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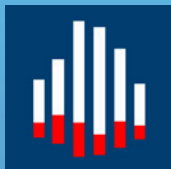
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Chia-Lin Chang

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Chia-Lin Chang holds a PhD in Economics (2004) from Université Catholique de Louvain, Belgium, is an elected Distinguished Fellow of the International Engineering and Technology Institute (DFIETI), and an elected Fellow of the Modelling and Simulation Society of Australia and New Zealand (FMSSANZ). Chia-Lin Chang is a University Distinguished Professor, Professor of Economics, Professor of Finance, and Director of the Agricultural and Natural Resources Research Centre (ANRRC) at National Chung Hsing University, Taiwan; Distinguished Visiting Professor at the Faculty of Economic and Financial Sciences, University of Johannesburg, South Africa; and Adjunct Professor, Department of Economic Analysis and ICAE, Complutense University of Madrid (founded 1293), Spain. Chia-Lin Chang has over 100 journal publications (most of which are in Web of Science Clarivate Analytics and Scopus) and chapters in books as well as edited and fully refereed conference proceedings volumes, is Executive Editor of the Taiwan Journal of Applied Economics (TJAE) (TSSCI), Editor-in-Chief of Journal of Medical and Health Economics (JMHE), Senior Co-Editor-in-Chief of Advances in Decision Sciences (ADS) (Scopus), Co-Editor-in-Chief of Journal of Reviews of Global Economics (JRGE) (Scopus), Journal of Management Information and Decision Sciences (JMIDS), and Journal of Big Data and Computational Science (JBDCS), a member of the Editorial Boards of 20+ international journals, and has served as co-Guest Editor of Special Issues of the following Web of Science Clarivate Analytics or Scopus journals: Journal of Econometrics (Elsevier), Mathematics and Computers in Simulation (Elsevier), North American Journal of Economics and Finance (Elsevier), Annals of Financial Economics (World Scientific), Advances in Decision Sciences (Hindawi), Sustainability (MDPI), Energies (MDPI), Journal of Risk and Financial Management (MDPI), Risks (MDPI), and China Finance Review International (Emerald). Chia-Lin Chang's research areas include applied econometrics, financial econometrics, applied statistics, quantitative finance, risk and financial management, energy economics, energy finance, applied time series analysis, forecasting, technology and innovation, empirical industrial organisation, health and medical economics, tourism research, tourism management, bibliometrics, and international rankings of journals and academics.

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Article

Cultural Distance and Entry Modes in Emerging Markets: Empirical Evidence in Vietnam

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Abstract: Cultural distance is acknowledged as a crucial factor that significantly affects the entry mode selection of multinational enterprises. The purpose of this article is to analyze the relationship between cultural distance and entry mode choice by exploring a novel dataset of 5236 firms in Vietnam with foreign investment during the period 2005–2016. Although many studies were conducted about the cultural distance and entry mode nexus, most of the research mainly focuses on developed and developing countries, where a market economy is already established. It is important to expand the research to a transition economy such as Vietnam, where the government is committed to attracting foreign investment. The results indicate that, when the cultural difference between Vietnam and their home country is high, foreign-invested firms prefer wholly-owned subsidiaries (WOS) over equity joint ventures (EJV). The study contributes to the general understanding about cultural distance and entry mode decision of foreign-invested firms in emerging markets.

Keywords: cultural distance; entry mode; equity joint venture; wholly owned subsidiary

1. Introduction

Multinational companies invest in foreign markets for a variety of reasons: Some may find new markets for their goods and services, while others are attracted by the cheap and abundant resources of the host country (Dunning 2002). During the pre-investment stage, the choice of market entry mode is the essential strategy that will affect the survival and development of firms in the future (Anderson and Gatignon 1986). Many scholars believe that the cultural distance between the investing and host countries is one of the most important factors that influences the entry mode choice by investors (Kogut and Singh 1988; Agarwal and Ramaswami 1992; Erramilli 1996). However, the way in which cultural distance affects the entry mode is still controversial among scholars. According to transaction cost theory, there are two opposing arguments about the impacts of cultural distance on entry mode selection. The first argument states that cultural distance influences the perception of costs and uncertainty of the investing firm (Kogut and Singh 1988). A larger cultural distance between home and host countries encourages multinational corporations to select equity joint ventures (EJV) over wholly owned subsidiaries (WOS) to limit their exposure to uncertainty and risk. The second argument states that it is difficult for foreign firms to acquire accurate information about the local partners, as well as understand the behavior of these partners in an environment with a large cultural distance (Chang et al. 2012). Therefore, foreign firms would select WOS to gain full control of their business and avoid opportunistic behaviors by the partners (Sutcliffe and Zaheer 1998). However, most studies on the entry mode and cultural distance focus on developed economies. Many researchers (Meyer and

Nguyen 2005; Dikova 2012) state that the entry mode strategy is totally different in transition countries and developed countries due to different institutional frameworks.

The question of whether the WOS or EJV can be selected in a transition country when the cultural distance between an investing country and a host country is large, remains unanswered. Our research in the context of a transition country contributes to the body of knowledge about entry mode selection.

To address the research gap, we aim to explore the impact of cultural difference on entry mode selection using a novel dataset of 5236 foreign-invested firms in Vietnam in the period 2005–2016. This research objective is achieved by adopting the transaction cost theory. The transaction cost approach contributes new insights into how the cultural distance influences the entry mode choice of foreign-invested firms into a transition economy. Theoretical argument about the role of cultural distance and entry mode selection is developed in a transition country context. As suggested by Michailova (2011) about the importance of context-specific theory development in international business research, we believe that our theoretical argument can contribute a new knowledge in international business literature.

Vietnam is a suitable country for this study for many reasons. First, Vietnam is an emerging country with a high economic growth rate in recent years, and continues in transition with commitments from the government for important reforms, such as attracting foreign direct investment (FDI), so it is a good case for research on the entry mode. Vietnam's Investment Law 2015 introduces positive change, but the cultural distance between the home and host countries is still the main obstacle, in addition to restrictions on investors who are considering investment in Vietnam (Van Dut et al. 2018). Therefore, comprehensive research on the relationship between cultural distance and entry mode choice to promote foreign investment in Vietnam is needed. Second, little research about entry mode selection in emerging countries covers Vietnam. Most research on this topic mainly discusses developed or developing countries, where a market economy is already formed (Kogut and Singh 1988; Agarwal and Ramaswami 1992). It is important to expand the research to a transition economy such as Vietnam, and it makes a contribution to the theory development in a specific context, as suggested by Michailova (2011).

The structure of the paper is as follows: In the next section we present a brief review of the literature. We then present the methodology in Section 3, followed by a discussion of the results in Section 4. Section 5 concludes our paper.

2. Literature Review

When conquering new markets, multinational enterprises need to select an entry mode as their important internationalization strategy (Agarwal and Ramaswami 1992). Entry mode is defined by Sharma and Erramilli (2004, p. 2) as “a structural agreement that allows a firm to implement its product market strategy in a host country either by carrying out only marketing operations (i.e., via export modes) or both production and marketing operations there by itself or in a partnership with others (contractual modes, joint venture, wholly owned operations).” The choice of entry mode has a significant impact on the survival and development of firms in the future (Porter 1987). In the past two decades, researchers identified different types of entry modes, mainly divided into two groups: Equity mode and non-equity mode. The equity mode group includes joint venture and wholly owned subsidiaries (Root 1994). The non-equity mode group includes exporting, licensing/contractual agreement, R and D contracts, franchising, and strategic alliance (Root 1994). Different types of entry modes have different levels of control, resource commitment, and risk (Hill et al. 1990). In this research, we consider two important modes of entry in Vietnam: Equity joint ventures (EJV) and wholly-owned subsidiaries (WOS) (Tsang 2005). Another reason for only considering EJV and WOS in this study is the nature of the data that we collected. Our sample consists of 4070 WOS projects (77.27%), 1116 EJV projects (22.14%), six build-operate-transfer (BOT), build-transfer (BT) and build-transfer-operate (BTO) projects (0.11%), and 25 business cooperation contract (BCCs) projects (0.47%). We omit the

data on BOT, BT, BTO and BCCs from the sample because they are small in number, and have special characteristics.

Based on previous empirical research, scholars divide the determining factors of entry mode into three groups: Country-specific factors, firm-specific factors and industry factors (see [Luo 2001](#); [Tsang 2005](#); [Shieh and Wu 2012](#)). Country-specific factors represent the characteristics of investing and recipient countries such as the country risk, market potential and cultural distance. Industry-specific factors refer to characteristics of the industry. Lastly, firm-specific factors are concerned with the characteristics of foreign-invested firms, and this study examines investment amount, project orientation, investment duration and year of investment. When we move from macro to micro determinant factors, the role of transaction cost theory is increasingly more important.

Prior research often emphasizes that cultural distance (a country-specific factor) has significant impacts on entry mode choice ([Yiu and Makino 2002](#)). Cultural distance is defined as “the degree to which shared norms and values differ from one country to another” ([Hofstede 2001](#)). In order to explore the cultural distance and entry mode relationship, international business scholars tend to rely on transaction cost theory ([Anderson and Gatignon 1986](#); [Kogut and Singh 1988](#)). Transaction cost theory was first articulated in the seminal work of Ronald [Coase \(1937\)](#), who was awarded the Nobel Memorial Prize in economics for his research on the nature of the firm. In addition, [Williamson \(1975\)](#) also received the Nobel Prize in economics for his research on transaction costs economics theory (TCT), and the concept of transaction cost was first applied to entry mode by [Anderson and Gatignon \(1986\)](#). TCT is the most widely-adopted and applied in international business on market entry mode choice ([Canabal and White 2008](#)). The theory states that the selection of market entry mode by foreign firms is affected by the desire to minimize transaction costs ([Anderson and Gatignon 1986](#)). Transaction costs occur when firms do business with their partners. These costs include the cost of compiling a contract and negotiating with business partners, as well as cost of monitoring contract performance. The theory suggests two opposing arguments about the impacts of cultural distance on entry mode selection. The first argument states that cultural distance influences the perception of costs and the uncertainty of the investing firm ([Kogut and Singh 1988](#)). A larger cultural distance between home and host countries encourages multinational corporations to select equity joint ventures (EJV) over wholly-owned subsidiaries (WOS) to limit their exposure to uncertainty and risk. Empirical evidence from [Kogut and Singh \(1988\)](#), [Erramilli and Rao \(1993\)](#), and [Pak and Park \(2004\)](#) support this argument. The second argument states that it is difficult for foreign firms to acquire accurate information about the local partners, as well as understand the behavior of these partners in an environment with a large cultural distance ([Chang et al. 2012](#)). In this case, the cost of negotiating, monitoring, and enforcing contracts with local firms is even higher. Therefore, foreign firms would select WOS to gain full control of their business and avoid opportunistic behaviors by the partners ([Sutcliffe and Zaheer 1998](#)). Empirical studies by [Shane \(1994\)](#), as well as [Chen and Hu \(2002\)](#), provide evidence that supports the hypothesis of choosing WOS when the cultural difference is large. However, most studies on the entry mode and cultural distance focus on developed economies. Given the debate, we argue that the role of cultural distance on entry mode selection cannot be ignored in the context of the transition economy. In transition countries, the main difficulty faced by foreign-invested firms is the selection between WOS or EJV. The reason is that foreign-invested firms first need to select between employing local resources or conquering the transition country on their own ([Van Dut et al. 2018](#)). When the cultural distance between host country with a transition economy and the home country is large, firms need the local knowledge and local resources to overcome the risk and uncertainty ([Van Dut et al. 2018](#)). Adopting the transaction cost approach, we expect a large cultural difference and inefficient cooperation with local counterparts to encourage foreign investors to select WOS. The discussion leads to the hypothesis:

Hypothesis 1 (H1): *WOS are preferred to EJV when the cultural distance between Vietnam and investing countries is large.*

3. Methodology

3.1. Data

The study explores the linkage between entry mode choice and the cultural distance of foreign firms in Vietnam, a developing country in the transition process with reform commitments by the government to attract FDI. The data, from 2005 to 2016, were compiled by the Ministry of Planning and Investment of Vietnam, totaling 4070 wholly-owned subsidiaries (WOS) (77.27%), 1116 equity joint ventures (EJV) (22.14%), six build-operate-transfer (BOT), build-transfer (BT), and build-transfer-operate (BTO) (0.11%), and 25 business cooperation contract (BCCs) (0.47%). The data on BOT, BT, BTO, and BCCs were omitted from this study because of their small number and special characteristics. These foreign-invested projects came from 78 countries in the world. The sample consisted of 1064 foreign-invested projects from Korea, 876 from Europe, 792 from Singapore, 654 from Chinese regions (mainland China, Hong Kong, Macau, and Taiwan), and 274 from the US.

3.2. Variables

3.2.1. Dependent Variable

The dependent variable is the entry mode choice of foreign investors when entering Vietnam. This is a dummy variable that takes a value of 1 if foreign investors establish EJV, and 0 for WOS (Slangen and Hennart 2008).

3.2.2. Independent Variable

Cultural distance is the most important variable in this study. We measure cultural distance between Vietnam and investing countries along the six cultural dimensions developed by Hofstede (1980): Power distance, individualism, masculinity, uncertainty avoidance, long-term orientation and indulgence. Hofstede's cultural metrics are used because they enable us to conduct international comparisons between cultures. These data are widely employed in international business and cross-cultural psychology studies (Shenkar 2001). These data are adjusted and computed from 0 to 100 (percentage), and are available at Hofstede's website, <https://geerthofstede.com>. Based on the equation of Kogut and Singh (1988), we calculate a cultural distance index between Vietnam and other countries. Because culture is a multidimensional concept, using cultural distance data at an aggregate level can fully measure all aspects of culture. In addition, if we use data from each dimension, some of them may be incompatible with Vietnam.

$$CD_j = \sum_{i=1}^6 \left\{ \frac{(I_{ij} - I_{iv})^2}{V_i} \right\} / (6)$$

where CD_j is the cultural distance between investing countries and Vietnam, I_{ij} is the cultural aspect i of home countries j , I_{iv} is the i th cultural aspect of Vietnam, v is Vietnam, and V_i is the variance of the i th cultural aspect. The larger the value of this indicator is, the larger the cultural distance between Vietnam and the investing countries.

3.2.3. Control Variables

To account for country-specific factors that might affect entry mode choice, we included variables for country risk and market potential. Anderson and Gatignon (1986) define country risk as unpredictable changes in the business environment in a particular country (cited in Shieh and Wu 2012), and these risks decrease the profitability of firms conducting business in this country. In high-risk host countries, foreign investors often avoid committing to investment in large projects to minimize losses in case they want to withdraw from the market (Kim and Hwang 1992). Previous empirical studies predict

that in an unpredictable business environment FDI firms prefer a joint venture, rather than a WOS (Agarwal and Ramaswami 1992).

This is because when investment risks increase, multinational corporations (MNCs) seek information and knowledge through joint ventures with local companies. Joint ventures allow firms to enjoy lower long-term costs due to having better information (Beamish and Banks 1987). We follow Manh Chien and Tu (2012) in using the political risks of Vietnam as a proxy for country risk. The data can be obtained from the website of Political Risk Services at http://www.prsgroup.com/ICRG_Methodology.aspx.

Market potential is a crucial factor in entry mode selection. A country with a rapid and stable economic growth rate encourages foreign-invested firms to commit all their financial resources to development, and thus establish a company with 100% foreign capital (Agarwal and Ramaswami 1992). We employ Vietnam's GDP growth rate in the year that an investment project is initiated as a proxy for market potential. This is the one-year GDP growth rate, and the data come from the General Statistics Office of Vietnam, at <https://gso.gov.vn>.

