conditional variance equation. Which means that the HNX-Index is not affected by the number of COVID deaths in Vietnam. Moreover, the trading volume variable (HNX_Vol) is positive and significant at 1% level.

Table 4.4. The impact of the number of COVID-19 cases and deaths on the HNX 30 Index from January 1, 2020 to March 31, 2022.

$$y_t = \alpha_0 + \alpha_1 X_t + \alpha_2 \text{Volumes}_t + \sum \beta_i D_i + \epsilon_t \quad (1)$$

$$\sigma_t^2 = \exp(\lambda_0 + \lambda_1 X_t) + \gamma_0 \epsilon_{t-1} + \gamma_1 \sigma_{t-1}^2 \quad (2)$$

| Particulars | HNX30 Index | HET | ARCH | HNX30 Index | HET | ARCH |
|-------------|--------------------|-----|------|--------------------|-----|------|
| HNX30_Vol | .0099 (5.17)*** | | | .0097 (5.22)*** | | |

| | | | | | | |
|-----------------|-------------------|------------------------|--------------------|-------------------------|--------------------|----|
| COVID Cases | -0.175 (-0.99) | 3.6663 (3.83)*** | | | | |
| COVID Deaths | | | .0178 (1.24) | -1.9735 (-0.29) | | |
| ARCH Effect | | | .2738 (4.76)*** | | .2539 (4.62)*** | |
| GARCH Effect | | | .3477 (2.66)*** | | .5752 (4.85)*** | |
| Constant | .0039 (2.59)** | -9.3364 (-25.31)*** | .0034 (2.45)** | -10.1887 (-13.99)*** | | |
| Weekday dummies | YES | NO | NO | NO | NO | NO |

Notes: The column HNX30 Index reports the results for the conditional mean equation. The column ARCH reports the results for the conditional variance equation, where ARCH Effect is ϵ_{t-1} in eq. (1) and GARCH Effect is σ^2_{t-1} in eq. (2). The column HET reports the results for λ_0 and λ_1 . Figures in () indicate the value of Z-statistics.

*** Significant at 1% level; ** significant at 5% level; * significant at 10% level.

As can be seen from **Table 4.4** that the coefficient on the COVID cases variable (COVID Cases) is found negative yet statistically insignificant. However, in the conditional variance equation, the number of COVID cases is the significant and positive influence on multiplicative heteroscedasticity (as reported in the column named "HET"), implying the statistically significant impact of the infection cases on the volatility of HNX30 returns. The coefficients on Total deaths (COVID Deaths), are insignificant in either the conditional mean or the conditional variance equation. The results of ARCH and GARCH effect are positive and significant at 1% level, indicating that past news and variance affect current volatility.

4.2. Discussion

In terms of the impact of COVID-19 on the Vietnam stock market, the result indicates that the number of COVID cases affect negatively to the mean returns in all indices at 5% to 1% level of significance, except for the HNX30-Index but the value is still less than zero. This is because of the undeniable severe impact of the pandemic on all aspects in not only Vietnam but globally. Specifically, the Vietnam stock market experienced a dramatic drop in the stock prices during the period of middle March – early April, 2020; end of July – early August, 2020; end of January – early February, 2021; July 2021, corresponding to new community outbreaks in Vietnam. Furthermore, COVID cases are positively and significantly related to the stock market volatility in the context of the Vietnam market, implying that the growth in the daily COVID confirmed cases leads to an increase in the Vietnam stock market volatility. The results for COVID deaths variable, on the other hand, have no statistically significant impact on the mean returns as well as the volatility in all indices of the Vietnam stock market for the entire period from January 1, 2020 to March 31, 2022. The reason for that is because of the low rate of mortality compared to the rate of cases and most of deaths occurred to those who are in the elderly or have background health problems. It can also be seen from the outcomes that the coefficients for ARCH and GARCH effects are positive and significant at 1% and 5% in all indices. Which means that the volatility of the Vietnam stock market is influenced by historical news and fluctuations.

According to Vo et al. (2021), the figure for global COVID-19 cases and deaths has a stronger influence on the Vietnamese stock market volatility compared to that of Vietnam COVID data during the period from January 31, 2020 to March 16, 2021. What is more, the impact of the number of COVID-19 infections is clearer and greater than the number of deaths. This empirical study also mentions that through

the quick, timely and drastic implementation of social distancing, isolation, epidemic prevention measures and the implementation of the message "5K" in the community, Vietnam has achieved success in fighting against the epidemic, thereby reducing the impact on the stock market. Besides, Matthew S. Yiu and Andrew Tsang (2021) find that the global COVID-19 development has more impact on the ASEAN5 (including Vietnam) stock market daily returns than that of the local COVID-19 situation. In general, the COVID-19 development does not increase the volatility of ASEAN5 stock markets during the pandemic in 2020 but for a longer sample period, the empirical results show that the current pandemic has a significant impact on the returns and volatilities of the ASEAN5 stock markets. Moreover, the findings suggest that a loose monetary policy of the regional authorities could help in reducing the stock market volatility during the pandemic. In addition, Izani et al. (2020) study results ascertain that market volatilities are affected by domestic events, notably, the COVID-19 government intervention measures. In most sample countries, the government measures significantly reduce market volatility in the domestic equity markets.

5. Conclusion and Implications

This paper examines the impact of COVID-19 on the volatility of the Vietnamese stock market through the GARCH (1,1) model. Specifically, this study examines how the number of COVID-19 infection cases and deaths in Vietnam affects the volatility of VN-Index, VN30-Index, HNX-Index and HNX30-Index during the period from January 1, 2020 to March 31, 2022. After controlling the trading volume variables and day-of-the-week effect, the results indicate that the number of COVID infection cases in Vietnam has a negative impact on the mean returns and positive impact on the volatility of the Vietnamese stock market, and significant from 5% to 1%, while the figures for that of COVID deaths in Vietnam are statistically insignificant. This might be because the COVID-19-related deaths recorded in Vietnam are relatively low owing to the wide coverage of vaccines, and most deaths occurred in the elderly or those with pre-existing diseases. Moreover, the changes in trading volume also affect all the index returns. The VN-Index witnesses the strongest impact of the COVID variables since it is considered as the major stock index in the Vietnam market. It can be further stated from the research outputs that all four indices witness a mean-reverting procedure as the sum of the ARCH and GARCH coefficients are positive and lower than one. As the received outcome shows a mean reversion procedure in all the Vietnam stock exchanges, the stock returns of all indices return back to the previous mean values after a certain period of time.

This study is significant because understanding the consequences of the current epidemic allows governments, policymakers, and asset managers to take timely and effective measures in order to protect stock markets from severe deterioration. In addition, the empirical findings may help investors and risk practitioners in identifying, analyzing and modifying their trading methods to make their investment decisions.

Since this study examines the impact of the COVID-19 pandemic on the Vietnamese stock market volatility, the collected data related to COVID variables are only limited in the context of Vietnam, which does not consider the information of the COVID-19 around the world. Secondly, though the application of the GARCH (1,1) model handles most of the disadvantages of previous research methods, various control variables can be added to the model to give better insights about the results. Moreover, the research has the potential to expand by including the consideration of more robust techniques and asymmetric volatility models such as threshold ARCH (TARCH), which include signs indicating the invention of volatilities that can influence the variation of stock returns, as well as investigate the stock market integration.