We also add a dummy variable to distinguish between manufacturing (coded as 1) and services (coded as 0) (Brouthers and Brouthers 2003). According to Erramilli and Rao (1993) (cited in Brouthers and Brouthers 2003), manufacturing firms often require higher capital investment than service firms. Investing in manufacturing requires a large amount of capital to build factories and buy equipment when entering a foreign country (Gatignon and Anderson 1988). Manufacturing firms that make large capital-intensive investment are assumed to prefer WOS to EJV because doing so helps them protect their business secrets better and avoid opportunistic behavior by joint venture partners.

Firm-specific factors include investment amounts, duration, project orientation and investment year as crucial factors in entry mode choice. Investment amount represents the financial commitment of a parent company to its subsidiaries (Wei et al. 2005). According to transaction cost theory, the level of financial commitment has a significant impact upon the market entry mode of foreign firms. When a small amount of capital is invested, WOS is a preferred option because it allows the parent company to control the subsidiary and retain the profits (Luo 2001). However, when the company participates in a large project and requires a large amount of investment capital, EJV can provide solid financial support, as well as share the risks with the local partners (Luo 2001). Therefore, a higher investment amount increases the likelihood that EJV is chosen for entry in Vietnam. Investment capital is calculated by total investment in a project (USD). The data come from the Ministry of Planning and Investment. We take the natural log of this variable to reduce the variable scale.

Investment duration is the period during which a foreign company commits to investment in the host country, and it is a source of bargaining power (Pan 1996). When the duration is short, foreign companies do not earn the necessary profits or exploit the full potential of the business. Therefore, foreign-invested firms with shorter investment duration are reluctant to choose WOS because they cannot obtain higher returns (Shan 1991). In this paper, investment duration is measured by the number of years that the project lasts. The data come from the Ministry of Planning and Investment.

Project orientation (exporting or serving the domestic market) affects the distribution strategy, marketing capability and performance of MNCs, and this affects the company's governance structures, as well as the entry mode selection (Luo 2001). If a project is set up to serve the domestic market, it interacts with the domestic environment more deeply than an export project. Partnering with local companies can reduce the risk of change in the domestic business environment. Most business transactions in emerging economies are based on relationships with individuals or organizations, and consumers tend to be loyal to businesses that have long experience (Xin and Pearce 1996) (cited in Luo 2001). Collaboration with local companies is necessary for MNCs seeking local market expansion. However, when a project is export-oriented, contributions by local companies become less important. Instead, MNCs can choose 100% foreign capital to facilitate business processes (Luo 2001). This variable is a dummy variable. It takes a value of 1 if the investment project is for exporting purposes, and 0 if the investment project only serves the domestic market.

Investment year has a significant impact on the entry mode choice of the firms. In 2008, after it became a member of the World Trade Organization (WTO), Vietnam increased its socio-economic achievements and created a favorable business environment for domestic and foreign investors. For example, Vietnam's GDP growth rate in 2018 was 7.08%, the highest since 2008, making Vietnam one of the fastest-growing countries in the region and the world (GSO 2018). In addition, the introduction of an Investment Law in 2014 has contributed to an improvement in the investment climate in Vietnam. Therefore, investors are more confident about choosing WOS as an entry mode. This variable is also a dummy variable. It takes a value of 1 for the period after 2008, when Vietnam joined the WTO; otherwise, 0.

3.3. Analytical Methodology: Logit Regression Model

Based on the measurement of dependent variable described in Section 3.2, we employ the Logit (logistic unit) regression model to examine the impacts of cultural distance between Vietnam and investing countries on the entry mode selection of FDI firms. The Logit regression model allows us to explain the actual coefficients in the model. The estimation model can be described with the equation:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \varepsilon$$

where

Y is the entry mode choice of foreign-invested firms ($Y = 1$ for EJV, and $Y = 0$ for WOS)

β_0 is the intercept

β_1 is the regression coefficient of cultural distance

X_1 is the value of the cultural distance variable

$\beta_{2 \rightarrow 8}$ is the regression coefficients of other control variables (country risk, market potential, investment capital, duration, project orientation, industry, WTO)

$X_{2 \rightarrow 8}$ is the value of control variables

ε is the error term

4. Results and Discussion

4.1. Descriptive Statistics

Table 1 describes the means, standard deviation (SD) and correlations for the entry mode choice of foreign-invested firms in Vietnam. The average capital investment of a project is USD 5.1 million, and the average project duration is 22 years. About 2% of foreign-invested projects in Vietnam are for exporting. About 83% of projects in Vietnam with foreign investment post-date Vietnam's WTO membership.

Table 1. Mean, Standard Deviation, and Correlation ($n = 5236$).

	VIF	Mean	Std. Dev	1	2	3	4	5	6	7	8	9
1. Entry mode		0.22	0.41	1								
2. Culture distance	1.02	0.89	0.58	−0.03	1							
3. Country risk	1.72	0.80	0.03	−0.004	−0.02	1						
4. Market potential	2.45	6.18	0.64	−0.03	−0.01	0.4	1					
5. Investment Capital	1.10	5.1	6.55	0.07	−0.09	0.1	0.04	1				
6. Duration	1.23	22.11	16.67	0.02	−0.05	−0.02	0.33	0.17	1			
7. Project orientation	1.13	0.02	0.15	−0.07	0.03	0.18	0.26	0.001	−0.0006	1		
8. Industry	1.12	0.239	0.42	−0.08	−0.06	0.23	0.15	0.18	0.02	0.15	1	
9. WTO	3.08	0.83	0.375	0.01	−0.004	−0.62	−0.72	−0.10	−0.13	−0.31	−0.23	1

In terms of market potential, Vietnam's economic growth rate in the period 2005–2016 was 6.18%. Vietnam is considered a country with low political risk, and the average level of political risk in that period was 0.8.

Regarding the cultural distance between Vietnam and the investment country, Vietnam has the lowest cultural difference (minimum value is 0.07) with countries in Southeast Asia, such as Brunei, Cambodia, Myanmar and Indonesia. The cultural gap increases in the sample with European countries and the US. Vietnam has the largest cultural gap (2.34) with Nigeria.

4.2. Results of Regression Models

The findings in our research contribute to a general understanding of the entry mode selection in emerging countries.

In cross-sectional data regression, heteroskedasticity may be a serious problem that we need to address. To deal with heteroskedasticity, we use a White heteroskedasticity consistent covariance matrix for each coefficient standard error. In addition, the variance inflation factor (VIF) test provides no evidence of multicollinearity in our model (Hair et al. 2016). We include four regression models to examine the impacts of country-specific factors, firm-specific factors, and industry factors on entry mode choice. The estimates remain robust in term of significant level and sign. The Pseudo- R^2 has improved from 0.0022 in model 1 to 0.0230 in model 4. Therefore, we choose model 4 as our final model to interpret the results.

In H1, we assume that the greater the cultural distance between Vietnam and the investing countries is, the more likely it is that foreign investors will choose WOS over EJV as an entry mode. Regression results in Table 2 support this hypothesis: When cultural difference increases by one percentage point, the probability of selecting WOS increases 1.8%. The finding is consistent with transaction cost theory, which emphasizes that the structure chosen by a firm with foreign investment is affected by a desire to minimize the transaction costs (Anderson and Gatignon 1986; cited in Luo 2001). These transaction costs include the cost of drafting contracts, negotiating with business partners, and monitoring the partner (Luo 2001). When the transaction costs are high, firms are more likely to select WOS as an entry mode because it enables them to operate independently and to avoid opportunistic behavior by their local partners. For example, in Vietnam, in the era of doi moi, foreign investors preferred joint ventures to WOS because this investment form helped them to overcome inefficient government bureaucracy and gain more market information from their local partners and it also had a lower sunk cost for new entrants (Simonet 2012). However, joint ventures have many disadvantages, such as lacking flexibility, and many joint venture companies ended up in litigation. For example, Sapharco bought the share of its French partner to change Roussel Vietnam into a 100% locally-owned enterprise in 2002 (Simonet 2012). In this kind of situation, great cultural difference and inefficient cooperation with local counterparts encourages foreign investors to select WOS to ensure a lower failure rate. According to Simonet (2012), the overall failure rate of foreign-invested firms from 1988 to 1997 was 16% (694 out of 4514 projects were dissolved), and the failure rate of joint venture projects is twice as high as the overall rate. New foreign investors in Vietnam hear stories about unsuccessful EJV from previous investors. Therefore, they prefer WOS for entry. In 2015, the share of WOS in investment in Vietnam was high, comprising 70.5% of investment projects compared to 3.8% that were EJV (Ministry of Planning and Investment 2015).¹ The same was seen in China, where in 2004, WOS made up 65% of investment projects, whereas EJV accounted for 30% (Simonet 2012). Our findings suggest that the cultural distance between home and host transition country is an important factor to consider when foreign-invested firms want to invest in a transition country with a high level of uncertainty. The study contributes to the discussion of entry mode selection in transition countries.

¹ This information comes from <http://www.mpi.gov.vn/en/Pages/tinbai.aspx?idTin=38605&idcm=109/>.

Table 2. The Effect of Cultural Distance on the Entry Mode Choice of Foreign-Invested Firms in Vietnam (Marginal Effect of the Logit Model).

	Model 1	Model 2	Model 3	Model 4
Country-Specific Factors				
Cultural distance	−0.022 *** (0.01)			−0.018 *** (0.009)
Country risk	0.107 (0.15)			0.146 (0.18)
Market potential	−0.025 ** (0.009)			−0.032 ** (0.013)
Industry-Specific Factors				
Industry sector		−0.08 * (0.01)		−0.09 * (0.01)
Firm-Specific Factors				
Investment amount			0.015 * (0.003)	0.017 * (0.003)
Duration			0.0003 (0.0003)	0.0005 (0.0003)
Project orientation			−0.192 * (0.017)	−0.182 * (0.02)
Year of investment			0.006 (0.01)	−0.048 *** (0.02)
No. of obs.	5194	5236	5236	5194
Wald chi-square	12.10	40.48	43.91	93.95
(Prob. > chi-square)	(0.0070)	(0.0000)	(0.0000)	(0.0000)
Pseudo chi-square	0.0022	0.0079	0.0118	0.0230

Notes: * significant at 1%, ** significant at 5%, *** significant at 10%. White heteroskedasticity consistent standard errors are reported in parentheses. Industry sector: Manufacturing (coded as 1) and services (coded as 0).

As hypothesized, we find that manufacturing firms prefer WOS to EJV, and service firms are more likely to select EJV over WOS. This is because manufacturing firms often require greater capital investment than service firms (Erramilli and Rao 1993). Selecting WOS allows foreign-invested firms to enjoy lower transaction costs and avoid opportunistic behavior by joint venture partners (Brouthers and Brouthers 2003).

These findings support Shieh and Wu (2012), who find that investors in Vietnam in the Greater Chinese Economic Region were more likely to select WOS when investing in manufacturing, and EJV in services.

The regression results show that markets with greater potential have a higher likelihood that investors will select WOS over EJV. A country with a fast and stable economic growth rate encourages foreign investors to commit resources toward its development. In this context, market potential stimulates investors to establish WOS in order to maximize profits (Agarwal and Ramaswami 1992). The finding is consistent with those in previous empirical studies (Hill et al. 1990).

As expected, foreign-invested enterprises with high investment capital are more likely to choose EJV over WOS to share the risks with domestic partners. When capital investment increases by 1%, the likelihood that a foreign-invested firm will choose EJV as its entry mode increases by 1.7%. Investment capital represents the financial commitment of the parent company to the subsidiary (Wei et al. 2005). According to transaction cost theory, financial commitment has a significant impact on the market entry mode of foreign-invested enterprises. When a relatively small amount of capital is being invested, WOS is the preferred option, as this form of investment allows the parent company to fully control the subsidiary and retain all of the profit (Luo 2001). However, when the company participates in a large project and requires a large amount of capital investment, EJV can provide solid financial support and help to share risks with local partners (Luo 2001). This result is similar to those in previous studies (Kogut and Singh 1988; Tsang 2005; Shieh and Wu 2012).

The coefficient of the project orientation variable is negative and statistically significant at 1% with the entry mode choice. This means that if the project is established for the purpose of exporting, foreign-invested firms choose WOS. If a project is set up to serve the domestic market, it will certainly interact more intensively and extensively with the domestic environment than an export project (Luo 2001). Partnering with local companies can help reduce the risks of change in the domestic business environment and explore business potential. However, when a project is export oriented, the contributions of local companies will become less important. Instead, MNCs choose WOS to facilitate business processes.

We conjecture that foreign investors would be more likely to choose WOS over EJV after Vietnam joined the WTO. Regression results in Table 1 support this hypothesis. After becoming an official WTO member, Vietnam had great socio-economic achievements and created a favorable business environment for domestic and foreign investors. Thanks to significant changes in the investment environment, foreign investors feel more secure when investing in Vietnam and selecting WOS.

However, we do not find a statistically significant relationship between country risk and entry mode choice in Vietnam. This is because Vietnam has low investment risk (especially political risk). The political risk index fluctuates over a range of only 0.76–0.86. Therefore, the investors do not consider political risk an important factor when choosing their entry mode in Vietnam.

We expect that if the investment duration is long, the likelihood that investors will choose WOS is higher than that of EJV. Our regression results do not support this hypothesis. The duration variable is not statistically significant in the model.

5. Conclusions

This study broadens our knowledge of the entry mode choice of foreign-invested firms in a transition economy, in this case, Vietnam. The study is based on transaction cost theory to explore the link between cultural difference between Vietnam and investing countries and their entry mode selection. We employ a novel dataset of 5236 foreign-invested firms in Vietnam from 2005 to 2016, and our empirical results indicate that foreign-invested firms prefer WOS over EJV when the cultural difference between Vietnam and their home country is large. The study contributes to a general understanding of the investment strategy of foreign-invested firms and academic discussion of the entry mode in many ways. First, although cultural distance is widely accepted as having a significant influence on the entry mode choice, the question of whether a high level of cultural difference is connected with the choice of WOS or EJV in Vietnam remains unanswered. Our paper fills the research gap.

Our findings are consistent with transaction cost theory, which emphasizes that the structure chosen by a foreign-invested firm is affected by a desire to minimize the transaction cost. When the cultural distance and transaction costs are high, firms are more likely to select WOS as their entry mode because it enables them to operate independently, and to avoid opportunistic behavior by their local partners. Second, our findings have practical implications for the Vietnamese government. Given that a larger cultural distance leads to more WOS selection by foreign investors, this investment form hinders the positive spillover effects of transferring advanced technology, as well as good management practices. This is because the establishment of WOS makes it easy for MNCs to engage in production and minimize the risk of technology exposure to domestic firms. In fact, for many years, Vietnam has encountered many difficulties in promoting technology transfer, as well as learning advanced technology from foreign firms (Ministry of Planning and Investment 2015). The Vietnamese government should improve the investment climate and the quality of governance if it wishes to attract foreign firms to establish EJV with domestic firms.

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Article

Exchange Rate Regime and Economic Growth in Asia: Convergence or Divergence

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Abstract: Exchange rates and exchange rate regimes in a constantly changing economy have always attracted much attention from scholars. However, there has not been a consensus on the effect of exchange rate on economic growth. To determine the direction and magnitude of the impact of an exchange rate regime on economic growth, this study uses the exchange rate database constructed by Reinhart and Rogoff. This study also employs the GMM (Generalized Method of Moments) technique on unbalanced panel data to analyze the effect of the exchange rate regime on economic growth in Asian countries from 1994 to 2016. Empirical results suggest that a fixed exchange rate regime (weak flexibility) will affect economic growth in the same direction. As such, results from the study will serve as quantitative evidence for countries in the Asian region to consider when selecting a suitable policy and an exchange rate regime to attain high economic growth.

Keywords: exchange rate regime; economic growth; Asia; Reinhart and Rogoff

1. Introduction

In a market economy with a flexible exchange rate, the exchange rate changes daily, or in fact, by the minute. The fluctuation in exchange rates has an impact on the economy (reflected by macroeconomic variables) and on society. As a result, in addition to policymakers and enterprises, the majority of the public pays attention to exchange rate changes. The selection of an appropriate exchange regime for a country is a very important issue, as it not only affects international finance but also a country's economic development.

In reality, different countries select different exchange rate regimes, and a country can have different exchange rate regimes at different points in time. There is not a universally suitable exchange rate regime for every country in the world. Some countries choose a floating exchange rate regime when the price of a country's currency relative to other currencies entirely depends on the supply and demand of related currencies. One of the representative countries with a floating exchange rate regime is Australia. In Australia, the Reserve Bank of Australia (RBA) does not intervene in the foreign exchange market except for in urgent situations, such as a speculative attack. Some countries may choose a fixed exchange rate (Hong Kong), while others, such as Vietnam, opt for a managed floating system.

From a theoretical angle, the theory of optimum currency areas by American economist Mundell (1961) states that a fixed exchange rate regime can enhance trade and output growth by devaluing the exchange rate and risk premium, while encouraging investment by lowering monetary value with interest rates. The criteria of the theory of optimum currency areas include trade interdependence, a converging trend of macro policies, flexibility of production factors, and uniform responses to shocks.

From an empirical angle, many scholars have examined how the exchange rate regime affects economic growth and have arrived at different conclusions. Empirical studies by [Baxter and Stockman](#)

(1989); Flood and Rose (1995); Ghosh et al. (2002); Mauro and Juhn (2002) argue that the choice of exchange rate regime has no effect on economic growth. However, the study by Husain et al. (2005) contends that a floating exchange rate regime is more stable and has a stronger relationship with growth, while a managed float in emerging economies is unstable and vulnerable to crises. On the other hand, studies by Mundell (1961); Dubas et al. (2005); and Bailliu et al. (2003) show contradictory results.

The current study is employed to supply additional empirical evidence on growth and exchange rate regimes for Asian countries. To the best of our knowledge, most of the studies used de jure data set on exchange rate regimes such as Husain et al. (2005); Domaç et al. (2004); and Eichengreen and Leblang (2003) but a limited number of studies conducted their research with de facto exchange rate regimes of Asian countries such as Coudert and Dubert (2005). To address this issue, in this paper, we contribute to the discussion by using the unique data set of the exchange rate regime classification by Reinhart and Rogoff (2004) with two types of measurement, by value and by group of dummy variables, to investigate the effect of exchange rate regime on economic growth. This study also covers all Asian countries with data availability.

Moreover, this paper pays much attention to Asian countries. Asia is one of the world's most dynamic economic regions and plays an essential role in the world's economy. Figure 1 shows that the growth rates of Asian countries are always much higher than the average growth of the world. Referring to papers on the exchange rate regime and economic growth, most studies focused either on all the world such as Ghosh et al. (1997); Moreno (2001); Levy-Yeyati and Sturzenegger (2003); Husain et al. (2005); and Dubas et al. (2005), or indispensable Asian countries which suffered from the financial crisis of 1997 such as Huang and Malhotra (2005); and Coudert and Dubert (2005). Moreover, the empirical evidence of Asian countries over the time period of the study confirms the theory of Mundell (1961) on optimum currency areas, which requires trade interdependence, convergence of macro policies, and flexibility in production factors. Asian countries are increasingly open to trade, and financial markets play an increasingly important part of the world economy. Asia also has a high number of emerging and developing countries. Therefore, the stability of currency values plays an important role in the balance of trade, thereby contributing positively to a country's economic growth. The choice of exchange rate regime ultimately aims to boost growth, improving the standard of living and executing international responsibilities. As a result, the study of these countries will provide many vital implications in the choice of exchange rate regime for Asian countries.

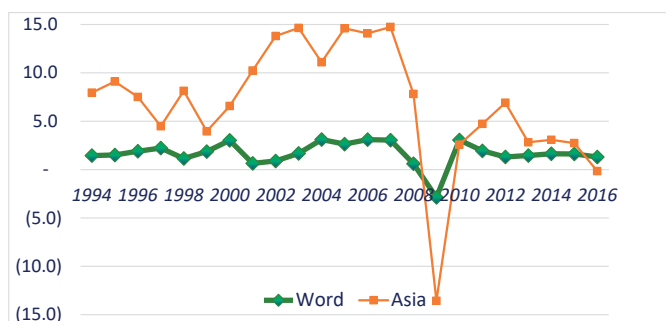


Figure 1. Average growth rate of GDP per capita of World and Asian countries in 1994–2016.

Despite these miraculous developments, Asian economies have fell into crisis in the 1990s. This currency crisis started Thailand in 1997 (Stiglitz 2000; Wang 1999; Wade 1998) then spread to the rest of southeast Asia, to the Taiwan, Hong Kong, Korea, Russia, and even countries such as Australia and New Zealand (Wade 1998; Jang and Sul 2002; Athukorala and Rajapatirana 2003). These countries were also affected by the 2008 economic crisis. The global economic crisis in 2008 saw the banks panic, with a sudden drop in lending in the US (Ivashina and Scharfstein 2010) cause recessions in many

western countries (Burdekin et al. 2012; Barth et al. 2012), falling stock prices, and large-scale currency depreciation in the US and Europe, before spreading to other countries (Ivashina and Scharfstein 2010; Kotz 2009).

The contributions of this paper are as follows: (1) economic theory and empirical evidence provides conflicting predictions about the effects of exchange rate regimes on economic growth. This paper attempts to help close this gap by examining the effect of exchange rate regimes on economic growth using de facto exchange rate classification which is considered to be a better indicator for exchange rate policy; (2) This is a unique study using two datasets (the dataset of Reinhart and Rogoff, which reflects the foreign exchange market, and the dataset of Laeven and Valencia, which identifies the crisis year of each Asian country); (3) This research investigates the role of crisis (two measurement techniques of crisis) in the impact of exchange rate regimes on economic growth.

The rest of this paper is structured as follows: Section 2 presents a literature review. Section 3 presents the methods and data. Empirical results and a discussion are given in Section 4. Lastly, Section 5 includes some conclusions and policy recommendations.

2. Theoretical Reviews on the Effect of Exchange Rate on Economic Growth

2.1. Exchange Rate Regime

According to Ilzetzki et al. (2017) and International Monetary Fund (IMF), types of exchange rate regime classification based upon official statements of the jure policy include (1) exchange arrangement with no separate legal tender; (2) currency board arrangement; (3) conventional peg arrangement; (4) stabilized arrangement; (5) crawling peg; (6) crawling-like arrangement; (7) pegged exchange rate within horizontal bands; (8) floating; (9) free floating; and (10) other managed arrangements.

Since the IMF classification of exchange rate regimes is based on information provided by member countries, it does not reflect the differences between the actual implementation versus the official statements. According to Rose (2011), there are some other de facto exchange rate regime classifications such as Levy-Yeyati and Sturzenegger (2003); Reinhart and Rogoff (2004) (RR); and Shambaugh (2004). The ratio of observations is similar between these methodologies of classifications and IMF one is 59%, 59%, and 68% respectively. RR classification is based on market-determined exchange rates, dividing regimes into 5 groups: (1) the fixed exchange rate regime: a fixed regime that is announced and maintained, with monetary policy pegged to foreign policy; (2) the peg regime: the central exchange rate is pegged to another currency on a fixed rate with a small margin of fluctuation, the central bank is ready to intervene to maintain the rate, central bank may intervene but not frequently; (3) the managed float regime: the exchange rate is determined by the market, which means there is no officially announced exchange rate though the government has an underlying target exchange rate; the central bank proactively intervenes to soften the fluctuations; (4) the free float regime: the exchange rate is entirely determined by the market as the central bank has no underlying target rate and does little intervention; and (5) the “free-falling” regime: a regime that can be any type legally but the country is in fact suffering from a crisis.

International Monetary Fund (IMF) presents a set of common principles regarding the size of the economy, openness, diversification of production/export, diversification of export market, difference between domestic and external inflation, extent of economic development, finance, extent of freedom in capital movement, exchange rate fluctuation, and trustworthiness of policies to control inflation. The choice of an appropriate exchange rate regime depends on the characteristics of each country and may vary with time.

2.2. Theoretical Background and Previous Studies on Exchange Rate Regime and Economic Growth

Ghosh et al. (1997); Bailliu et al. (2003); and Jakob (2016) point out that economic theory which explains how the exchange rate regime affects economic growth is relatively modest. Theories mainly refer to the exchange rate regimes that can affect trade, investment, and productivity, and thereby

affect growth. Furthermore, the magnitude of these effects is upon the development level of each country. Two notable theories concerning this relationship are the theory of optimum currency areas (OCA) of Mundell (1961) and Penne hypothesis of Balassa (1964); Samuelson (1964). The leading theoretical basis for exchange rate regime selection is the theory of OCA, first proposed by Mundell (1961) and McKinnon (1963). According to his theory, a fixed exchange rate regime can promote trade and output growth by devaluing the exchange rate and risk insurance premium, while encouraging investment by lowering the monetary value with interest rate. However, on the other hand, it reduces trade growth potential and output growth by suspending, delaying, or slowing the necessary relative price adjustment process. The Balassa–Samuelson hypothesis is also considered to be a well-known theory indirectly explaining exchange rate regime, trade, and growth. The Penne effect is explained by productivity increases in the tradable sector tending to be higher than that of non-tradable ones. In turn, the productivity increases are expected to contribute to higher growth rates of prices in the tradable sector. Moreover, exchange rates tend to appreciate in countries with high growth rate and be underestimated in countries with low growth rate (Balassa 1964; Samuelson 1964).

Because theories do not present the foundations of the relationship between exchange rate regimes and economic growth, the research framework is built on neoclassical economic growth theory, endogenous growth theory, and empirical evidence.

For economic theory, the neoclassical theory by Solow (1956) introduces labor and technology into the growth equation with decreasing marginal returns to production factors. The production function is $Y = f(K, L, R, T)$ in which Y = output (GDP), K = capital, L = labor force, R = natural resources and T = technology. According to Mankiw et al. (1995), capital does not flow to developing countries to make use of the high rates of return, as Solow and subsequently Lucas (1988) have predicted. Countries that invest more in physical and human capital will not only achieve an income in the steady state that is higher than in Solow's model, but also continue to grow at a faster rate. This means that the growth rate is not simply a reflection of external factors such as labor force growth rate or rate of global technological change, but also an endogenous variable in the model. Since then, economists have developed more sophisticated models and brought many endogenous variables into the model. This contribution has formed the research of Lucas (1988); Romer (1986); Romer (1990).

For empirical evidence, there are various studies on the impact of exchange rate regime on economic growth. The studies using descriptive statistics on panel data have provided very different results. Baxter and Stockman (1989) examined 49 countries in the 1946–1984 period, concluding that the impact does not exist. Meanwhile, a study by Mundell (2002), which looked into the 1947–1993 period in the US, Japan, Canada, and European countries, and a study by Moreno (2001), which investigated 98 developing countries in East Asia in 1974–1999, show a same-direction impact. Ghosh et al. (1997) conducted a study on 145 countries in the 1960–1990 period, which found no clear impact.

Following the studies using descriptive statistics, many post-2002 studies opt to use econometric models, most commonly pooled ordinary least squares. Similar to those using descriptive statistics, the econometric studies yield inconsistent results on the impact of exchange rate regime on economic growth.

A lot of the studies, with different data types, different time periods, and different estimation techniques, find no conclusive evidence on whether exchange rate regime makes a difference to economic growth. Huang and Malhotra (2005) used regression on panel data of 18 developed countries in 1976–2001. Domaç et al. (2004) employed the switching estimation technique for 22 different countries in different time periods in 10 years in the 1990s. Garofalo (2005) used OLS and 2SLS for Italy in the 1861–1998 period.

Besides the studies that give inconclusive results, there are studies that prove the inverse relationship between the fixed extent of the exchange rate and economic growth, such as Husain et al. (2005), Levy-Yeyati and Sturzenegger (2003) (183 countries in 1974–2000), and Eichengreen and Leblang (2003) (21 countries in 1880–1997). Most notably, Husain et al. (2005) argues that a floating exchange rate regime is more stable and has a strong relationship with economic growth. This is because richer

and more financially developed countries benefit more from the flexibility of the exchange rate system. On the other hand, as developing countries are less sensitive to the capital markets, a pegged exchange rate regime brings lower inflation and more stability for the economy, even though this regime is least stable and more susceptible to risks when crises occur.

In particular, [Levy-Yeyati and Sturzenegger \(2003\)](#) examined the relationship between growth and exchange rate regime of 183 countries in the post-Bretton–Woods era between 1974 and 2000. Developing countries that have a less flexible exchange rate regime have a slower growth rate and more volatile output fluctuation. Meanwhile, in industrial countries, exchange rate regime does not have any impact on growth. Even though this result is later rebutted by [Bleaney and Francisco \(2007\)](#) as having a weak basis, it prompts much thinking on the diverging or converging nature of the effect of exchange rate regime on economic growth.

Contrary to this viewpoint, according to the theoretical analysis by [Mundell \(1961\)](#), who establishes the foundation of the theory of exchange rate regime selection, a fixed exchange rate regime can enhance trade and output growth rate by devaluing the exchange rate and risk premium, while encouraging investment by lowering the monetary value with interest rate. Criteria to achieve this include trade interdependence among countries in the area, a converging trend in macro policies, flexibility of production factors, and uniform responses to shocks. This result is supported by empirical studies conducted by [Dubas et al. \(2005\)](#); [De Grauwe and Schnabl \(2005\)](#); [Bailliu et al. \(2003\)](#); and [Baldwin \(1989\)](#). In their study, [Ghosh et al. \(2002\)](#) state that “one of the most surprising discoveries is that the growth results of a fixed exchange rate regime are not worse than the floating regimes”. [Dubas et al. \(2005\)](#) prove that there is a meaningful symmetrical effect between fixing the exchange rate and economic growth. Notably, countries with exchange rate regimes that show “fear of floating” (in which the exchange rate regime is announced to be floating but exposes characteristics of a fixed regime) have a significantly higher growth rate than other countries. Other than in developing countries, [De Grauwe and Schnabl \(2005\)](#) point out that a fixed exchange rate does not reduce economic growth in Central and East European countries, and that it is unconvincing to think that joining the European common currency area will dampen economic growth. In support of this argument, [Baldwin \(1989\)](#) in his analysis of the European monetary union asserts that a common currency such as the euro can stimulate economic growth in Europe by reducing the exchange rate premium on capital within the continent. In addition to the effect of exchange rate regime, economic growth is affected by other factors, which are compiled in Table 1.

Table 1. List of explanatory variables used in previous studies.

Author	Time and Region Regime	Independent Variables	Methods	Results
Baxter and Stockman (1989)	1946–1984; 49 countries; pegged and floating		Comparative	No effect
Mundell (2002)	1947–1993; US, Japan, Canada, EC, other Europe; De jure		Descriptive statistics	Positive
Moreno (2001)	1974–1999; 98 East Asian developing countries; De facto		Descriptive statistics	Positive
Ghosh et al. (2002)	1960–1990; 145 countries; De jure		Descriptive statistics	Unclear relationship

Table 1. Cont.