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HERD BEHAVIOR IN VIETNAMESE STOCK MARKET DURING COVID-19 PANDEMIC: THE INFLUENCES OF GOVERNMENT POLICIES

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ABSTRACT

The COVID-19 pandemic has caused severe damage to several aspects of Vietnam, and the Vietnamese stock market is no exception. The fluctuations in the market are predicted to affect investor sentiment, making them more inclined to herd. Therefore, we examine the behavior of Vietnamese stock market participants to test the existence of herd behavior during the pandemic from 2020 to 2021, based on the model of Chang et al. (2000) and with modifications proposed by Yao et al. (2014). Using the data collected from OxCGR, this paper aims to investigate whether there was herding during four waves of the COVID-19 pandemic in Vietnam. In addition, due to the fact that the Vietnamese government coped well with Corona viruses, we analyze government policy's effect on the market by using three policy indexes, including Stringency Index, Containment and Health Index, Economic Support Index. We find evidence of herd behavior in the stock market from 2020 to 2021 along with a significant effect of three policy measures. Based on the results obtained, we have made some recommendations to limit herd behavior.

Keywords: herd behavior; Vietnamese stock market; COVID-19 pandemic.

1. Introduction

COVID-19 is a new virus that has never been observed before in human history. Its consequences have been disastrous. On December 31st, 2019, the first four cases of Coronavirus were officially announced in Wuhan, China. Until the end of 2021, the disease has infected about 289 million people and killed nearly 5.5 million (Worldometers, 2022). The extent of COVID-19's growth and trajectory prompted the World Health Organization to declare it a worldwide emergency on February 20th, 2020, and later a pandemic on February 11th, 2020. The COVID-19 pandemic has not only had an impact on public health but has also resulted in an economic and financial crisis (Nicola et al., 2020). In terms of economic downturn and revenue loss, the lockdown policies of countries around the world have caused a drop in the economic activity, and transportation constraints in the impacted nations may have varying effects on worldwide enterprises' outputs and prices. As a result, extreme adjustments in global supply and demand in the COVID-19 pandemic have the greatest likelihood of forcing the economy to enter a recession (Priya et al., 2021).

In the face of uncertain information about the COVID-19 pandemic as well as the possibility of falling into a recession, the overall psychology of global investors got perplexed, as they pondered how to determine where to invest (Lee et al., 2021). Investors are likely to be influenced by other investors' decisions and, as a result, may imitate others' decisions or rely too heavily on public opinion. That can lead to increased herding behavior during times of market stress caused by uncertainty. Several nations, notably China (Wu et al., 2020) and Australia (Espinosa-Méndez & Arias, 2020), demonstrate herd behavior during the COVID-19 pandemic. The impact of herd behavior in the stock markets have been investigated by Javaira & Hassan (2015) or Litimi (2017). Furthermore, there are some factors affecting herd behavior that have been studied before such as risk (Chong et al., 2017) and stock price (Allam et al., 2020). However, the number of research on herd behavior in the stock market during the pandemic period (Ahmar & Val, 2020; Baker et al., 2020) is relatively small. When it comes to the impact of government policy on herd behavior, the number is even lower. Indeed, there

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is only one research undertaken by Bharti and Kumar (2021) to examine how Indian government responses might contribute to herd behavior. It only looked into one element, which is the Stringency Index. This measurement demonstrates a limit since, throughout the COVID-19 pandemic, the government undertook actions not only in the scope of blockade but also in areas such as health and economics. The research situation in Vietnam for the above issues is similar to the world. Although there have been numerous studies on herd behavior in Vietnam, there have not been many studies during the COVID-19 pandemic, which was one of the eras that caused the Vietnamese stock market to be volatile. Furthermore, no research has been conducted on the impact of government measures on the stock market during the COVID-19 pandemic.

For these reasons, the study “*Herd behavior in Vietnamese Stock Market during COVID-19 pandemic: The influences of Government Policies*” aims to see whether there is herd behavior in Vietnamese stock market during the COVID-19 pandemic, and how policies the government issued influence investors. Our research contributes to two aspects. Firstly, research on herd behavior during the COVID-19 period in Vietnam is limited. Our study examines the existence of herd behavior among Vietnamese individual investors in the Vietnamese stock market between 2020 and 2021, covering the entire period and four specific pandemic waves. The study updates the latest results on the market, contributing to enriching the research process on investor psychology in general and on the herd behavior of Vietnamese people in particular. Secondly, few studies have examined the impact of government policy on herd behavior leading to limited understanding. To represent government policy during COVID-19 pandemic, our research adds three policy-measuring indexes including Stringency Index, Containment and Health Index, and Economic Support Index to study the impact on herd behavior of investors. To our best knowledge, we are among the first groups to add these policy measurements in the Vietnamese stock market during COVID-19. Thirdly, Vietnamese investors have various characteristics and this article assists in better understanding the behavior of them. Their herd behavior will be different as well, resulting in distinct outcomes while investing in the stock market. We advise investors about what they should do in the event of a new pandemic to reduce herd behavior, based on our study findings.

2. Theoretical framework

2.1. Herd behavior measurement

Two popular methods when examining the occurrence of herd behavior proposed by previous studies are the one by Christie & Huang (1995) and the second by Chang et al. (2000).

For Christie and Huang (1995), they suggest decisions made by investors depend on overall market conditions. When the market is suffering from considerably extreme price movements, participants tend to suppress their beliefs and follow the behavior of the majority. Thus, stock returns will likely cluster around market returns. They apply cross-sectional standard deviation (CSSD) method to measure return dispersion, which is the formula below:

$$CSSD_t = \sqrt{\frac{\sum_{i=1}^N (R_{i,t} - R_{m,t})^2}{N - 1}}$$

where N is the number of firms in the portfolio, $R_{i,t}$ is the observed stock return of firm i at time t and $R_{m,t}$ is the cross-sectional average of the N returns in the aggregate market portfolio at time t.

There exist some drawbacks of this method found by other studies. Firstly, CSSD is sensitive to outliers in the data with evidence from Economou et al. (2011). Secondly, CSSD only considers herd behavior when there is extreme return. However, it may appear at the entire return distribution and become more obvious during periods of market stresses (Chiang & Zheng, 2010).

We adopt the later method proposed by Chang et al. (2000) which utilizes return dispersion using cross-sectional absolute deviation (CSAD). To illustrate the presence of a linear relation between $CSAD_t$ and $R_{m,t}$, Chang et al. suggest that market participants price stocks according to CAPM (Black, 1972).

$$E_t(R_i) = \gamma_0 + \beta_i E_t(R_m - \gamma_0)$$

where γ_0 is the zero-beta portfolio return, β_i is the stock's time-invariant systematic risk measure, $i = 1; \dots; N$ and $t = 1; \dots; T$.