Author	Time and Region Regime	Independent Variables	Methods	Results
Levy-Yeyati and Sturzenegger (2003)	1974–2000; 183 countries; De facto	investment/GDP; terms of trade; Government spending; political instability; average initial GDP; population; trade openness; enrollment rate of secondary school; dummy variable for the region and exchange rate regime	OLS; 2SLS	Negative
Eichengreen and Leblang (2003)	1880–1997; 21 countries; de jure	income per capita/total income, enrollment rate of primary, and secondary students, capital control, dummy exchange rate regime	GMM	Negative
Bailliu et al. (2003)	1973–1998; 60 countries; de facto and de jure	initial GDP, investment rate/GDP, number of secondary students, real government spending/GDP, trade openness, M2/GDP, private sector credit/GDP, domestic credit/GDP, net private capital/GDP, exchange rate dummy variable	GMM	Positive
Domaç et al. (2004)	10 years (1990s, different period for each country); 22 transition countries; de jure	net government spending, lagged financial openness, inflation, number of years in socialism, urbanization degree, the proportion of trade in CMEA	Switching estimation technique	Depend on development level
Husain et al. (2005)	1970–1999; 158 countries; De jure	Investment/GDP; Trade openness; term of trade growth, average years of schooling, tax rates, net government spending; initial average annual income/gross income; population growth; population; exchange rate dummy variable	OLS	Developing countries: positive Developed countries: Negative, emerging: insignificant
Garofalo (2005)	1861–1998; Italy; De facto	investment/GDP; Government spending; political instability; initial GDP; population; trade openness; enrollment rate of secondary school students; dummy variable for the region and exchange rate regime	OLS; 2SLS	Depend on development level
Dubas et al. (2005)	1960–2002; 180 countries; De facto	initial GDP, initial population, population growth, investment/GDP; civil responsibility, trade openness; terms of trade, dummy variables for transition countries, Latin America and Africa, time dummy variables, exchange rate dummy variables	REM	Positive
Huang and Malhotra (2005)	1976–2001; 12 developing Asian countries and 18 developed European countries; De facto	financial crisis, trade openness; initial GDP, fertility rate, enrollment rate of secondary school students, dummy exchange rate regime	Pooled OLS	Depend on development level
Coudert and Dubert (2005)	1990–2011; 10 Asian countries	initial GDP, investment/GDP, population, trade openness, education spending	2SLS	Positive
De Grauwe and Schnabl (2005)	1994–2002; 10 Eastern Europe countries; de facto	investment rate/GDP; export, net government spending/GDP; Short-term capital/GDP ratio, EU-15 real growth rate, exchange rate dummy variable	GMM	Positive
Bleaney and Francisco (2007)	1984–2001; 91 developing countries; de facto	growth rate, time, exchange rate regime (all are dummy)	Pooled OLS	Negative

Source: Authors' synthesis.

3. Data and Model

3.1. Data

The study spans the 1994–2016 period and covers 46 countries according to geographical classification of the World Bank (Appendix A, column 1). Among them, 34 countries have sufficient data on the exchange rate regimes following RR classifications (Column 2), and 23 countries were present in systemic banking crisis data of [Laeven and Valencia \(2018\)](#). Therefore, all available data studies the impact of exchange rate regimes on economic growth. Moreover, Georgia and Russia were considered to be “dual market in which parallel market data is missing” in 1997, 1998 and 1997, 1998, 2011–2016, respectively. Data comprises an unbalanced panel with 525 observations.

Most variables, such as economic growth, trade openness, government expenditure, and education, are extracted from the World Development Indicator database (WDI) of World Bank.

Exchange rate regime (ER), the independent variable in the model, is the measurement of the exchange rate policies of various countries, and taken from the publications of Reinhart and Rogoff at <http://www.carmenreinhardt.com>, a website updated by the two professors. They re-classify actual exchange rate regimes based on reports of member countries to IMF. According to [Reinhart and Rogoff \(2004\)](#), exchange rate regimes are sorted from the most rigid to the most flexible {1; 2; 3; 4; 5} = {fixed; pegged; managed float; free float; “free-fall”}.

Crisis data is updated in the database on systemic banking crises presented in [Laeven and Valencia \(2018\)](#) and can be downloaded at <https://sites.google.com/site/laeven/des>. This data set provides more comprehensive information of the crisis over time. In contrast to other research, this dataset points out the crisis year of each country. The descriptive variables are presented in Table 2.

Table 2. A summary of variables.

Variables	Definition	Calculation
Dependent variable		
$Y_{i,t}(g)$	Economic growth	Growth rate of GDP per capita (measured in USD with 2010 as the base year)
Independent variable		
$Y_{i,t-1}$		GDP per capita of the year preceding year t
ER	Exchange rate regime	taking on the values 1, 2, 3, 4, 5
CRISIS	Crisis	dummy variables: 1 in crisis year (model 1)
		dummy variables: 1 in 1997 and 2008 (model 2)
OPEN	Trade openness	(Export + Import)/GDP
GOV	Government spending	General government final consumption expenditure (% of GDP)
EDU	A measurement of human capital	Total secondary school enrollment/Total population
GDP initial	A measurement of catching-up process	Ln (Real GDP per capita of 1993)

3.2. Research Model

Drawing from the theoretical basis and empirical studies, and from the process of trial and error, the research model is constructed with the following factors: (1) GDP per capital growth; (2) exchange rate regime; (3) frequency of monetary crisis, magnitude of crisis; (4) openness of the economy; (5) government spending; and (6) human capital. To examine the impact between exchange rate regime and economic growth, the study is based on theoretical and empirical studies (Table 1), and makes use of the two approaches, in which Model 1 uses a proportionate variable for exchange rate regime while Model 2 uses dummy variables for types of exchange rate regime as follows:

Model 1:

$$Y_{i,t(g)} = a + Y_{i,t-1} + \mu_1 ER + \mu_2 CRISIS + \mu_3 OPEN + \mu_4 GOV + \mu_5 EDU + GDP_{initial} + \varepsilon \quad (1)$$

Model 2:

$$Y_{i,t(g)} = a + Y_{i,t-1} + \mu_{11} dregime_1 + \mu_{12} dregime_2 + \mu_{13} dregime_3 + \mu_{14} dregime_4 + \mu_2 CRISIS + \mu_3 OPEN + \mu_4 GOV + \mu_5 EDU + GDP_{initial} + \varepsilon \quad (2)$$

In which:

- Crisis is a dummy variable reflecting the effect of the global financial crisis of 2008 and Asian financial crisis of 1997 on output (Ma and Lin 2016). In addition to Ma and Lin (2016), the currency crisis of 1997 was recognized in the studies of Stiglitz (2000); Wang (1999); Wade (1998); Jang and Sul (2002); and Athukorala and Rajapatirana (2003) while the financial crisis of 2008 was emphasized in the studies of Ivashina and Scharfstein (2010); Munir (2011); Kotz (2009). To cross check and increase the reliability of empirical evidence, this study uses another database of crisis, which is introduced and updated by Laeven and Valencia (2018).
- Openness reveals trade openness level. The effect of trade openness is not clear cut. Studies supporting fixed exchange rates suggest that the fixed exchange rate will reduce exchange rate risk, thus stimulating trade, investment, and especially technology transfer, increasing the openness of the economy and in turn promoting economic growth (Moreno 2001; De Grauwe and Schnabl 2005; Sachs et al. 1995). Unsupported studies such as Bailliu et al. (2003); Domaç et al. (2004) suggest that the flexible exchange rate will smooth the adjustment to shocks, thereby quickly and easily and absorbing economic shocks, enhancing the expected growth. They also pointed out that when uncertainty exists, trade and investment activities will become hesitant and many countries are claimed as mentioned in McKinnon (1963); Calvo and Reinhart (2002). In particular, Rodriguez and Rodrik (2000) could not find any linkage. However, given that most countries in our sample have based their development strategy on exports, a positive impact can be expected.
- Government spending and education enrollment should have a positive impact on growth, since such expenditure is generally viewed as an improvement in investment and human capital and helps to increase the factors of production. Both variables are represented by the resources in standard economic growth model.
- GDP initial is designed to stand for the catching-up process. According to neoclassical theory, initial per-capita income has a negative relationship with economic growth (Bailliu et al. 2003; Huang and Malhotra 2005; Coudert and Dubert 2005). Countries with a lower level of initial per-capita growth will grow faster than higher ones because they must go out of their steady state and must catch up.

For estimation technique, initially, the study uses pooled OLS estimation. However, a heteroskedasticity test using the Greene test (Greene 2000), and autocorrelation test using Wooldridge (2010) and Drukker (2003) show the presence of heteroskedasticity and autocorrelation. Moreover, the relationship between government spending and economic growth is theoretically endogenous, as confirmed by Lee and Gordon (2005) and Halko et al. (2012). Moreover, the existence of endogeneity in the model has been demonstrated in background theory. Endogenous problems in the model are mentioned by Garofalo (2005). In addition, the simultaneous relationship between economic growth and the exchange rate regime is also mentioned in the study of Levy-Yeyati and Sturzenegger (2003), and potential two-way causality between economic performance and the exchange rate regime also are pointed out by Bailliu et al. (2003).

As a result, this study will conduct the regression using the GMM (Generalized Method of Moments) on unbalanced panel data. According to results from Arellano and Bond (1991) and

Arellano and Bover (1995), GMM is an effective solution to control for autocorrelation of residuals, heteroskedasticity and endogeneity, ensuring that the estimation is strong and robust.

4. Analysis and Discussion of Results

4.1. Descriptive Statistics of Data

From Table 3, it can be seen that the standard variations are not too high compared to the mean values. The data are relatively uniform, with no presence of anomaly. A sample size of 525 observations is a large size in statistics according to Green (1991).

Table 3. Descriptive statistics of variables.

Variable	Sample Size	Mean	Standard Variation	Min	Max
Y	525	3.56	4.99	−20.78	32.99
GDP initial	525	4212.14	7890.64	180.19	35,451.30
ER	525	2.34	1.06	1.00	5.00
OPEN	525	81.52	37.92	16.10	220.41
GOV	525	14.02	4.87	5.46	33.92
EDU	525	8.54	2.33	3.98	14.14

The average economic growth of the countries being studied is 3.56 in the 1994–2016 period. Since a standard variation of 4.99 is not too high compared to the mean, the growth in this period is relatively stable. Tajikistan has the lowest growth rate of (−22.48%) in 1994. Azerbaijan has the highest growth rate of 33.03% in 2006.

Figure 1 shows that the trend in the growth rate of countries and territories in Asia is similar to that of the world economy, with two slowdowns in 1997–1998 and 2008–2009.

In the Asian region, the exchange rate regime is very diverse. During the period of research, most countries are under pegged or managed to float regimes: Kazakhstan, Kyrgyz, Sri Lanka, and Vietnam follow pegged exchange rates (except for crisis time); Brunei, Israel, and Turkey adopted managed float; the others apply both. Small countries or demand economy countries adopt fixed regimes such as Lebanon (23 years), Jordan (21 years), Azerbaijan (19 years), Kuwait (14 years), and China (12 years). The “free-fall” exchange rate regimes most frequently occurred in 1994, 1995 (8 countries), 1996 (5 countries), 1997, 1998 (3); in other years, only 1999 (2), 2001, 2002, 2015 (1 countries) occurred, and no countries face free-fall in the remaining years. The application of free-fall exchange rate mechanisms in Asian countries is probably considered to be an indicator for the fluctuations in their financial markets. The most common regime is pegged and managed float. This data also shows that before the 1997 crisis countries often chose either fixed or floating exchange rates, also called “hollow middle” according to Hernández and Montiel (2001) or bipolar (Fischer 2001) or corner solutions (Calvo and Reinhart 2002). All five worst-hit Asian economies, except for Japan (Hernández and Montiel 2001), pegged their currencies to USD (McKinnon and Schnabl 2003).

After the crisis, the countries involved are more floating than before: after falling into free-fall in 1998, Korea moved to managed float so far, Indonesia moved from free-fall to managed float (1998) and pegged (2006), Thailand from fixed to managed float (1998), and the Philippines shift to both managed and pegged. As can be seen, with the strong impact of the crisis on economic growth, many countries have changed their exchange rate regime selection. Not only the five most affected countries (Korea, Malaysia, Indonesia, Thailand, and the Philippines) but also the remaining others must be changed. This movement is also consistent with Ilzetzki et al. (2017); Hernández and Montiel (2001); Coudert and Dubert (2005); Grewal and Tansuhaj (2001); Rajan (2012); Hernández and Montiel (2001); and Ellis and Gyoerck (2019).

Although shifting to the more floating mechanism, the movement of the exchange rate regimes of Asian countries shows the “fear of floating” tendency, which announces floating in theory but still keeps fixed in practice. Currently, in 2016, the dominant exchange rate regime remains pegged

and managed (9 countries) followed by fixed and “free-fall” and pegged (with 3 countries of each). Only Japan maintained an exchange rate of “free float” during the period 2004–2016 and Malaysia adopted this regime only in 2008.

4.2. Analysis of Results

Results of the GMM model following the Arellano Bond test on AR(1) and AR(2) correlation of the first different order satisfy the conditions as p -value AR(1) < 0.05 and p -value AR(2) > 0.05 (see Table 4). At the same time, the Hansen test for the validity of the GMM model based on instrumental variables is sufficient and valid at 5% significant level. Hence, the GMM model is highly reliable for the analysis.

Table 4. Regression results of panel data.

	GMM (Model 1)	GMM (Model 2)
y	0.357 *** (5.36)	0.368 *** (0.069)
er_regime	−0.938 *** (−2.64)	−1.044 *** (0.298)
lnigdppc	−0.0002 (−0.86)	−0.000 (0.000)
Open	0.020 (1.21)	0.021 (0.018)
Gov	−0.039 (−0.29)	−0.037 (0.130)
EDU	0.863 *** (5.13)	0.862 *** (0.160)
Crisis	−4.868 *** (−2.78)	−0.919 (0.605)
cons	−3.116 (−1.20)	−3.085 (2.618)
AR(1)	0.000	0.000
AR(2)	0.133	0.214
Hansen	1.000	1.000

Notes: ***, **, and * denote significance at the level of 1%, 5%, 10% respectively. Figures in parenthesis denote t statistics.

In the first model (financial crisis measured by dummy variables for the crisis year) and the second model (using dummy variables for 1997 and 2008), it can be seen from the results that the higher the ER value, the lower the growth rate at 5% significant level. Specifically, when the exchange rate regime as classified by [Reinhart and Rogoff \(2004\)](#) increases by 1, the average growth rate decreases by 0.938% and 1.044% respectively (Table 4). Therefore, the more flexible the regime, the lower the growth rate. Moreover, the inconsistent results of the two models (using dummy variables in 1997 and 2008 and using the above dataset) show that Asian countries are quite different, so the simultaneous selection of two years of 1997 and 2008 as the crisis year is not reasonable.

Regarding control variables, they are significant, and expected. The study finds same-direction impacts exerted by the openness of the economy (OPEN) and human capital (EDU) on economic growth. On the other hand, government spending (GOV), economic crises (CRISIS), and GDP per capita of previous year have a negative relationship with growth.

While controlling the likely impact of human capital, government spending, crisis, economic openness, the econometric results reveal that the empirical evidence supports the hypothesis that the more flexible the exchange rate regime, the lower the growth rate. This result persists after changing methods of measurement exchange rate regimes (Model 1 and 2) and correcting for endogeneity by using GMM.

The empirical evidence of Asian countries in 1994–2016, which shows that countries with less flexible exchange rate regimes have a higher growth rate, concurs with an empirical study by Dubas et al. (2005), which states that economic growth will be high under a fixed exchange rate regime.

The more fix, the more growth is quite strange in the context of the increase in capital flows and the increase in trade openness. This may be because small countries, which have high trade and financial openness, are easily affected by world economy fluctuations, and choose more fixed exchange regimes to ensure stability. In addition, many countries in the study experienced two shocks in 1997 and 2008, thus having more experience in adjusting the exchange rate (not anchoring with a currency, using foreign exchange reserves to avoid currency speculation). Moreover, most countries in the sample are leading exporting countries; nevertheless, they keep the exchange rate stable to gain from trade and then higher growth.

These findings are consistent with the results of Levy-Yeyati and Sturzenegger (2003), and Huang and Malhotra (2005) that countries with lower levels of development will have higher growth when applying a more fixed exchange rate regime. This conclusion is also in line with the judgment of Rose (2011); Calvo and Reinhart (2002) that small economies often pursue fixed exchange rate regimes.

Results of the study are also consistent with the fundamental values of the theory of OCA by Green (1991), as well as with other studies undertaken in the past on various regions in different time periods. Therefore, the results of this study can serve as quantitative evidence for Asian countries that are deliberating on the choice of appropriate exchange rate policies and regime to achieve high economic growth.

5. Conclusions and Policy Recommendations

The question of whether exchange rate regimes influence the performance of Asian countries has attracted attention among researchers. However, the number of these studies in Asia is relatively limited and the answer is controversial. Thus, this paper adds to the literature by supplying new evidence on the impact of exchange rate regimes on economic growth. Using unbalanced panel data of 23 economies over 23 years, we find that a country with a less flexible exchange rate regime will have a higher growth rate.

With this result, the study suggests that the approach in government's choice of policy is to intervene in the exchange rate to lower the flexibility, depending on the ability of each government. To do this, policymakers should prepare the tools of exchange rate intervention, such as foreign exchange reserve or the power and effectiveness of the central bank. Moreover, depending on the context, when formulating exchange rate policies, governments should look at trade interdependence, convergence of macro policies, flexibility of production factors, and uniformity of responses to economic shocks in comparison to other countries.

In addition, passively adopting a fixed exchange rate mechanism is a failure of this mechanism. Therefore, it is necessary to have flexible policies, and a good strategy for this adjustment. The experience of countries that have experienced crisis shows that developing countries should stay away from corner solutions, i.e., solutions that are at the poles, either too floating or fixed to sole currency.

It is worth noting that although our empirical results prove the abovementioned hypothesis, the theoretical foundations underlying this impact largely remain absent due to the lack of robustness check to extended period of time as well as sub-samples. Therefore, pointing out detailed information on financial crises and expanding the sample size by increasing the number of countries being observed, thus increasing the years under observation, should be undertaken in future research.

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Appendix A

Table A1. List of Countries under Observation in the Study.

NO.	Country	RR	LV	NO.	Country	RR	Crisis
1	Afghanistan			24	Lebanon	x	x
2	Armenia	x	x	25	China, Macao	x	
3	Azerbaijan	x	x	26	Malaysia	x	x
4	Bahrain	x		27	Maldives		
5	Bangladesh			28	Mongolia	x	x
6	Bhutan	x		29	Myanmar		
7	Brunei Darussalam	x		30	Nepal	x	x
8	Cambodia	x		31	Oman	x	
9	China	x	x	32	Pakistan		
10	Georgia	x	x	33	Philippines	x	x
11	China, Hong Kong	x		34	Qatar		
12	India	x	x	35	Russia	x	x
13	Indonesia	x	x	36	Singapore		
14	Iran	x		37	Sri Lanka	x	x
15	Iraq			38	Syrian Arab Republic		
16	Israel	x	x	39	Tajikistan	x	
17	Japan	x	x	40	Thailand	x	x
18	Jordan	x	x	41	Timor-Leste		
19	Kazakhstan	x	x	42	Turkey	x	x
20	Korea	x	x	43	United Arab Emirates		
21	Kuwait	x	x	44	Vietnam	x	x
22	Kyrgyz	x	x	45	West Bank and Gaza	x	
23	Laos	x		46	Yemen		

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Article

Enhancing Financial Inclusion in ASEAN: Identifying the Best Growth Markets for Fintech

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Abstract: While most of the advanced economies are facing saturated markets, the Association of Southeast Asian Nations (ASEAN) has been touted a stable and attractive investment region averaging 5.4% growth since 1980. In 2013, ASEAN overtook China as the top foreign direct investment destination. Boasting the world's fifth largest economy with over 650 million people and 400 million reaching middle class, ASEAN has commendably transitioned from a subsistence economy to product and service industries. Despite the success, many live in marginalized areas without access to banking facilities. Advancing internet capability and availability present investors an opportunity to offer financial technology, or Fintech, to meet the need for financial services in this digital era. The aim of this research is to identify the countries with the highest need for financial inclusion and, hence, the best potential for Fintech growth. The results may help governments formulate policy that improves investment competitiveness. The methodology includes identifying relevant criteria and allocating weight to each criterion to evaluate the best international markets. The findings show Vietnam, Laos, and Cambodia as the countries with the highest potential. The associated risks and opportunities are discussed, followed by managerial implications, limitations, and recommendations for future research.

Keywords: ASEAN; financial inclusion; Fintech; risk; foreign direct investment; competitiveness

1. Introduction

ASEAN stands for the Association of Southeast Asian Nations comprising 10 members: Brunei, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, and Vietnam. ASEAN has been outperforming the global growth rate averaging over 5.4% annual GDP since 1980, and in 2013, its foreign direct investment eclipsed China's. ASEAN has the world's fifth largest economy, third largest population with over 650 million, and a growing middle class reaching 400 million by 2020. The fast-emerging economies of Cambodia, Laos, Myanmar, and Vietnam average 7% growth. Business analysts agree that ASEAN is a high-growth region with strong intra-Asian trade, manufacturing supply chains with Northeast Asia, and massive infrastructure expansion over the next two decades. China's One Belt One Road, with three of five corridors across ASEAN connecting to some 60 countries, is expected to enhance ASEAN's competitiveness.

Christine Lagarde ([Lagarde 2018](#)), the International Monetary Fund (IMF) Managing Director, noted while ASEAN shows positive growth trends, ASEAN is subject to heightened competition, financial volatility, and technological advances such as digitalization, robotics, and artificial intelligence. ASEAN countries could navigate the difficult terrain by managing *uncertainty*, making economies more *inclusive*, and preparing for the *digital revolution*.

Although ASEAN countries have built stronger economic foundations that helped weather the global financial crisis, recent *volatility* in financial markets reminds policymakers to stay vigilant to manage uncertainties, and safeguard against volatile capital flows with bold reforms to make economies more resilient.

Many ASEAN countries have shifted from agriculture to advanced manufacturing and services but new growth models that are more *inclusive* are needed to sustain growth. ASEAN can work together to promote inclusive growth by increasing the quality of education and infrastructure, eliminating red tape and corruption, providing affordable childcare to encourage more women in workforce, and enhancing women's access to finance. However, all this will only go so far.

A McKinsey and Company (McKinsey and Company 2016) study found that 60% of current jobs comprise tasks will soon be automated. New growth models will rely on technological innovations from artificial intelligence to robotics, to biotechnology, to *fintech* or financial technology. Lee and Teoh (2015) argue that Fintech will bring about lower business costs and profit margins. An estimated 38% of the world population has no formal bank accounts and another 40% are underserved by banks, providing a huge potential market for Fintech firms.

With mobile payment systems, Fintech has become the new economy. Indonesia has a vibrant digital ecosystem with more than 1700 start-ups and *Go-Jek* is a transformation example from a ride-hailing app into a platform for mobile payments and other services. The Singapore Fintech Festival gathers some of the world's most dynamic entrepreneurs and innovators.

Fintech is the platform for the digital revolution that promotes financial inclusion. It is not just a boost to productivity, but also one that works for young and old, rich and poor, urban and remote communities to help create a smarter and fairer economy.

In ASEAN, only 50% of adults have an account at a financial institution and 264 million adults keep money at home and borrow from "loan sharks" at exorbitant interest rates. Rates of financial exclusion are higher among the poor, less-educated, and those living in rural areas. Recognizing the importance of financial inclusion for economic development, ASEAN leaders aim to achieve 70% account ownership by 2020 (Luna-Martinez 2016).

From the above discussion, there is a critical need to enhance Fintech to help ASEAN people access financial services to receive and save wages safely and build credit history. Which ASEAN countries would offer the greatest growth for financial inclusion to attract Fintech investors?

2. Objective

The objective of this research is to identify ASEAN markets that offer the best growth potential for financial inclusion to attract Fintech investors.

There are three associated research questions to guide the research project. What may be some factors that attract Fintech investors? How should markets be evaluated to determine the best potential for financial inclusion? What type of investors may value social returns over immediate profit in growing financial inclusion in ASEAN?

3. Literature Review

Financial inclusion is the process that ensures the ease of access, availability, and usage of formal financial system that offers equality of opportunities to access financial services to all members of a nation (Sarma 2008; Nanda and Kaur 2016) and access to a transaction account is a first step toward broader financial inclusion since a transaction account allows people to store money, and send and receive payments (World Bank 2019). This definition implies there is financial exclusion, and the (World Bank 2016) describes voluntary exclusion as a condition where the segment of the population or firms choose not to use financial services either because they have no need or due to cultural or religious reasons.

Involuntary exclusion may arise from an individual's insufficient income or high risk profile, discrimination by race, religion, or gender, market failures, and imperfections. The poor are excluded from wage-earning employment opportunities that traditional economic theory presupposes (Park and Mercado 2015). They live and work in the informal economy, not by choice but by necessity (Cull et al. 2014), managing a broad range of financial services by themselves to sustain livelihoods, build asset, and manage risks. They have limited financial access, which excludes them from the normal financial system.

3.1. Does Financial Inclusion Lower Income Inequality?

Many financial inclusion studies focused on the role of financial access in lowering poverty and income inequality.

A study in India provides empirical evidence that local differences in opening bank branches in rural unbanked population were associated with significant reduction in rural poverty (Burgess and Pande 2005). Cull, Ehrbeck, and Holle (Cull et al. 2014) suggest that financial access improves local economic activity.

Research in Mexico showed that rapid opening of Banco Azteca branches had a significant correlation with the region's economy leading to 7% increase in overall income levels compared to areas without Banco Azteca branches being opened (Bruhn and Love 2009). Ruiz (2013) explained that households were better able to smooth consumption and accumulate more durable goods in communities with Banco Azteca branches. At the same time, the proportion of households that saved money declined 6.6% in those communities, suggesting that households were able to rely on savings rather than available formal credit as a buffer against income fluctuation (Cull et al. 2014).

At the macroeconomic level, the literature suggests that the degree of financial intermediation is not only positively correlated with economic growth and employment under normal circumstances, but it is generally believed to casually impact economic growth (Levine 2000; Pasali 2013). The main mechanism for doing so is generally lower transaction costs and better distribution of capital and risk across the economy. Moreover, broader access to bank deposits can also have a positive effect on financial stability (Cull et al. 2014). However, Demetriades and Law (2006) indicated that the positive growth impact from financial intermediation does not hold in economies with weak institutional frameworks and nonexistent financial regulation.

3.2. Financial Inclusion in ASEAN

Financial inclusion could be measured in multiple dimensions, including account ownership, use of account, and financial account penetration. Table 1 shows the financial account penetration by percent of total adult population for ASEAN nations.

Table 1. Financial account penetration (% of total adult population).

Singapore	Malaysia	Thailand	Indonesia	Philippines	Vietnam	Lao PDR	Myanmar	Cambodia	Brunei
98%	85%	82%	49%	34%	31%	29%	26%	22%	NA

Source: The Global Findex Database (2017), World Bank. Data are not available for Brunei.

Lower levels of account ownership. While Singapore, Malaysia, Thailand, and Brunei have achieved almost universal financial inclusion, other countries in ASEAN face various challenges (Luna-Martinez 2016). From Table 1, Singapore, Malaysia, and Thailand have financial account penetration of over 75% while the rest of ASEAN range from 22% to 34%, which means at least two-thirds of their population do not have a bank account.

Wage payments mostly in cash. Only 29% of workers reported receiving monthly salaries through an account with a financial institution, and 71% are paid in cash, risky for employers and workers alike. Paying salary into employees' bank accounts is safer and builds credit histories to access new services, such as consumer credit, mortgages, education loans, and insurance products.

Figure 1 shows Singapore leads with less than 20% of adults receive wage in cash, followed by Malaysia at less than 50%, while the rest of ASEAN are over 70% (no data on Brunei). Singapore is on par with the Organization of Economic Cooperation and Development (OECD) comprising 35 countries. Overall, ASEAN has a higher percentage of adults who receive wage in cash at about 75% compared to East Asia Pacific at about 65%.

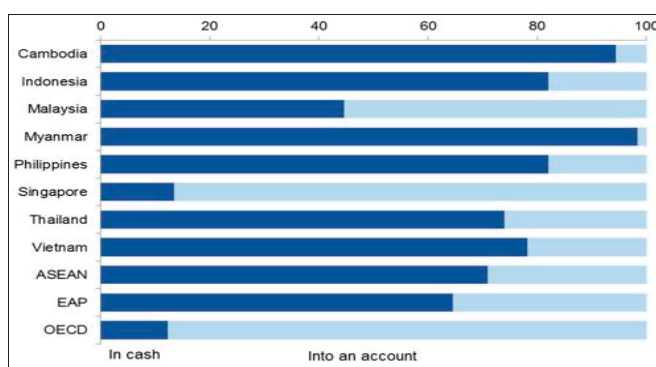


Figure 1. Adults receiving wage payments by method (%). Source: (Luna-Martinez 2016). “How to scale up financial inclusion in ASEAN countries”.

Adoption of Electronic Payment. Only 30% of adults have a debit card and 9% have a credit card. Cash is used extensively including those with a bank account. Even among the banked population, penetration of non-cash payment tools is low. Table 2 shows the percent of adults with a debit card, credit card, and whether they are used.

Table 2. Adults with debit card and credit card (% of Total Adult Population 2014).

Card	Singapore		Malaysia		Thailand		Indonesia		Philippines		Vietnam		Lao PDR		Myanmar		Cambodia	
	Own	Used	Own	Used	Own	Used	Own	Used	Own	Used	Own	Used	Own	Used	Own	Used	Own	Used
Debit	89	78	41	19	58	7.9	26	8.5	21	12	27	3.1	6	2	1.7	0.4	5.4	0.7
Credit	35	31	20	17	5.7	3.7	1.6	1.1	3.2	2.2	1.9	1.2	3	2	NA	Na	2.9	2.3

Source: The Global Findex Database (2017), World Bank. Note: Lao PDR 2011 data. Data is not available for Brunei.

Singapore leads at 89% with a debit card and 78% used it, and 35% with a credit card and 31% used, followed by Malaysia and Thailand. The rest of ASEAN has below 30% debit card ownership and below 5% credit card ownership.

4. Methodology

From the above discussion, Singapore has the highest financial inclusion rate and while Fintech businesses continue to grow, it is a matured market with people owning and using multiple credit and debit cards. In contrast, there may be emerging ASEAN nations with a greater need for financial inclusion and offer a bigger opportunity. The objective is to identify the markets with the best potential to grow financial inclusion that attract Fintech investors.

The methodology is similar to evaluating international markets. However, the uniqueness of this methodology is that it does not seek to identify the most advanced Fintech markets but the markets that need financial inclusion most urgently. Hence, the methodology executes the societal marketing philosophy and fulfills the social responsibility mission.

The steps to determine the best growth market in ASEAN for Fintech to promote financial inclusion are described below.

1. Identify the key factors that promote Fintech growth.
2. Gather reliable data for key factors.
3. Determine the scale to rate each factor.
4. Allocate weight for the set of factors.
5. Calculate and compare the scores for the ten ASEAN nations.
6. Determine the best market(s) to grow financial inclusion and maximize equality.

4.1. Identify the Key Factors That Promote Fintech Growth

(Bart and Ayna 2014) proposed three key factors for Fintech success: Selection process and criteria, business support services, and network. Lee and Teoh (2015) identified LASIC for Fintech success: *Low margin, asset light, scalable, innovative, and compliance easy*. Chen, Chen, Yeh, and Tsaur (Chen et al. 2016) found that Taiwan finance customers had high expectations of information security and preferred high technology products with complex functions, demonstrating the customer's *use behavior* was influenced by *perceived usefulness*, not *perceived ease of use*.