Consider β_m to be the systematic risk of a market portfolio with identical weighting.

$$\beta_m = \frac{1}{N} \sum_{i=1}^N \beta_i$$

The absolute value of the deviation (AVD) of stock i 's expected return in time t from the t^{th} time portfolio's expected return can be written as:

$$AVD_{i,t} = |\beta_i - \beta_m| E_t(R_m - \gamma_0)$$

As a result, in time t , we can calculate the expected cross-sectional absolute deviation of stock returns (ECSAD) as follows:

$$ECSAD_t = \frac{1}{N} \sum_{i=1}^N AVD_{i,t} = \frac{1}{N} \sum_{i=1}^N |\beta_i - \beta_m| E_t(R_m - \gamma_0)$$

Taking the first and second derivatives of $ECSAD_t$, we observe the increasing and linear relation between $ECSAD_t$ and $R_{m,t}$.

$$\begin{aligned} \frac{\partial ECSAD_t}{\partial E_t(R_m)} &= \frac{1}{N} \sum_{i=1}^N |\beta_i - \beta_m| > 0 \\ \frac{\partial^2 ECSAD_t}{\partial E_t(R_m)^2} &= 0 \end{aligned}$$

The $CSAD_t$ and $R_{m,t}$ are used as proxies for the unobservable $ECSAD_t$ and $E_t(R_{m,t})$ and show that equity return dispersion has an increasing relationship with the absolute value of overall market returns. However, if investors suppress their beliefs and choose to follow the crowd, the positive relationship can increase more slowly or experience a drop if herd behavior is severe.

$$CSAD_t = \alpha + \beta_1 |R_{m,t}| + \beta_2 (R_{m,t})^2$$

The model of Chang et al. (2000) has been used popularly for the process of testing the existence of herding in the stock markets around the world. There are many studies which have used the Chang et al. (2000)'s model to explore the existence of herding, such as Pakistan (Javaira & Hassan, 2015), China (Lao & Sing, 2011), Vietnam (Lý, 2010; Vo & Phan, 2017; Luu & Luong, 2020).

However, there is a high possibility of existing serial autocorrelation in a high frequency time series data. Thus, we apply the heteroskedasticity and autocorrelation consistent standard errors suggested by Newey and West (1987) to estimate the regression coefficients, which is the model suggested below by Yao et al. (2014):

$$CSAD_t = \alpha + \beta_1 |R_{m,t}| + \beta_2 (R_{m,t} - \bar{R}_m)^2 + \beta_3 CSAD_{t-1}$$

where \bar{R}_m is the arithmetic mean of $R_{m,t}$. The $(R_{m,t} - \bar{R}_m)^2$ eases a small proportion of the multicollinearity between the explanatory variables in the regression model and hence reduces the standard errors associated with the regression coefficients and increases the strength of the model. The significance of β_2 and its negative value will indicate the existence of herd behavior. Moreover, we also use Robust standard errors to considerably reduce the effect of heteroskedasticity.

2.2. Hypotheses development

2.2.1. Herd behavior in Vietnamese stock market during COVID-19 pandemic

Vietnam recorded four waves of COVID-19 outbreak from the beginning of 2020 to the end of 2021 (Hiệp, 2020). During the first period from January 23rd to July 24th, 2020, Vietnam reported 415 cases positive with COVID-19. Two persons from Wuhan (China) were the first instances detected in Ho Chi Minh City, and the sickness quickly spread to 13 other locations. In the second period, through 99 days without positively

affected, the total number of cases was reported as 1,136 from July 25th, 2020 to January 27th, 2021 with 35 patients passing away, which caused the panic-stricken feeling in citizens. The epicenter was in Da Nang. In the third period, confirmed cases in Hai Duong were initially recorded when an individual tested positive after entering Japan. There was a total of 1,301 infected people from January 28th to April 26th, 2021 without any passed-away cases reported that showed the efficient methods of treating in Vietnam at that time. With the appearance of the Delta mutation, the fourth period was the most severe period of COVID-19 outbreak in Vietnam. More than two million cases were positive with the virus and over 36 thousand patients passed away from April 27th, 2021 to the beginning of 2022.

According to Dao et al. (2021), the increase in the number of daily COVID-19 confirmed infection cases in Vietnam has a negative impact on the market's stock returns. The pandemic had a detrimental impact on stock returns during the pre-lockdown, which is as the second wave of COVID-19. In contrast to the negative impact on stock returns in Vietnam during the COVID-19 pre-lockdown and second-wave periods, as well as the negative impact of stock market lockdowns in other countries (Eleftheriou & Patsoulis 2020; Baig et al., 2020), the COVID-19 quarantine period in Vietnam had a positive impact on stock performance in Vietnam (Dao & Gan, 2020).

The COVID-19 pandemic has wreaked havoc on stock markets and shaken fear among investors around the world. In Australia, there is evidence that herd behavior exists during COVID-19 and it has increased the herd degree which shows that investors initially abstain from investing when facing a health crisis (Espinosa-Méndez & Arias, 2020). Abd-Alla (2021) study confirms that the Egyptian stock market is affected by herding behavior during the COVID-19 pandemic when using Chang et al. (2000) methodology. Selvan & Ramraj (2020) find evidence that herd behavior in the Indian stock market exists and is on the rise because fear and uncertainty about the pandemic led the less experienced to abandon their beliefs and adopt those of the more informed.

As stated by the presented literature review, we predict that the instability in the market when COVID-19 appears will cause Vietnamese investors to imitate the majority instead of making decisions on their own. We thus suggest the following hypothesis:

Hypothesis H1: Herd behavior exists in the Vietnamese stock market during COVID-19 pandemic.

2.2.2. Government policies affect herd behavior during COVID-19 pandemic

We use three policy metrics taken from OxCGRT. In which the Stringency Index is created from lockdown policies, the Containment and Health Index relates to policies on treatment and vaccination, the Economic Support Index measures income support and debt relief. Previous studies have shown relationships between the three measures and herd degree of investors in other stock markets during Covid-19. The findings of Bharti & Kumar (2021) indicate that stringency control of government eases herd behavior. The same result is applied to the stimulus to the economy of India. The policy boosted the confidence of investors and hence decreased the herd degree. In addition, the research by Kizys et al. (2021) studying international stock markets finds that more stringent government response mitigates herd behavior during the novel Covid-19 outbreak.

In Vietnam, the government initially responded to the COVID-19 pandemic in the country by taking precautions to prevent the spread of the Coronavirus. In particular, one of the immediate solutions is to restrict entry and exit from countries with confirmed cases (Da Nang Airport, 2020). People are asked to stay at home and limit going out as much as possible to avoid the risk of spreading the infection to the community. Areas with outbreaks of the disease are blocked, and isolation is strictly managed. As a result, before the second wave of the pandemic, Vietnam recorded 99 days without any confirmed cases in the community.

To prevent COVID-19 as well as reduce harm in case of infection, the government has actively negotiated to buy vaccines from many countries. Vietnamese in the priority group were vaccinated starting March 8th, 2020, and vaccinations have since been deployed at COVID-19 treatment facilities and focused on pandemic areas. disease before. More than 77 million people in Vietnam have received at least one dose of the vaccine by early 2022, and more than 68 million people have received the required dose (Ourworldindata, 2022).

During the COVID-19 pandemic, especially with the social distancing directive, people's lives faced many difficulties. To support the poor, unemployed workers, and employers, the government has launched a social security package of up to tens of trillions of VND (Tuân, 2020).

According to Ashraf (2020), government policies have considerable influence on stock market return. Therefore, the government policies that have proven effective against Covid-19 pandemic are predicted to lead to herd behavior of investors in the Vietnamese stock market.

The relationships between the three policies and the herd behavior of market participants during the pandemic can be explained based on several factors. Regarding the Stringency policy, when it comes into effect, investors may project a reduction in the economy because of halting manufacturing facilities, causing businesses to operate inefficiently. Investors may be afraid that the stock market can see a downturn. Inexperienced ones will quickly adjust their portfolios and follow others because they don't believe in their decisions. This implies that the Stringency policy often intensifies the herd degree. In contrast, Containment and Health measures bring more positive sentiment to investors since they expect when more people are inoculated, immunity will exist and all activities of the economy will recover. They are likely to enhance investor confidence in the market and positively impact market return, leading to herd reduction. Regarding the Economic Support policy, it may both decrease and increase herd behavior. On the one hand, this measure will stimulate the whole economy and bring bright performance in the stock market, which boosts the confidence of investors and thus mitigates herding. On the other hand, people with little experience will choose to follow others to invest in fields benefitting from stimulus packages because they have a fear of missing out on these opportunities, which leads to stronger herd behavior.

Thus, our next three hypotheses are:

Hypothesis H2: Stringency policy affects herd behavior in the Vietnamese stock market.

Hypothesis H3: Containment and Health policy affects herd behavior in the Vietnamese stock market.

Hypothesis H4: Economic Support policy affects herd behavior in the Vietnamese stock market.

3. Research method

3.1. Research framework

In this study, we use the following model to test their impact on herd behavior as well as influence of government policies on herd behavior.

$$CSAD_t = \alpha + \beta_1 |R_{m,t}| + \beta_2 (R_{m,t} - \bar{R}_m)^2 + \beta_3 CSAD_{t-1} + \beta_4 DStringency + \beta_5 DContainmentHealth + \beta_6 DEconomicSupport + \varepsilon_t$$

Table 1. Description of variables

| Variables | Description |
|------------------------------------------------|--------------------------------------------------------------------------------|
| CSAD _t | cross-sectional absolute deviation on day t |
| R _{m,t} | absolute value of market return |
| (R _{m,t} - \bar{R}_m) ² | square of the difference of market return and arithmetic mean of market return |
| CSAD _{t-1} | 1-day lag of cross-sectional absolute deviation |
| DStringency | first difference of Stringency Index |
| DContainmentHealth | first difference of Containment and Health Index |
| DEconomicSupport | first difference of Economic Support Index |

3.2. Market return

Market return (R_m) is the cross-sectional average of all returns in the aggregate market portfolio on a specific day. It is generated using the average value of the available stock returns in the market on that day (Javaira & Hassan, 2015).

$$R_{m,t} = \frac{\sum R_{i,t}}{N}$$

where $R_{m,t}$: market return on day t

$R_{i,t}$: stock return on day t

N : number of firms on day t

Stock return is calculated by taking the log of the closing price of day t divided by the closing price of day t – 1.

$$R_{i,t} = \ln\left(\frac{P_t}{P_{t-1}}\right) \times 100$$

where P_t : closing price on day t

P_{t-1} : closing price on day t – 1

The market return in the model is expressed in terms of absolute value and squared form. When the coefficient of the R_m^2 is negative and the coefficient of $|R_m|$ is positive, it is concluded that there is herd behavior in the stock market.

3.3. Policy indices

The Oxford COVID-19 Government Response Tracker (OxCGRT) gathers systematic data on policy measures used by countries to tackle COVID-19. These policies are graded on a scale to represent the level of government involvement, and the results are combined into a set of policy indices. The method for calculating the indicators is provided directly below.

On any particular day, the index is derived as the average score of the relevant metrics, each of which has a value between 0 and 100. A higher score implies a more stringent response (i.e., 100 = most stringent response). If policies differ at the sub national level, the index is displayed as the strictest sub-response region's level.

It is vital to highlight that this index only tracks the rigor of government policy. It does not assess or indicate a country's propriety or efficacy of response. A higher number does not always imply that a country's response is 'greater' than that of other countries lower on the index.

These policy indices are simply means of their constituent indicators. This is depicted in equation (1) below, where k is the number of component indicators in an index and I_j is the sub-index score for a single indicator.

$$index = \frac{1}{k} \sum I_j \quad (1)$$

The function specified in equation (2) calculates each sub-index score (I) for each given indicator (j) on any specific day (t) depending on the following parameters:

the indicator's maximum value (N_j)

whether or not the indicator has a flag variable ($F_j=1$ if the indicator has a flag variable, 0 if the indicator does not have a flag variable)

the policy value as reflected on the ordinal scale ($v_{j,t}$)

the binary flag for that indicator that has been recorded ($f_{j,t}$)

$$I_{j,t} = 100 \frac{v_{j,t} - 0.5(F_j - f_{j,t})}{N_j} \quad (2)$$

Stringency Index

The Stringency Index measures the rigor of 'lockdown form' rules, which largely limit people's actions. It is calculated utilizing all ordinal containment and closure policy indicators, as well as a public information campaign indicator. The nine metrics used to determine the Stringency Index are: school closures, workplace closures, public event cancellations, restrictions on public gatherings, public transportation closures, stay-at-home requirements, public information campaigns, internal movement restrictions, and international travel controls (OxCGRT, 2021).

If the coefficient is positive then government policy will tend to decrease herd behavior. Conversely, government policy will increase herd behavior if the coefficient is negative.

Containment and Health Index

The Containment and Health Index combines 'lockdown' limitations and closures with efforts like testing procedures and contact tracing, as well as short-term healthcare spending and vaccination investments. It is estimated by taking all ordinal containment and closure policy indicators along with health system policy indicators. This index expands on the Stringency Index by incorporating its nine factors as well as testing policy, the degree of contact tracking, regulations to wear facial coverings, and vaccination roll-out guidelines. It is thus calculated using the thirteen metrics listed below: school closures, workplace closures, public event cancellations, restrictions on public gatherings, public transportation closures, stay-at-home requirements, public information campaigns, restrictions on internal movements, international travel controls, testing policy, degree of contact tracing, face coverings, and vaccine policy (OxCGRT, 2021).

The results of the Containment and Health Index are interpreted similarly to the case of the Stringency Index.

Economic Support Index

The Economic Support Index is computed by combining two ordinal economic policy indicators which are income support and debt relief. Income support denotes whether the government pays people's salaries or provides direct cash assistance, universal basic income, or something similar if they lose their employment or are unable to work. Debt or contract relief occurs whether the government freezes financial obligations during the COVID-19 pandemic, such as suspending debt repayments, preventing utilities such as water from being cut off, or prohibiting foreclosures (OxCGRT, 2021).

The outcomes of economic support policy are comparable to the two measures mentioned above.

3.4. Cross-sectional absolute deviation of returns (CSAD)

$$CSAD_t = \frac{1}{N} \sum_{i=1}^N |R_{i,t} - R_{m,t}|$$

CSAD does not measure herd behavior. The link between CSAD and R_m is employed to detect herd behavior rather than CSAD itself. In the model, the existence of a negative parameter β_2 indicates herd behavior. According to the quadratic relationship, $CSAD_t$ reaches its maximum at $R_{m,t}^* = -(\beta_1/2\beta_2)$. That is, when R_m grows, CSAD increases across the range where realized average daily returns are smaller than R_m , and when average daily returns is greater than R_m , CSAD tends to decrease.