The three studies adopted different approaches from evaluating external to internal factors, from support services and network to easy compliance to customer's perception of usefulness of Fintech facilities. While the discussions of these authors focused on building the success of the Fintech business, there is a need to determine the success factors that help identify the best growth nations in ASEAN that can help influence and accelerate financial inclusion in other ASEAN nations.

Table 3 shows the key factors that influence international market selection based on surveys by UNCTAD, Deloitte and Touche, International Finance Corporation, and FDI Markets (Elms 2017). The far left column categorizes the factors identified from the four surveys.

Table 3. Factors that influence international market selection.

Factor Category	Factors	UNCTAD	Deloitte & Touche	International Finance Corporation	FDI Markets
1. Market Size	Market size	Yes			
	Access to customers		Yes	Yes	Yes
	Market growth	Yes		Yes	Yes
	Regional market access	Yes			
2. Labor Market Efficiency	Skilled labor		Yes	Yes	Yes
	Management staff		Yes		
	Tech pros		Yes		
	Labor Cost	Yes			
3. Financial Market Development	Capital market access	Yes			
4. Institutions	Government support			Yes	Yes
	Government incentives	Yes		Yes	
	Regulations & business climate				Yes
5. Stability (<i>Fragile States Index</i>)	Stability	Yes	Yes		
	Crime and safety		Yes		
6. Ease of Doing Business	Ease of doing business		Yes		
7. Infrastructure	Infrastructure			Yes	Yes
	Utilities	Yes			
8. Technological Readiness	Technology				Yes
	Universities & Researchers				Yes

Source: Created by author, adapting from Elms (Elms 2017).

The ING Economics Department (ING Economics Department 2016) developed the fintech index methodology (FIM) comprising three *dimensions* and four *Sub-indices* with respective *indicators*. While the FIM used a set of data to determine the most advanced and commercial Fintech markets, this study seeks to identify the markets that need Fintech most to expand financial inclusion and, thus, needs a different approach in sourcing data to meet this objective.

This methodology undertakes a rigorous procedure to identify the markets with the highest potential to expand financial inclusion urgently to appeal to Fintech entrepreneurs. First, it determines the nations with low penetration and usage of credit and debit cards to facilitate cashless transactions. Second, it determines the most important factors for selecting markets with the best potential for growth such as ease of doing business and infrastructure, from the comparative surveys of four investment-related organizations as shown in Table 3. Third, it identifies sources of information that provide measurements for these factors as shown in the last column *data sources* in Table 4.

Table 4. Dimension, sub-index, indicators, and data sources for this study.

Dimension	Sub-Index	Indicators in ING FIM	Indicators for This Study	Data Sources
Demand	Urgency for Financial Inclusion	1. Unbanked	1. Financial Account Penetration	World Bank
		2. Credit gap		
		3. Poverty		
		4. Rural population		
Supply	Fintech Infrastructure	5. Mobile subscription density	2. Mobile telephone subscriptions 3. Internet users 4. Quality of Electricity 5. Technological Readiness	GCR 2017–2018
		6. Internet density		
		7. Electricity coverage		
		8. Grid reliability		
Risk	Fintech Ecosystem	9. Start-up attractiveness	6. Ease of doing business	World Bank (indicators 6 & 7) GCR 2017–2018 (indicators 8, 9 & 10)
			7. Starting a business	
			8. Market size	
			9. Labour market efficiency	
	Political & Regulatory Environment	10. Corruption index 11. Political stability, absence of violence & terrorism index 12. Strength of legal rights index	10. Financial market development	GCR 2017–2018 (indicator 11) FSI (indicator 12)
			11. Institutions	
			12. Fragile States Index	

Source: Adapting ING Fintech Index Methodology's indicators with Key Factors for Investment identified by investment surveys as per Table 3. GCR = Global Competitiveness Report by World Economic Forum. FSI = Fragile States Index by Fund for Peace.

4.2. Gather Reliable Data for Key Factors

Several global data sources were referenced. The [World Competitiveness Yearbook \(2017\)](#) by the International Institute of Management and Development covers 63 countries but excludes Brunei, Cambodia, Laos, Myanmar, and Vietnam. These countries were, however, included in the global competitiveness report (GCR) 2017–2018 by the World Economic Forum that ranked competitiveness of 137 economies and countries, the Global Findex Database 2017 by World Bank that ranked financial inclusion of 190 countries, and the Fragile States Index 2018 by Fund for Peace that measures the cohesion-economic-political-social stability of 178 countries. Table 4 shows the indicators drawn from these sources to form three *dimensions* and four *sub-indices*.

The specific indicators for this study that form the three *dimensions* and four *sub-indices* are discussed in the following.

4.2.1. Demand

The urgency for financial inclusion is measured by the *financial account penetration* (FAP) expressed in percentage of adults aged 15+ with a formal account at a bank, credit union, cooperative, post office, or microfinance institution ([Kunt and Klapper 2013](#)), available to all population segments irrespective of economic situation ([Griffin 2017](#)), especially marginalized rural markets ([Lewis and Lindley 2015](#); [Schlein 2017](#)). The cumulative effect of digitally driven financial inclusion could boost GDP by 2% to 3% in markets like Indonesia and the Philippines, and 6% in Cambodia ([Asian Development Bank 2014](#)).

4.2.2. Supply: Fintech Infrastructure

The *internet* is dependent on *quality of electricity supply*, which powers connectivity. *Electricity* and *mobile subscription* indicators are provided by the second pillar, infrastructure, and *internet user % population* by the ninth pillar, technological readiness, in the global competitiveness report by the World Economic Forum. *Technological readiness* comprises all the important indicators that support financial inclusion such as *fixed broadband internet subscriptions*, *internet bandwidth*, and *mobile-broadband subscriptions*.

Quality of Electricity Supply (QES) refers to the availability and fitness to power devices important to the success of Fintech businesses. *Electricity* access refers to the percentage of people with stable access to electricity, and serves as a good proxy for other indicators of wealth and opportunity ([Hanania et al. 2018](#)). The 2017 World Bank Enterprise Survey identified electricity services as one of the biggest obstacles to business owners ([Doing Business 2018: Reforming to Create Jobs 2018](#)). QES data are provided by the second pillar, infrastructure, in GCR 2017–2018.

Mobile Cellular Telephone Subscriptions provides access to the public switched telephone network (PSTN) using cellular technology. It includes the number of postpaid and active prepaid accounts during the past three months and subscriptions that offer voice communications. It excludes subscriptions via data cards or USB modems, subscriptions to public mobile data services, and private trunked mobile radio, telepoint, radio paging, and telemetry services. ([ITU World Telecommunication-ICT Indicators 2017](#)). The second pillar, infrastructure, in the GCR 2017–2018 provides data for *mobile cellular telephone subscription per 100 population*.

Internet users % population refers to *percent of people* using internet from any location or purpose in the last three months via a desktop, laptop or tablet, mobile phone, games machine, and digital TV regardless of fixed or mobile network (GCR 2017–2018). Internet penetration increases trade and income growth ([Chu 2013](#)) and a 10% rise has been reported to increase GDP by 1.08% ([The Economic Times 2015](#)). With smartphones, the internet evolved the banking platform ([Andrew 2015](#)) into the internet of things (IoT) facilitating consumer banking, international trade financing, exchange of information, and customer authentication to increase legitimacy of transactions (“Fintech Trends: The Internet of Things,” 12 January 2017 ([Lazarova 2017](#))). The ninth pillar, *technological readiness*, provides data on *internet users by % population*, and six other important indicators of Fintech infrastructure.

For example, Singapore is ranked 25th in internet users due to its small population of 5 million but the other indicators put Singapore in the world's top five: Fifth for internet bandwidth, fourth for mobile broadband subscriptions, and second for FDI and technology transfer.

4.2.3. Supply: Fintech Ecosystem

While the ING FIM only provided *start-up attractiveness*, this study uses several measurements: Ease of doing business, starting a business, market size, labor market efficiency, and financial market development.

Ease of doing business (EDB) represents the reforms a country has undertaken such as infrastructure and legal systems over decades (Javadekar 2017) that influence international confidence (Wijaya 2017). A higher EDB index indicates higher investment friendliness in three ways: (1) Access to economic opportunities such as securing construction permits and electricity, registering property, getting credit, paying taxes, trading across borders, enforcing contracts, and resolving insolvency; (2) lower business set up costs with fewer steps to allow small and medium enterprises (SME) to use finances for post-setup operation; and (3) less corruption as bureaucracy can make official channels vulnerable to corruption, while simplifying the process accelerates economic growth (Naumann 2018). The World Bank's Global Findex Database 2017 provides data for ease of doing business.

Starting a business (SB) measures the paid-in minimum capital requirement, number of procedures, time, and cost for a SME limited liability firm to complete the procedures to start business and formally operate in the country's largest business city. A higher rank indicates more ease in starting a business. Table 5 shows starting a business is harder than doing business in ASEAN, for example, Malaysia' EDB is ranked 24 but SB is 111. (World Bank's Doing Business 2018: Reforming to Create Jobs 2018).

Market Size affects productivity since large markets allows economies of scale (GCR 2017–2018; Ozimek 2016; Aziz and Makkawi 2012). However, population cannot adequately explain market size efficiency; for example, Singapore has a population of 5 million but ranks 35th in market size in the world. The 10th pillar, market size, accounts for strength of domestic market, foreign markets, GDP, and exports as GDP%. Purchasing power is important to advance Fintech into more sophisticated transaction platforms.

Labor Market Efficiency refers to matching worker skills with suitable jobs and incentivizing human capital development with workers working efficiently and employers providing the right incentives (GCR 2017–2018). The seventh pillar, *labor market efficiency*, comprises 10 indicators including professional management, talent retention and attraction, effect of taxation, pay, and productivity to support Fintech growth.

Financial Market Development is defined as the depth of the intermediation system, including the availability and liquidity of credit, equity, debt, insurances, and other financial products (GCR 2017–2018). The eighth pillar, *financial market development*, measures eight factors that includes availability and affordability of financial services, ease of access to loans, venture capital availability, soundness of banks, securities of exchange regulations, and legal rights index.

Table 5. Factors, data source, and scaling method.

Dimension and Indicators	Data Source & Scaling Method					
	The Global Findex Database (2017), World Bank, 190 Ranks, Rank Range: 19 Reverse scale is applied: the lower the percent of account penetration, the higher the potential market for Fintech					
Demand	% AP	Points	% AP	Points	% AP	Points
1. Financial Account Penetration	0–5	10	36–40	6.5	71–75	3
	6–10	9.5	41–45	6	76–80	2.5
	11–15	9	46–50	5.5	81–85	2
	16–20	8.5	51–55	5	86–90	1.5
	21–25	8	56–60	4.5	91–95	1
	26–30	7.5	61–65	4	96–100	0.5
	31–35	7	66–70	3.5		
	Note: AP = Account Penetration					
Supply: Fintech Infrastructure	Global Competitiveness Index 2017–2018					
2. Mobile Cellular Subscription/100 population	137 Ranks, Rank Range: 14	Rank	Points	Rank	Points	Rank
3. Internet users % population	1–7	10	50–56	6.5	99–105	3
4. Quality of Electricity	8–14	9.5	57–63	6	106–112	2.5
5. Technological Readiness	15–21	9	64–70	5.5	113–119	2
Supply: Fintech Ecosystem	22–28	8.5	71–77	5	120–126	1.5
6. Market Size	29–35	8	78–84	4.5	127–133	1
7. Labor Market Efficiency	36–42	7.5	85–91	4	134–137	0.5
8. Financial Market Development	43–49	7	92–98	3.5		
Supply: Fintech Ecosystem	The Global Findex Database (2017), World Bank, 190 Ranks, Rank Range: 19					
9. Ease of Doing Business	Rank	Points	Rank	Points	Rank	Points
10. Starting a Business	1–10	10	68–76	6.5	134–143	3
	11–19	9.5	77–86	6	144–152	2.5
	20–29	9	87–95	5.5	153–162	2
	30–38	8.5	96–105	5	163–171	1.5
	38–48	8	105–114	4.5	172–181	1
	49–57	7.5	115–124	4	182–190	0.5
	58–67	7	125–133	3.5		
Risk	Fragile States Index (2018), 178 Ranks, Rank Range: 18					
11. Institutions	Rank	Points	Rank	Points	Rank	Points
12. Fragile States Index	1–9	0.5	64–72	4	127–135	7.5
	10–18	1	73–81	4.5	136–144	8
	19–27	1.5	82–90	5	145–153	8.5
	28–36	2	91–99	5.5	154–162	9
	37–45	2.5	100–108	6	163–171	9.5
	46–54	3	109–117	6.5	172–178	10
	55–63	3.5	118–126	7		

Note: Ranks = number of nations surveyed by the data source; Rank Range = number of Ranks divided by 10 nations, to nearest whole number.

4.2.4. Risk

FIM measures risk by the political and regulatory environment indexes such as *corruption, political stability, and strength of legal rights*. These indexes are covered by the first pillar, *institutions*, in the GCR. **Institutions** is the first pillar with 21 indicators including strength of investor protection, property rights, judicial independence, efficiency of legal framework in settling disputes and challenging regulations, ethical behavior, and protection of minority shareholders' interest (GCR 2017–2018).

The *Fragile States Index* (2018) assesses vulnerability comprehensively through four categories with 12 risk indicators: Cohesion (security apparatus, factionalized elites, group grievance), economic (economic decline, uneven economic development, human flight, and brain drain), political (state legitimacy, public services, human rights, and rule of law), and social (demographic pressures, refugees, external intervention).

4.3. Determine the Scale to Rate Each Factor

A scale of 1 as lowest to 10 as highest is awarded to the indicator rank for each nation. The scale developed is dependent on the number of countries in each survey, and *reverse scaling* may be applied, where the higher the rank, the lower the support for financial inclusion.

World Bank's ranking for 190 countries. For ease of doing business and starting a business, the 190 countries are divided by 10 (ASEAN members) and the resulting rank range is 19. As the rank does not have a decimal, Table 5 shows rank 1 to 10 gains 10 points and 11 to 19 gains 9.5 points, and so on.

The financial account penetration (FAP) shows percent of adult population with a bank account. 100% divided by 10 yields a range of 10. *Reverse scaling* will be applied. Countries with lower FAP have higher potential for financial inclusion. Table 4 shows countries with up to 5% FAP earns 10 points, 6% to 10% earns 9.5 points, and so on. There are no FAP data for Brunei but reporting for World Bank, Luna-Martinez (2016) advised "Singapore, Malaysia, Thailand and Brunei have achieved almost universal financial inclusion ...". Thus, an 82% penetration is accorded to Brunei, and 81% to 85% FAP earns 2 points for Malaysia, Thailand, and Brunei. Data for Myanmar are based on 2014/15 as no later data are available.

Global Competitiveness Report's ranking for 137 countries. With 137 divided by 10, the rank range is 13.7 rounded to 14. Table 4 shows rank 1 to 7 earns 10 points, rank 8 to 14 earns 9.5 points, and so on. This scale applies to the indicators in:

- Infrastructure: Mobile cellular subscriptions/100 population (*second pillar, infrastructure*), internet users % population (*ninth pillar, technological readiness*), quality of electricity (*second pillar, infrastructure*), and technological readiness (*ninth pillar*).
- Ecosystem: Market size (*10th pillar*), labor market efficiency (*seventh pillar*), and financial market development (*eighth pillar*).
- Risk: *Institutions* (*first pillar*).

The Fragile States Index's ranking of 178 countries. With 178 divided by 10, the range is 17.8 rounded to 18. *Reverse scaling* is applied as a higher rank means higher risk. Rank 1 to 9 earns 0.5 points, 10 to 18 earns 1 point, and finally, rank 172 to 178 earns 10 points.