4. Results and discussion

4.1. Results

Table 2. Regression results – Whole period

| VARIABLES | (1) Model 1 | (2) Model 2 |
|---------------------------|-------------------------|----------------------------|
| $ R_m $ | 0.570*** (0.00143) | 0.571*** (0.00169) |
| $(R_{m,t} - \bar{R}_m)^2$ | -1.875*** (0.0462) | -2.021*** (0.0655) |
| $CSAD_{t-1}$ | 0.345*** (0.000906) | 0.344*** (0.00115) |
| $DStringency$ | | 2.75e-05*** (3.40e-06) |
| $DContainmentHealth$ | | 4.26e-05*** (4.39e-06) |
| $DEconomicSupport$ | | -1.21e-05*** (1.45e-06) |
| Constant | 0.0108*** (1.92e-05) | 0.0108*** (2.36e-05) |
| Observations | 373,314 | 373,314 |
| R-squared | 0.726 | 0.727 |

Table 3. Regression results – Each wave

| VARIABLES | First Wave | | Second Wave | | Third Wave | | Fourth Wave | |
|---------------------------|-----------------------|----------------------------|--------------------------|----------------------------|-------------------------|----------------------------|-------------------------|----------------------------|
| | Model 1 | Model 2 | Model 1 | Model 2 | Model 1 | Model 2 | Model 1 | Model 2 |
| $ R_m $ | 0.698*** (0.00165) | 0.700*** (0.00165) | 0.510*** (0.00227) | 0.507*** (0.00225) | 0.506*** (0.00271) | 0.513*** (0.00273) | 0.431*** (0.00335) | 0.434*** (0.00337) |
| $(R_{m,t} - \bar{R}_m)^2$ | -1.324*** (0.0490) | -1.463*** (0.0483) | -1.257*** (0.0737) | -0.823*** (0.0777) | -2.217*** (0.0533) | -2.292*** (0.0555) | 1.848*** (0.115) | 1.708*** (0.116) |
| $CSAD_{t-1}$ | 0.368*** (0.00102) | 0.371*** (0.000966) | 0.395*** (0.00240) | 0.389*** (0.00234) | 0.311*** (0.00277) | 0.303*** (0.00304) | 0.275*** (0.00228) | 0.283*** (0.00221) |
| DStringency | | -0.000121*** (4.60e-06) | | 0.000226*** (1.87e-06) | | 0.000117*** (1.34e-05) | | -1.31e-05 (8.93e-06) |
| DContainmentHealth | | 0.000172*** (5.66e-06) | | -0.000315*** (2.08e-06) | | -0.000103*** (1.94e-05) | | 6.72e-05*** (9.79e-06) |
| DEconomicSupport | | 4.91e-05*** (5.44e-07) | | - | | -2.45e-05*** (2.40e-06) | | -4.35e-05*** (2.60e-06) |
| Constant | | 0.00997*** (2.08e-05) | 0.00949*** (4.42e-05) | 0.00961*** (4.33e-05) | 0.0116*** (5.98e-05) | 0.0117*** (6.51e-05) | 0.0132*** (5.21e-05) | 0.0130*** (5.22e-05) |
| Observations | 89,933 | 89,933 | 97,975 | 97,975 | 42,646 | 42,646 | 130,923 | 130,923 |
| R-squared | 0.932 | 0.934 | 0.836 | 0.841 | 0.863 | 0.863 | 0.504 | 0.505 |

4.2. Discussion

The overall result of β_2 of $(R_{m,t} - \overline{R_m})^2$ shows that there exists herd behavior among investors in the Vietnamese stock market between January 6th, 2020 and December 31st, 2021. This can be explained due to a lack of quality and transparent data about the market leading to the fact that people are afraid of fake news and tend to follow market consensus. As a result, this causes herd behavior (Lý, 2010). Moreover, some considerable price movements (A reduction by 24.8% of VNIndex in March 2020; A fall by 73 points of VNIndex on January 28th, 2020) contributed to the unstable sentiment of investors. The result of the test together with the finding of herding between 2005 and 2015 of Dang & Lin (2016) consolidate that large price movements often trigger herd behavior among the Vietnamese stock participants.

Next three policy indices' coefficients have an impact on the herd behavior of investors and they tend to reduce herd degree as policies get more effective. It can be understood that when measures related to distancing, testing and economy go into effect, the number of cases drops and investors project economic activities to continue sooner than in other countries affected by the pandemic. In fact, Vietnam is one of the top countries to successfully cope with COVID-19 from the beginning, which results in less economic interruption and since people can soon get back to work, which then causes less damage to the economy and the Vietnamese stock market. The positive values of coefficients of the Stringency Index and Containment and Health Index indicate that when these policies are announced and go into effect, there is less herd behavior because investors expect the market to escape extreme movements and their fear existing during bad times will be gone. However, the negative value of the Economic Support Index shows that when stimulus economic packages have more impact, they tend to increase herd behavior. This can be explained that when more money is poured into the economy, investors expect stock markets to go up. However, they do not have enough quality and transparent data so they fear that they will miss the opportunity to make a big return. This fear will lead more investors to follow consensus in stock markets, and thus causes more herd behavior. The result we find from Stringency measures is similar to the finding of Bharti & Ashish (2021) that stringency control mitigates herd behavior in India stock market while economic stimulus activities in Vietnam have the opposite effect, inconsistent with the result of Bharti & Ashish. (2021).

The test results of the first COVID wave are presented in table 3 in which Model 1 shows results without policies' effects and Model 2 contains the effects. The result of β_2 – coefficient of $(R_{m,t} - \overline{R_m})^2$ indicates the existence of herd behavior. When the first wave arrived in Vietnam, daily increasing cases caused a negative impact on stock returns pre-lockdown (Hung et al., 2021), market participants do not know how to react to extreme market movements properly and hence they start to suppress their own beliefs and follow others. This as a result causes herd behavior among investors. Results from policy indices shows that when they are enacted, they lead to a fall in herd degree (from -1.324 to -1.463). Specifically, the Stringency Index has a negative and significant coefficient, which illustrates when stringency measures are more tightened, herd behavior has a tendency to rise. This can be explained that during the month of lockdown period – April 2020, nearly 40,000 new securities accounts were opened according to Vietnam Securities Depository (VSD) since people have more free time at home. A huge number of new and inexperienced participants in the Vietnamese stock market are more likely to follow market consensus rather than their beliefs. Therefore, it causes the extent of herd behavior to spread. Although the Containment and Health Index and Economic Support Index have significant values from the test, they have relatively small impacts on herd behavior as well as reducing its degree. After the closures of several sites nationwide including schools, offices, public parks, etc. and the 62 thousand billion VND subsidy package from the government, no more cases were reported and the Vietnamese stock market started to show recovery signs. According to Bloomberg reports (Giang, 2020; Giang & Yap, 2020), Vietnam was the best performer in the global market in April 2020 as well as the Asian stock markets in May 2020. The panic from investors began to reduce and thus reduced herd behavior.

The table 3 displays test results in the second COVID wave in which Model 1 does not include policies' effects while Model 2 does. The coefficient of $(R_{m,t} - \overline{R_m})^2$ being negative and significant indicates that there is herd behavior among. In addition, this degree of herding is larger than that in the first wave. This can be

explained as the impact of COVID-19 is more severe on stock returns for the second wave (Hung et al., 2021) compared to the first wave with social distancing methods, investors react extremely to the market movements. Moreover, in the second wave, there were first reported death cases in Da Nang which instilled fear among investors who were afraid that this wave would get worse than the first one. The variable DEconomicSupport is eliminated due to its collinearity with two other variables of policies. Results show that herd degree rises as we include policy indices (from -1.257 to -0.283). Specifically, Stringency measures tend to decrease herd behavior while Containment and Health Index measures including school closures, workplace closures, travel bans, etc. increases herd behavior as they get more effective.

In regard to the third wave, the table 3 presents test results of two models. The results from Model 1 indicate that herd behavior prevails during this time of the third wave. Moreover, the degree of herd behavior is relatively smaller than those of the previous waves when looking at the coefficient of $(R_{m,t} - \bar{R}_m)^2$ (-2.217). This can be seen as the experience drawn from previous COVID waves which enables investors to make rational decisions and become less sensitive to the majority's trend. For model 2, three policies have significant values at 1 percent level but their impacts are minor. Stringency together with Containment and Health measures decrease the level of herd behavior as they take more effect and vice versa.

The table 3 displays test results during the fourth wave in which Model 1 does not consider the effects of government policies while Model 2 does. The result of the coefficient of $(R_{m,t} - \bar{R}_m)^2$ indicates there is no herd behavior among market participants even though the fourth COVID wave is the fiercest of all with 10,000 cases on June 12th, 2021 while the total number of cases of the previous waves reached 3,000 and over 100,000 patients on July 26th, 2021 (Vietnam.net). Once again, this shows that investors in the Vietnamese stock market no longer hold as much fear as before when the next wave of the pandemic arrives. Having drawn experiences from the first two waves in 2020, investors have careful considerations and be able to manage their own investment portfolios. After then, when policies are enacted, there is still no sign of herd behavior because the coefficient $(R_{m,t} - \bar{R}_m)^2$ has a positive and significant value at 1 percent level. This can be explained that during the fourth wave, effective policy communication and implementation lead to public trust in government meanwhile trust in government results in citizens' support for and compliance with the government's policy (Vu, 2021). Therefore, trust is also generated among investors in the stock market which eases the fear that happened in the first two waves and eventually prevents herd behavior from spreading.

We have some recommendations for investors to limit herd behavior during the volatile period like COVID-19 pandemic. If a future disease spreads across animals and causes damage to the Vietnamese livestock industry, investors may consider the impact of Economic support measures without the other two policies. Then, market participants can expect that when this policy comes into effect, it triggers even stronger herd behavior. Initially, a majority of investors think that the herd behavior will fall as the economy is supported and it eases their fear, but our findings suggest another prospect for the Vietnamese stock market. Similarly, the two policies regarding Stringency and Containment and Health can be anticipated to decrease herd degree if they are brought in the future. However, the coefficients of the three policies suggest that their effects are relatively minor on herd behavior, so investors do not necessarily take into account these as top priorities. In addition, they need to consider other factors such as whether it is the second or third wave of a pandemic, or whether a first confirmed fatality can lead to extreme reactions. These external factors may alter the thought and behavior of investors and lead to different reactions to government policies.

5. Conclusion

Firstly, we emphasize the rationale of the research, including the prevalence and impacts of herding on the stock market as a result of the COVID-19 pandemic, as well as the importance of assessing and developing suitable policies to mitigate the risks of herding negative effects in Vietnam and other countries.

Secondly, we conduct a review of theoretical models of herd behavior, and then apply the model Yao et al (2014) adapted from the model of Chang et al (2000) to test the existence of herd behavior in the Vietnamese stock market under the influence of the COVID-19 outbreak. Furthermore, we use three policy indices

regarding Stringency, Containment and Health and Economic Support to study the effect of government interventions in the COVID-19 outbreak based on the data source given by OxCGR.T.

Thirdly, we test to seek for herd behavior during COVID-19 pandemic between 2020 and 2021 as well as four COVID waves happening during that time. The results for the whole period indicate that there exists herd behavior in the Vietnamese stock market and government measures have significant impacts on investors' herding. Specifically, Stringency including social distancing reduces herd degree as its extent rises. This finding is consistent with the result of Bharti & Ashish (2021) in the Indian stock market while the finding of Economic Support policies is not similar. We also find evidence of the appearance of herd behavior during the first three waves while the heaviest one – the fourth wave shows no sign of herding. Policies are found to affect differently across the first three waves on herd behavior. Besides, we have proposed methods to reduce the degree of herd behavior in fluctuating pandemic period.

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Information about Organizing Partners and Sponsors

THE UNIVERSITY OF DANANG - UNIVERSITY OF ECONOMICS



15,500 students
31 Undergraduate Majors
12 Student Transfer programs
02 Undergraduate Collaboration Programs

PARTNERS



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University of Economics (DUE), located in Danang city, is a member of the University of Danang – one of the three regional universities in Vietnam.

With over 47 years of experience in educating and training, the DUE has played an important role in providing a labour force specializing in business, management and economics, partly contributing to Vietnam’s economic development. We offer a wide range of under-graduate and post-graduate programs, including 04 doctoral programs, 06 master programs, and 31 under-graduate programs. High qualified teaching and research staff, including professors, senior and experienced lecturers together with learner-centered curriculums are the reflection of our aim to ceaselessly raise teaching standard. The University currently has about 15,000 students for both full-time and part-time courses.

The DUE has cooperated with a number of companies to not only provide our students with opportunities for internship courses,

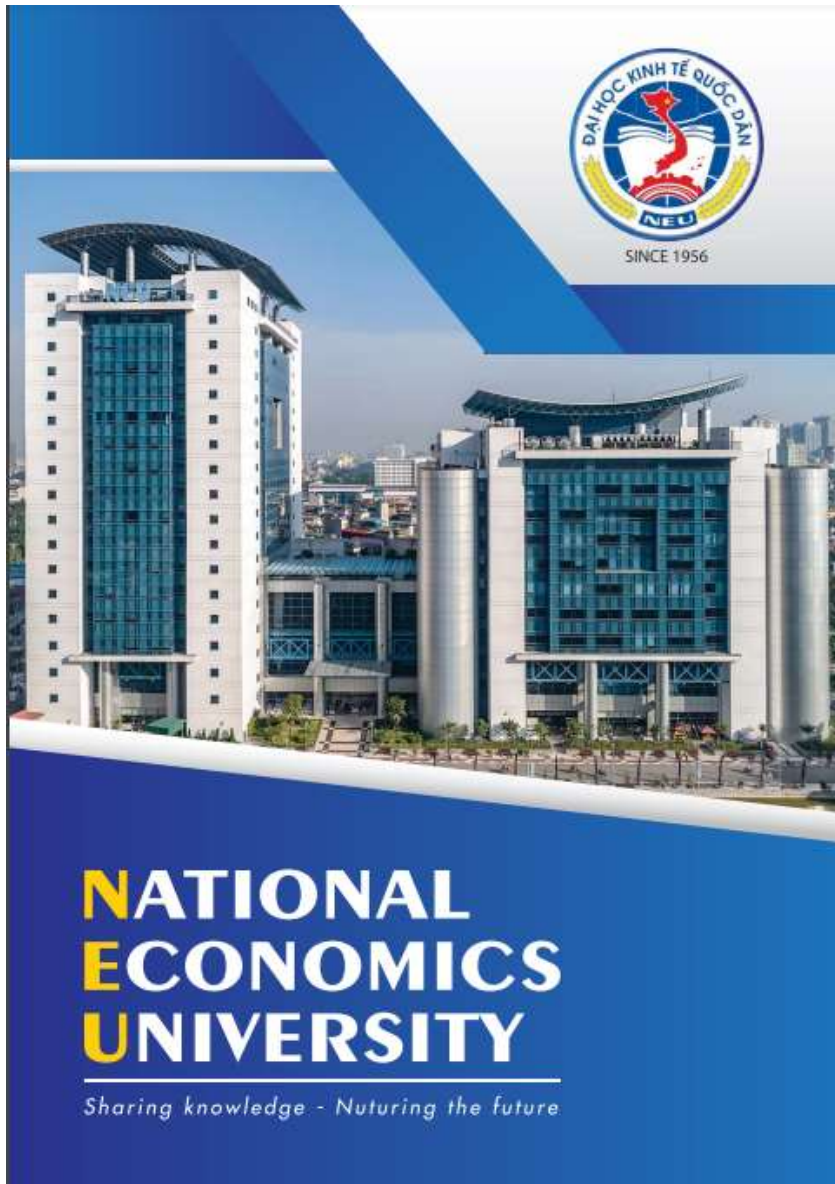
but also equip them with necessary skills and capabilities to work within the context of global integration.