Table 6 shows the FAP and ranks for each financial inclusion indicator, Table 7 shows the weight allocation, and Table 8 shows the respective points allocated for each indicator along with evaluative scores for the market with the best potential for financial inclusion.

Table 6. Financial account penetration and ranks for financial inclusion indicators.

Country	Financial Account Penetration %	Mobile Telephone Subscriptions	Internet Users	Quality of Electricity	Technological Readiness	Ease of Business	Starting a Business	Market Size	Labour Market Efficiency	Financial Market Development	Institution	Fragile State Index
Singapore	98	23	25	3	14	2	6	35	2	3	2	161
Malaysia	85	28	32	36	46	24	111	24	26	16	27	116
Thailand	82	5	86	57	61	26	36	18	65	40	78	77
Brunei	82	61	43	53	60	56	58	110	47	87	40	124
Indonesia	49	18	109	86	80	72	144	9	96	37	47	91
Vietnam	31	44	87	90	79	68	123	31	51	71	79	107
Philippines	34	88	74	92	83	113	173	27	84	52	94	47
Lao PDR	29	131	116	75	110	141	164	101	36	75	62	60
Cambodia	22	52	107	106	97	135	183	84	48	61	106	53
Myanmar *	26	135	137	118	138	171	155	60	73	138	133	22

Note: Myanmar * data for first eight factors from GCR 2014/15. Financial Account Penetration % Brunei estimated (Luna-Martinez 2016).

Table 7. Weight allocation for financial inclusion urgency, infrastructure, ecosystem, and risk.

Dimension	Sub-Index	Indicator for This Study	Weight 1	Weight 2
Demand	Urgency for Financial Inclusion	1. Financial Account Penetration	40%	50%
Supply	Fintech Infrastructure	2. Mobile telephone subscriptions	20%	20%
		3. Internet users		
		4. Quality of Electricity		
		5. Technological Readiness		
		6. Ease of doing business		
	Fintech Ecosystem	7. Starting a business	20%	15%
		8. Market size		
		9. Labor market efficiency		
		10. Financial market development		
		11. Institutions		
Risk	Political & Regulatory Environment	12. Fragile States Index	20%	15%

Sources: Created by author, adapting the ING FIM's three dimensions and four sub-indices.

Table 8. Countries with highest potential for financial inclusion (financial account penetration 50%).

Dimension	Demand		Supply: Fintech Infrastructure				Supply: Fintech Ecosystem				Risk						
	Financial Account Penetration %	50%	Mobile Telephone Subscriptions	Internet Users	Quality of Electricity	Technological Readiness	20%	Ease of Business	Starting a Business	Market Size	Labour Market Efficiency	Financial Market Development	15%	Institution	Fragile State Index	Total 100%	
Country																	
Vietnam	7	35	7	4	4	5	9.8	7	4	8	7	5	9.4	5	6	7.9	62
Lao PDR	8	37.5	1	2	5	3	5.3	3	2	3	8	5	5.6	6	7	9.8	58
Cambodia	8	40	7	3	3	4	7.5	3	1	5	7	6	5.6	3	3	4.1	57
Philippines	7	35	4	5	4	5	8.5	5	1	9	5	7	6.9	4	3	4.9	55
Indonesia	6	27.5	9	3	4	5	10	7	3	10	4	8	8.3	7	6	9.4	55
Singapore	1	2.5	9	10	10	10	18.3	10	10	8	10	10	14.3	10	9	14.3	49
Malaysia	2	10	9	8	8	7	15.5	9	5	9	9	9	11.4	9	7	11.3	48
Myanmar	8	37.5	1	1	2	1	1.8	2	2	6	5	1	5.4	1	2	1.9	47
Brunei	2	10	6	7	7	6	12.8	8	7	3	7	4	9.0	8	7	10.9	43
Thailand	2	10	10	4	6	6	13	9	9	9	6	8	12.0	5	5	6.8	42

Source: Points allocated by ranks from Global Index Database (2017), Global Competitiveness Report 2017–2018 2017 (2017); Fragile States Index (2018).

4.4. Allocate Weight for the Set of Factors

If the 12 factors have equal weight, Singapore would top the list. While sophisticated Fintech businesses can flourish, there is little room for financial inclusion as Singaporeans have a high FAP with high debit and credit cards ownership and usage.

As the goal is to achieve maximum financial inclusion to overcome inequality, demand is the most important factor to begin with: Financial account penetration (FAP). Table 7 below shows two weight approaches to identify the best growth potential markets for financial inclusion.

The first approach allocates 40% to FAP (demand) for financial inclusion urgency, and 20% each to infrastructure and ecosystem (supply) and political and regulatory environment (Risk). The second approach allocates 50% to FAP, 20% to infrastructure, and 15% each to ecosystem and political and regulatory environment.

4.5. Calculate and Compare the Scores for the Ten ASEAN Nations

When 40% weight was applied, the results from highest to lowest potential for financial inclusion: Vietnam, Singapore, Lao PDR, Indonesia, Malaysia, Cambodia, Philippines, Brunei, Thailand, and Myanmar. As discussed earlier, Singapore and Malaysia have achieved high financial inclusion, which does not achieve the objective of this study. Incremental weight at 45% was applied but yielded similar results.

In Table 7, the points are allocated according to the rank of each indicator and the corresponding weight for each dimension (Table 5). When 50% was applied to FAP, a significantly different result emerged as shown in Table 8.

4.6. Determine the Best Market(s) to Grow Financial Inclusion and Maximize Equality

Vietnam, Lao PDR (Laos), and Cambodia are the top three markets for financial inclusion. The Philippines and Indonesia are fourth and fifth.

4.6.1. Discussion

Vietnam, Laos, and Cambodia are the emerging markets in ASEAN that need help to reduce inequality through financial inclusion. Table 9 shows the sector share of GDP (% 2011) of the three countries, all with agriculture 35% or more, suggesting a high rural population that suffers financial exclusion. Cambodia is highest in services at 43%, followed by Laos at 37%, while Vietnam is highest in industry at 41%.

Table 9. Sector share of real gross domestic product (GDP) (% 2011).

	Vietnam	Lao PDR	Cambodia
Agriculture	39%	43%	35%
Services	20%	37%	43%
Industry	41%	20%	21%

Source: Doubling Financial Inclusion in the ASEAN Region by 2020, UNCDF.

4.6.2. Opportunities

Ensuring adults have access to a bank account is a first step toward comprehensive financial inclusion, where people can make use of appropriate financial services, including savings, payments, credit, and insurance (Pazarbasioglu 2017). Table 10 shows the summary of supply and demand of financial services of the three countries based on the UNCDF's *Doubling Financial Inclusion in the ASEAN Region by 2020*. The data show great potential in all three countries to grow financial inclusion.

Table 10. Summary of supply and demand of financial services.

	Country	Cambodia	Laos	Vietnam
	Population	16.3 Million	6.9 Million	96.5 Million
<i>Method of savings (aged 15+, 2011)</i>	Financial institution	0.8	19.4	7.7
	Savings club	4.3	8.1	5.1
<i>Population having a bank account (% , 2011)</i>	Urban	10.2	32	29.8
	Rural	2.4	20.2	16.5
	Aged 15–24	4.5	23	22.6
	Aged 25+	3.3	28.5	21.1
<i>Mobile use (% , 2011)</i>	Mobile penetration	96	87	99
	Mobile use to pay bills	0.1	0	3.6
	Mobile use to receive money	0.6	0	3.4
	Mobile use to send money	0.4	0	2.8
<i>Banking sector statistics (2010)</i>	Number of banks	36	26	101
	Market share of state-owned banks	0	67.4	47.7
	Number of branches	360	83	1988
	Number of ATMs	501	346	11700
	Number of branches (per 100,000 adults)	4	2.6	3.3
	Number of ATMs (per 100,000 adults)	5.1	4.3	17.6
	Assets/GDP ratio (%)	58	49.7	14

Source: *Doubling Financial Inclusion in the ASEAN Region by 2020*, UNCDF. Population data from (Worldometers 2018).

Table 10 shows the following financial inclusion opportunities:

- *Method of savings (% population aged 15+)*: All three countries have less than 20% who saved with a financial institution. Laos has twice more savers in a financial institution at nearly 20% than Cambodia and Vietnam.
- *Population with a bank account*: Rural dwellers are twice lower than urban dwellers in a bank account ownership.
- *Banking sector statistics*: There are insufficient bank branches to meet needs. Cambodia leads by four branches per 100,000 adults. Laos has 67.4% market share of state-owned banks followed by Vietnam 47.7% but nil for Cambodia. Laos has the highest population of formally banked at nearly 20% but lowest in branches and ATMS per 100,000 adults.
- *Mobile use*: Despite mobile penetration from 87% upwards, mobile use to pay bills, receive, or send money is 0% in Laos, below 1% in Cambodia, and below 5% in Vietnam. There is great potential for mobile banking.

The data above provide a vast opportunity for growth in financial inclusion in the three countries. The following discusses the initiatives in each country to expand financial inclusion.

4.6.3. Vietnam

Vietnam has 96.5 million people and a density of 299 people per sq. km (compared to 8188 per sq. km in Singapore). Financial account penetration is 31% and 27% own a debit card and 1.9% a credit card (The Global Findex Database 2017, World Bank). Vietnam has the highest number of banks, bank branches, and ATMs compared to Laos and Cambodia.

Since 2016, the State Bank of Vietnam and World Bank have partnered to focus on shifting government payments to digital platforms, providing financial services to ethnic minorities and

agricultural communities where poverty rates are above national average, and strengthening financial education to prepare the next generation for a modern financial marketplace.

Vietnam is among World Bank's 25 priority countries for financial inclusion efforts, where 39% of adults save outside the formal sector such as "under the mattress" or use informal savings clubs, and 65% send or receive remittances, and pay school fees or utility bills in cash. Some of the barriers to formal financial services include:

- Financial services are too far to access—6.2 million adults;
- Financial services are too expensive to use—2.2 million adults;
- Documentation requirements are prohibitive to open an account—2.3 million adults;
- Lack of trust in the financial sector—1.1 million adults.

Removing these barriers through appropriate legal and regulatory reforms can help move consumers from the informal to formal financial sector with great effect, as an improved policy environment could mean an estimated 48 million adults with transaction accounts. Furthermore, government-to-person (G2P) cash transfers can be digitized to reach an additional 3.7 million currently unbanked adults.

4.6.4. Lao PDR

Lao People Democratic Republic (Laos) has 6.9 million people with a density of 30 people per sq. km. An agricultural society with 80% of population in rural areas, the landlocked landscape of thick forests, rugged mountains, and fast flowing rivers makes physical and economic connectivity between communities difficult. Small-scale subsistence agriculture accounts for over 30% of GDP and employs 70% of population. In rural upland areas, the poverty rate is 43% compared with 28% in the lowlands. A mere 20% of the population in the lower 40% income segment have a formal bank account ([Internationale Zusammenarbeit \(GIZ\)](#)).

While Laos has experienced economic growth over the last decade, inequality has risen and financial inclusion remains low. Access to financial institutions is limited to 29% of population, 6% own a debit card, and 3% credit card ([The Global Findex Database 2017](#)). Laos has the third-lowest level of financial access in ASEAN (only Cambodia and Myanmar rank lower). Laos is working on increasing the supply of financial services such as access to ATMs and financial literacy programs.

To increase financial inclusion, the authorities introduced "Community Money Express" in 2015 to allow microfinance institutions to utilize commercial banks' branches to expand reach in the largely rural and agrarian country, a service launched by Banque pour le Commerce Extérieur Lao Public (BCEL), one of the country's leading banks. The UNCDF, in collaboration with the Bank of Lao PDR and Central Bank, have worked to design several initiatives:

- Making access to finance more inclusive for poor people to improve policy and regulatory environment, financial infrastructure, and capacity of financial service providers.
- Making access possible through evidence-based financial inclusion policy framework to diagnose financial inclusion disaggregated by gender, geographic location, and income level.
- Shaping inclusive finance transformations to accelerate financial inclusion and women's economic participation ([UNCDF 2017](#)).

4.6.5. Cambodia

Cambodia has 16.3 million people with a density of 92 people per sq. km. Financial account penetration is 22% and 5.4% with credit cards and 2.9% debit cards ([The Global Findex Database 2017](#)). In 2016, the United Nations Capital Development Fund (UNCDF) and partners conducted a survey on the accessibility and usage of Cambodian financial services among 3150 adults. The findings show:

- Financial exclusion: 29% use neither formal nor informal financial services.
- Informal services: Over one-third of the population use unregistered lenders or savings clubs.

- Formal inclusion: 59% with 24% of these using microfinance institutions (MFIs) and 17% banks; females 73% compared to males 69%; urban areas 74% and rural areas 69%.
- Access financial infrastructure: 75% in rural areas take over 30 min to access post offices, bank branches, and ATMs.
- Borrowings: 58% do not borrow to avoid debt; 54% turn to MFIs; 22% borrow from family and friends; 14% from a bank.
- Savings at time of survey: Over 50% no savings with 86% of these claiming no money left after basic living expenses.
- Those who save: Kept money at home or a secret hiding place, while 31% invested in livestock; 21% bought gold or jewelry for future re-sale profit. (MacGrath 2016).

Microfinance is used as a key driver of financial inclusion. The Cambodian Microfinancing program aims to increase financial literacy, improve governance and transparency, regulate the financial sector, and make financial services more affordable. Oxfam (2013), a global charitable organization, introduced savings-for-change (SfC) as a pro-poor savings-led microfinance product, and in 2017, over 140,000 people saved USD 5.7 million and 40 local organizations received training to provide the product. SfC is a community-organizing tool to support women transformative leadership to challenge social norms. Oxfam developed two approaches on financial inclusion and economic strengthening of poor women farmers and their families. The single approach provides financial services (loans and credits) for poor women and their families and financial education of households. The integrated approach provides skills-based education (financial literacy with social/life skills) and service on financial inclusion (SfC Group, MFIs, and banking).

Giving women access to affordable financial credit/savings, such as SfC groups, helps to boost self-esteem and leadership capacity, improve income and livelihoods through loans or share outs, invest in farms or businesses to increase household income and security, and create sustainable wellbeing for poor women and their families.

Like their work in Laos, UNCDF has designed similar programs to help increase financial inclusion in Cambodia:

- Shaping inclusive finance transformations to accelerate financial inclusion and women's economic participation, and advocate pro-poor policies, utilize big data analysis of Cambodia's top banks to understand customer service needs and gaps; invest in innovative business models to expand women's economic participation.
- Making access possible expands financial access for rural populations, and micro and small businesses.
- YouthStart Global convenes stakeholders to provide economic opportunities geared toward youth, including capacity-building in opportune sectors, increased access to financial and non-financial services, and access to information on integrated services available to youth.
- CleanStart supports clean energy policy development, and provides risk capital and technical assistance to competitively selected financial service providers and energy enterprises. This initiative supports low-income consumers to transition to cleaner and more efficient energy through access to financial services and payment mechanisms and will help contribute to achieving development goals on poverty and hunger, education, gender, health, and environmental sustainability.

4.6.6. Interventions with Most Impact

In a UNCDF consultation with CLMV market-leaders in financial inclusion, the participants were requested to rate the interventions with the greatest impact on improving the level of financial inclusion in each market. Points were allocated for each intervention out of a total of 100 for each country. Table 11 shows the interventions that participants rated as having the most impact and the explanations of these outcomes are presented below.

Table 11. The interventions that will double the level of financial inclusion by 2020.

Intervention	Cambodia	Laos	Vietnam
Improved function of state FI	4	11	13
Government payments	11	10	11
Regulatory	10	16	18
New distribution models	21	11	10
Mobile	23	18	14
Microfinance extension	16	19	19
Demand analysis	15	15	15
Total	100	100	100

Source: Doubling Financial Inclusion in the ASEAN Region by 2020, UNCDF.