Forty-seven years of vigorous growth witnesses our university achieving a variety of historical milestones. The DUE has become not only a nationally prestigious multidisciplinary higher educational institution, but also a leading research center for business management consultancy and business & economic knowledge transfer in Vietnam.

Annually, the DUE has about 8 to 10 key research projects carried out at state, ministerial, provincial levels, and dozens of university-level projects. Additionally, the DUE collaborates with its international partner network to organize academic conferences, seminars, workshops on business, management and economic matters. These assist the University in improving teaching materials and training quality. Research activities also bring more accessibility to business environment, practices and legal aspects.

NATIONAL ECONOMICS UNIVERSITY

Founded in 1956, National Economics University is one of Vietnam's leading universities in Economics, Management and Business Administration. Throughout the establishment and development, we always keep our proud position as:



Top Quality Economics and Business Institution in Vietnam

We place a high priority on the quality of teaching and the employment preparation for students in an increasingly competitive environment. With over 1,200 faculty members and staff, including more than 150 professors, associate professors, and over 200 PhDs, NEU currently offers training and education to over 35,000 students annually at Bachelor, Master and PhD levels.

A Prestigious Center For Economic Research

We are chairing a network of more than 40 universities in Vietnam in economics and business administration. Our university has become an important hub for academic exchange domestically and internationally.

A Consulting Center in Economics, Business and Management

NEU is a prestigious research and consultation center with its extended academic publications and consulting works to the government and non-governmental organizations on policy making and to the business community on strategic development.

THUONGMAI UNIVERSITY



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Các chương trình đào tạo cấp bằng quốc gia gồm

30

Chuyên ngành Đào tạo Đại học chính quy

20

Chuyên ngành Đào tạo Cử nhân Quốc tế

7

Chuyên ngành Đào tạo Thạc sĩ

6

Chuyên ngành Đào tạo Thạc sĩ

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~4000

Sinh viên Chính quy/ năm

Trình độ Sau Đại học

~700

Học viên cao học/ năm

~70

Nghiên cứu sinh/ năm



Hợp tác Quốc tế

Trường Đại học Thương mại đã thiết lập quan hệ hợp tác với nhiều trường Đại học và tổ chức trên thế giới tại Châu Âu, Châu Mỹ, Châu Á, Châu Úc. Cùng với đó là rất nhiều các chương trình trao đổi dành cho sinh viên và giảng viên.

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Trình độ Thạc sĩ

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Thuongmai University (abbreviated as TMU) is a public university under the national education system of the Socialist Republic of Vietnam.

Thuongmai University is a public autonomous multi-major training university with strengths and prestige in undergraduate and post-graduate training; knowledge, science-technology research and transfer in contemporary economic and trade fields which meet the demand of industrialization, modernization and international integration. Since its establishment, TMU has provided society with tens of thousands of bachelors, masters, and doctors and has trained many business management officers for commerce and other industries.

ACADEMY OF FINANCE



The graphic features a yellow and teal color scheme. At the top left is the AOF logo. The main title 'HỌC VIỆN TÀI CHÍNH' is in large, bold, teal letters. Below it, a circular graphic displays '97,52%' in white on a yellow background, with 'SV TỐT NGHIỆP CÓ VIỆC LÀM' in teal below. The mission statement is in small teal text. At the bottom, the website 'www.hvtc.edu.vn' and the address 'Số 58, Phố Lê Văn Hiến, Phường Đức Thắng, Quận Bắc Từ Liêm, Thành phố Hà Nội.' are provided. The background includes an aerial view of the AOF campus and a circular inset showing a building facade.

**HỌC VIỆN
TÀI CHÍNH**

97,52%
SV TỐT NGHIỆP
CÓ VIỆC LÀM

*Sứ mệnh: Cung cấp các sản phẩm đào tạo và nghiên cứu khoa học
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Quận Bắc Từ Liêm, Thành phố Hà Nội.

The Academy of Finance (AOF), formerly known as the Central Banking School of Finance and Accounting, was established in 1963 and renamed the Hanoi University of Finance and Accounting in 1976. In 2001, the name “Academy of Finance” was officially used under Decision No. 120/2001/QĐ-TTg based on the merging of three institutions: Hanoi University of Finance and Accounting, Institute of Financial Research and Centre of Financial Cadre Training. In 2003, the Institute of Market and Price Research and School of National Treasury Training were also integrated into AOF. The mission of the Academy of Finance is to provide finance and accounting expertise in scientific research and training activities to society. The mission has been defined by our 59-year history with outstanding achievements and contributions branded by our lecturers, researchers and students.

BANKING ACADEMY OF VIETNAM



The graphic features the Banking Academy of Vietnam logo in the top left, which includes a graduation cap and the text 'HỌC VIỆN NGÂN HÀNG' and 'BANKING ACADEMY'. To the right of the logo, contact information is provided: 'Hvnh.edu.vn/tuyensinh', 'Facebook.com/hocviennganhang1961', and the phone number '1900 561 595'. The background shows a stylized cityscape with buildings and palm trees. In the foreground, a smiling woman in a black graduation cap and gown is shown. Four orange arrow-shaped callouts point to the right, containing the following text: 'A multi-disciplinary University', '14 Faculties and Subjects', '600 Lecturers', and '4000 Undergraduate 400 Postgraduate Annually'.

Banking Academy of Vietnam is a multidisciplinary public university governed by the State Bank of Vietnam and the Ministry of Education and Training. It is headquartered in Hanoi with two campuses in Bac Ninh and Phu Yen provinces. Established in 1961, BAV is an applied interdisciplinary university. It meets international standards to become a leading university in Vietnam's finance and banking sectors. Currently, BAV offers 9 programs with around 600 academic faculties of high quality and attracts 17,000 students studying at different levels. BAV commits to internationalizing its curriculum to provide standardized training to meet the requirements of society in high-quality human resources. In recent years, the BAV has made impressive improvements in scientific research activities and extended research cooperation with international partners. The number of scientific research has been increasing through the years, illustrated through the number of scientific articles, domestic and international workshops and conferences. The university creates the most favorable conditions for its faculty, undergraduate and graduate students to actively and creatively participate in research activities.

UNIVERSITY OF ECONOMICS AND BUSINESS – VNU HANOI



Founded in 1974, University of Economics and Business is a member of Vietnam National University, Hanoi (abbreviated as UEB-VNU). During our development, UEB-VNU has constantly improved the quality of training, research and other services towards becoming a research-oriented university and training high-quality human resources in the fields of economics, management and business administration. UEB-VNU is known as a long traditional history university with visions and determination to develop towards world-class quality. Over more than 47 years of development, UEB-VNU is proud to be a key and leading unit among members and schools of VNU Hanoi. We played an important role in bringing VNU Hanoi to the top 1,000 universities worldwide in three consecutive years, according to QS World University Rankings. In 2022, UEB-VNU is the first and only university in Vietnam to appear in the top 451-500 QS Rankings by subject in Business and Management Studies. In the same year, we received the Certificate of Merit from the Prime Minister for extraordinary achievements in the fields of business administration, management studies and development of science, technology and international cooperation. With all our achievements in training and research, UEB-VNU has increasingly affirmed our reputation in the country and become a pioneer in international integration.

FOREIGN TRADE UNIVERSITY

Established in 1960, Foreign Trade University (FTU) is among the first universities in Vietnam to offer intensive economics and international integration training. Over 60 years of development, FTU is recognized as one of the most prestigious universities in Vietnam and has gained enormous achievements in providing talented graduates to the Vietnamese economy and gradually reaching the region and the world.

FOREIGN TRADE UNIVERSITY

A LEADING INNOVATIVE UNIVERSITY

Core Values

- Innovation and Excellence
- Accountability and Resilience
- Diversity and Inclusion

14 Academic Faculties

4 Research programs
25 Research groups

20.000 Students

800 Faculty + Staff members

With 3 campuses in Hanoi, Quang Ninh and Ho Chi Minh City, FTU is currently training over 20,000 students. Following its philosophy of “Enhancing liberation, practicality; nurturing integrity, accountability and creativity of learners”, the university has developed and diversified its programs in many forms and levels. In pursuit of academic and research excellence and changes for a prosperous nation and a better world, researchers at the FTU actively carry out innovative multidisciplinary research with a strong foundation in economics and business. The four main research directions of FTU include reform of socio-economic institutions for sustainable development, green economy and social responsibility, innovation and knowledge transfer to businesses, and restructuring and reform of corporate governance. In collaboration with international and local networks, organizations, universities, and businesses, FTU

researchers also strive to turn ideas into impact. FTU’s research is translated into policy recommendations, management models and tools transferred to enterprises, and solutions for community development.

UNIVERSITY OF ECONOMICS – HUE UNIVERSITY



University of Economics is a member of Hue University. Founded in 1969, University of Economics has a mission to train high-quality/ professional human resources and conduct prestigious research and consulting work to solve socio-economic development issues in the Central Region of Vietnam and the whole country. University of Economics offers a wide range of majors and specializations in economics, business administration, finance, banking and management information system. Currently, University of Economics, Hue University, offers training and education to over 6,5000 students annually at bachelor, master, and PhD levels. University of Economics, Hue University cooperates with over 40 international partners worldwide.

UNIVERSITY OF ECONOMICS HO CHI MINH CITY



As one of the leading key national universities in Vietnam, the University of Economics Ho Chi Minh City (UEH) is home to more than 30,000 students across all levels and disciplines, the largest culmination of the student body across the country. UEH continues to stay in first place in the ranking list of the best business schools in Vietnam (Webometrics, 2021) and in the Top 551+ Best Universities in Asia (QS World University Ranking, Asia 2022); Top 298 Best Universities in Asia in Research Performance, Innovation and Societal Impact (SCImago Institutions Rankings, 2022). By 2030, UEH will become a multidisciplinary university with reputable academic influence within Asia and sustainable development.

UNIVERSITY OF ECONOMICS & LAW – VNU HCMC



VIET NAM NATIONAL UNIVERSITY HO CHI MINH CITY
UNIVERSITY OF ECONOMICS AND LAW

Unity
Thống nhất
Excellence
Vượt trội
Leadership
Tầm phông



University of Economics and Law (UEL) - a member of Vietnam National University in Ho Chi Minh City (VNU-HCM) - was founded by virtue of Prime Minister's Decision No. 337/QĐ/TTg dated March 24th, 2010, formerly known as Faculty of Economics under direct authority of VNU-HCM by virtue of VNU-HCM President's Decision No. 441/QĐ/ĐHQG/TCCB.

UEL is a higher education institution as well as scientific research and technology transfer center with high quality in the fields of economics, law and management in response to the demands of socio-economic development in the process of industrialization, modernization and global integration in Vietnam.

MISSION

Promoting the development of society through high-quality research, training and other services in the fields of economics, law and management.

VISION

- Functioning as research oriented university.
- Becoming an institution of international standard, in the ranking of prestigious universities in Asia.
- Training learners who are capable of working in a global environment.
- Being the center of scientific research and a policy consulting pioneer Viet Nam in the field of economics, law and management.

● VNU-HCM ranks in the **top 801-1000**, in the **Top 68%** of the world's best universities by the **QS World Rankings 2021**

● Rankings by sciences subject field of THE 2021 evaluated VNU-HCM with a rank of **Top 601+** in the field of **Business and Economics**.

● **09** were evaluated to meet **AUN – QA standards: International Economic Relations, Finance – Banking, Economics, Accounting, Civil Law, Business Administration, Public Economics and Management, Management Informatics**

900

Postgraduate students

6.500

Undergraduate students

30.384

Alumni

97%

Students satisfy with the quality of teaching and support service at UEL

95%

Students are willing to introduce UEL to their relatives and friends

97%

Graduates are employed within one year after graduation

95%

Graduates work in the field of their majors



JOINT STOCK COMMERCIAL BANK FOR INVESTMENT AND DEVELOPMENT OF VIETNAM

BIDV has been recognized and awarded by many international and major financial institutions for its outstanding business performance. The bank is listed in the Top 500 world's most valuable banking brands (by Brand Finance), named "Best Retail Bank in Vietnam" for the fourth consecutive year (by The Asian Banker) and received a series of IT awards.



JOINT STOCK COMMERCIAL BANK FOR FOREIGN TRADE OF VIETNAM

Vietcombank's development orientation is to become the No. 1 bank in Vietnam and one of the 100 largest banks in Asia, and one of the 300 largest financial and banking groups in the world. By 2030, Vietcombank strives to become one of the 1000 largest listed companies in the world that contribute to the development of Vietnam.



VIETNAM JOINT STOCK COMMERCIAL BANK FOR INDUSTRY AND TRADE

A leading multi-functional, modern and efficient bank in Vietnam, being among the Top 20 strongest banks in the Asia-Pacific region by 2030; and by 2045, being the strongest and most prestigious bank in Vietnam, a leading bank in the Asia-Pacific region and a highly reputable bank in the world. Its mission is to become a pioneer bank in the country's development on the basis of bringing optimal value to customers, shareholders and employees.

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