- In Laos and especially Vietnam, state financial institutions play an important role in increasing financial inclusion. However, participants face challenges with securing appropriate engagement with state institutions to discuss financial inclusion.
- Leveraging the role of Government payments in promoting financial inclusion will be significant in all three markets but will generally account for less than 10% of progress towards the targets.
- Regulatory change is needed especially in Laos and Vietnam to progress in financial inclusion.
- New distribution models such as outsourced or non-branch based services were considered most important in Cambodia.
- For mobile-based service delivery, Cambodia and Laos offer the greatest potential for impact.
- Extending microfinance is highly significant for all three markets.
- Appropriate demand analysis needs to precede intervention efforts.

4.6.7. Risk and Investor Profiles

While the emerging nations of Vietnam, Laos, and Cambodia present exciting growth opportunities in financial inclusion, they also present risks associated with Fintech infrastructure, Fintech ecosystem, or stability. The [ING Economics Department \(2016\)](#) identifies three types of investors.

Commercial investors seek maximum return on investments. Risk-averse investors prefer a stable economy and the right ecosystem. Risk-loving investors are more willing to balance the risk with higher gains with markets that provide larger growth opportunities. These investors are generally investment funds and venture capitalists.

Social investors want to create both social impact and a financial return, seeking “double-bottom line” results. They are usually not-for-profit and for-profit funds, investment vehicles, government sponsored organizations, development banks, and social enterprises.

Donor organizations focus on maximizing social returns and are likely to invest in countries where financial exclusion is highest. They seek to identify the economies that have a better capacity to absorb their funds to create the most impact.

As a summary, the investors who may find Vietnam, Laos, and Cambodia as attractive markets for their funds will be donor organizations, followed by social investors, and risk-loving commercial investors.

5. Limitations

The main limitation is the availability of data of some nations. This may be due to political instability that prevent data gathering or a lack of research partners to collect the data in some nations. While care has been taken to ensure relevant data to help in evaluating markets with the best potential for financial inclusion, [The Global Findex Database \(2017\)](#) did not provide data on Brunei. Based on a World Bank online article that Brunei has achieved almost universal financial inclusion along with

Singapore, Malaysia, and Thailand, Brunei was allocated the same points as Malaysia and Thailand since Singapore is ahead in financial inclusion.

The findings support the UNCDF's efforts to expand financial inclusion in the CLMV. However, Myanmar did not surface in the results and instead the Philippines and Indonesia emerged as fourth and fifth most potential markets. This may be due to the fact that Myanmar's data were dated to 2014/2015 and may have changed since Myanmar won democracy in March 2016. Nevertheless, the Philippines and Indonesia are justified as two markets with high growth potential considering their huge populations of 103 million and 260 million, respectively, with many people facing financial exclusion living in the thousands of islands that make up each country,

Another limitation may be the conventional approach to maximize profit from investments. The findings present the conflict between maximizing social impact and financial returns. Singapore is the best market with state-of-the-art infrastructure and strong governance but offers little room to grow financial inclusion. The likely investors for Vietnam, Laos, and Cambodia would be donor organizations that seek to maximize social returns, followed by social investors who seek a mix of financial and social returns, and lastly, risk-loving commercial investors who prioritize higher gains in markets with larger growth opportunities.

6. Conclusions and Recommendations

The main contribution of this research lies in its originality of a research that seek not to maximize financial profit but financial inclusion for people in dire need for banking facilities to alleviate poverty and improve quality of life. This research fulfills the social responsibility mission while it offers high growth markets to Fintech entrepreneurs. While other research and their respective methodologies seek to determine the most advanced and commercial Fintech markets for gain, this research adopts rigorous filters that analyzes empirical data that identify (1) markets with lowest financial inclusion via data of ownership and usage of debit cards, (2) the most important investment attractiveness factors integrating findings from four reputable investment-related organizations, and (3) sources of information that provide measurements to the investment attractiveness factors. Fintech entrepreneurs who capitalize on this research's findings will reap returns from largely untapped markets while they help to achieve societal marketing goals.

The research also contributes to the economic growth of the nation. Governments with poor ratings such as in governance and risk indicators can take measures to improve the relevant factors, and devise investment incentives to draw foreign investment. Another contribution is the potential collaboration with economists and other specialists who analyze such data to propose policy to their governments which in turn need to operationalize the policy. This research operationalizes the constructs of risk, demand, and supply to draw investments to expand financial inclusion that will stimulate economic growth and stability. This research's methodology is a first to identify the best growth markets for financial inclusion that will appeal to Fintech entrepreneurs with profit or altruistic motivations, to help narrow the gap in income equality within a nation and between nations. The step-by-step market selection methodology based on empirical analysis makes it easier for investors to follow than econometric models that may limit the discussion to and among economists. Integrating the expertise of economists and marketing specialists may create research that build growth models for the nation.

There are two recommendations for future research. The first proposal is to investigate from the consumer perspective the reasons for low ownership and usage of debit cards. Except for Singapore with 89% of adult population owning a debit card followed by Thailand at 58% and Malaysia 41%, the rest are 25% or below. As for debit card usage, the statistics are even lower. For example, Thailand has 58% debit card ownership, higher than Malaysia at 41%. However, only 8% of Thais use a debit card compared to 19% of Malaysians. Except for Singapore, Malaysia and the Philippines were over 50% of debit card owners using the debit card, while the rest of ASEAN have less than 10% using the debit card although a larger percentage own a debit card.

Could one reason be the multitude of small businesses such as food vendors in Thailand who need cash to buy supplies to make food? If so, what conditions may allow the provision of handheld credit/debit card terminals to such vendors? What can governments do to promote a cashless society in a country where small businesses are the spine of the economy?

Singapore, Malaysia, and the Philippines use English as the official business language. Is there evidence that English helps accelerate the usage of debit cards, and financial inclusion in the ASEAN context? ASEAN people, like other Asian nations, have a Confucian philosophy of saving for the future. A perceptual and attitudinal study on cashless transactions may help uncover reasons for the low debit card usage.

The second recommendation is to investigate the challenges of financial inclusion from both industry and governance perspectives. Finance is an industry vulnerable to disruption by software because financial services are made of information rather than concrete goods. Data security remains a threat as regulators are concerned with hacking and the need to protect sensitive consumer and corporate financial data. Any data breach can ruin a Fintech firm's reputation. The Bank Secrecy Act and money transmission regulations represent an ongoing threat to Fintech companies.

Blockchains can help lower cost of transaction by sharing a digital ledger among competitors with the assurance that cryptocurrencies have a permanent record of transfers and ownership free from being tampered or hacked. Cryptocurrency, however, faces low consumer confidence as a practical and trusted currency for transaction. Moving data to the cloud may sound safe but seems risky as any online platform suffers the risk of hacking.

As the industry explores products and services based on innovations, diminishing margins is the most likely challenge in the face of increasing competition. There is greater operational risk in maintaining virtual operations, vulnerable to money-laundering and terrorism financing activities. The online financial sector is also an increasing target of distributed denial of service extortion attacks. Fintech companies often face doubts from financial regulators like issuing banks and the Federal Government. The research can identify the challenges and make recommendations how the industry and government could collaborate to balance the need for financial inclusion with the need for consumer and corporate data protection.

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Article

Foreign Direct Investment and Economic Growth in the Short Run and Long Run: Empirical Evidence from Developing Countries

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Abstract: A contribution of foreign direct investment to economic growth is possibly one of the widely examined topics in academic research in the last five decades. However, few studies have examined both the short run and long run impacts of this effect concurrently for developing and emerging markets, in particular during the period of economic turmoil that includes the global financial crisis. As such, this paper examines and provides additional and relevant quantitative evidence on the impact of foreign direct investment (FDI) on economic growth, both in the short run and the long run in developing countries of the lower-middle-income group in 2000–2014. Various econometric methods are employed such as the panel-based unit root test, Johansen cointegration test, Vector Error Correction Model (VECM), and Fully Modified OLS (FMOLS) to ensure the robustness of the findings. The results of this study show that FDI helps stimulate economic growth in the long run, although it has a negative impact in the short run for the countries in this study. Other macroeconomic factors also play an important role in explaining economic growth in these countries. Money supply has a positive effect on growth in the short run while total credit for private sector has a negative effect. In addition, long-run economic growth is driven by money supply, human capital, total domestic investment, and domestic credit for the private sector. Based on these results, recommendations for the governments of these countries have been developed.

Keywords: foreign direct investment (FDI); economic growth; endogenous growth; developing countries

1. Introduction

The relationship between foreign direct investment (FDI) and economic growth has attracted major attention from academics and the governments of developing countries. Since economic growth is one of their main focuses, FDI attraction-related policies have been prioritized during the process of economic growth and development in these countries (Vo et al. 2019a). It is widely observed that FDI mitigates the saving-investment imbalance and provides technology which is used for the production of goods and services. Additionally, FDI enhances tax revenue as well as human capital (Buckley et al. 2002). From another view, it can be asserted that FDI is one of the crucial factors for the process of economic integration, since it increases long-term benefits and connections between different countries.

On one hand, various positive effects FDI provides for an economy have been discussed among scholars. Not only does FDI diversify the capital structure of the recipient but it also provides positive externalities such as technology and knowledge diffusion (Mansfield and Romeo 1980; Markusen and Venables 1999; Caves 1974; Blomström et al. 1994; Blomström and Kokko 2002). For example, FDI increases investment, which in turn reduces the gap between saving and investment (Erhियovwe and Jimoh 2016). On the other hand, it is the claim of previous studies that in the short-run, the impact

of FDI on economic growth is negative (Schoors and Tol 2002), but in the long-run the effect of FDI on economic growth is positive (Bosworth et al. 1999).

In this era of globalization where economic, commercial, and technological barriers are fading, developing countries focus on FDI due to its positive effects (Demirsel et al. 2014). Though each country has its own characteristics and strengths to capitalize on when working towards economic growth, FDI still has an essential role among the major factors directly affecting growth. FDI is the key to global economic integration, providing financial stability, driving economic growth and improving social welfare (Borensztein et al. 1998; Nguyen et al. 2019).

The economic integration process has been penetrating geographical borders. For example, in Asia, the ASEAN Economic Community (AEC) is established and the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) has been signed. There are more opportunities and challenges for developing economies than ever. In this context, FDI brings valuable opportunities but challenges are unavoidable. Due to the importance and the contemporary nature of the subject matter, the authors aim to understand, assess, and quantify the role of FDI in short- and long-term economic growth rather than investigating the FDI-output volatility linkage, which is another strand of FDI-growth literature in developing countries for the lower-middle-income group in the 2000–2014 period. Results from the study will contribute to the literature on the controversial relationship between FDI and economic growth. Suitable policies are proposed to maximize the positive impact and minimize the negative impact of FDI, especially in countries with lower-middle-incomes.

The structure of the paper is as follows. Following this Instruction section, Section 2 discusses the literature review. Section 3 describes the model, methodology and data. Section 4 presents empirical results, followed by the Conclusions and policy implications being provided in Section 5.

2. Literature Review

The relationship between FDI and economic growth has attracted great attention from scholars around the world (Basu et al. 2003; Vo et al. 2019a). It is widely acknowledged that this relationship has been intensively investigated using data from a single country or a sample of many countries. Unfortunately, no consensus on empirical findings has been reached among scholars.

Concerning single-country investigation, Koojaroenprasit (2012) examined the impact of FDI on economic growth in Korea over the 1980–2009 period. The author found a strong positive effect of FDI on Korea's economic growth, while human capital, export, and employment also positively affected subsequent growth. The same observation was also found in Pakistan with a positive long-term effect of foreign capital flow on economic growth (Shahbaz and Rahman 2010).

The FDI-growth nexus also presents evidence to support the view that there is a negative effect of FDI on economic growth. Konings (2001) found no positive impact of FDI on relevant growth for Poland over 1993–1997 period. Moreover, the author stated FDI hindered growth for Romania and Bulgaria, since these countries were subjected to trade imbalances, monopolies or reverse transfers of knowledge and technology.

In addition to studies with the focus on the single-country data, various studies were conducted using cross-country data. Tiwari and Mutascu (2011) highlighted that both FDI and internationally commercial activity fostered economic growth for 23 Asian countries over the 1986–2008 period. Importantly, they found a profound effect of FDI on growth as an economy was developed. Borensztein et al. (1998) examined the role of FDI on economic growth for developing countries. Their findings indicate that FDI was an effective intermediary between technology and economic growth. In addition, they also stated the role of FDI would be more effective on an economy if the relevant country had high human capital. Omran and Bolbol (2003) showed both high correlation and significant causation between FDI and economic growth for Arab countries through a Causality test and OLS regression, respectively. Also, they concluded that local economic and political conditions together with FDI attraction-focused policies were significant factors determining FDI inflows. Alfaro et al. (2004) claimed FDI was one of the significant factors in economic growth for 20 Organization for Economic

Cooperation and Development (OECD) countries. Additionally, their empirical findings showed that in those countries, the level of development of the financial market mattered for the relationship between FDI and economic growth. Basu et al. (2003) considered a two-way linkage between FDI and economic growth for 23 developing countries over the period 1978–1996. They found that FDI and economic growth moved together in the long-run or they were cointegrated after allowing for heterogeneous country effects. Furthermore, their empirical results indicated there was a bidirectional causality between these two variables for the economies with a higher level of economic openness, but there was a unidirectional causality running from GDP to FDI for closed economies.

In contrast to the above mentioned positive relationship between FDI and economic growth for cross-country data, a negative one was found, contributing an important part of the (unsolved) puzzle. Jyun-Yi and Chih-Chiang (2008) identified no relationship between FDI and economic growth for 62 countries over 1975–2000 period. Similarly, Lyroudi et al. (2004) found no FDI impact on economic growth for emerging markets during 1995–1998.

Recently, there is a new and growing strand of literature emphasizing the relationship between FDI and volatility of output/consumption (Backus et al. 1992; Bodenstein 2008; Caporale et al. 2015; Levchenko 2005). Kose et al. (2003) stated an increasing financial openness tends to positively relate to the rising volatility of consumption for developing countries from 1960 to 1999. Kose et al. (2009) investigated how countries had benefited from financial globalization. They found that industrial countries had attained increased risk sharing compared to emerging markets during the period of globalization.

3. Model, Methodology, Data

3.1. Empirical Model

The study aims to examine the importance of FDI to economic growth in the short and long run in lower-middle-income countries. Based on the research model by Shahbaz and Rahman (2010), the proposed research model is expressed as follows

$$\text{LGDP}_{it} = \beta_0 + \beta_1 \text{FDI}_{it} + \beta_2 \text{M}_{2it} + \beta_3 \text{PRVT}_{it} + \beta_4 \text{CAP}_{it} + \beta_5 \text{SECP}_{it} + \varepsilon_{it}. \quad (1)$$

where β_0 is the intercept. $\beta_1, \beta_2, \beta_3, \beta_4$, and β_5 respectively are the estimation coefficients to be estimated. ε_{it} is the error term. Subscripts i and t denote country and year ($i = 1, 2, \dots, 30; t = 1, 2, \dots, 15$). The GDP per capita is converted into its natural logarithmic (LGDP) to reduce potential heteroskedasticity. The definitions of variables are presented in Table 1.

Table 1. Variable definitions.

Factor	Variable	Symbol	Description	Expected Sign	Measurement
Dependent Variable					
Economic growth	Real GDP per capita	GDPC	GDP per capita at 2005 prices		USD
Independent Variables					
Foreign capital flows	FDI, % inflows	FDI	Inflows to domestic businesses with management control and at least 10% stock	+	%GDP
Endogenous financial development	M ₂	M ₂	Money supply M ₂ : money in circulation outside of banks, savings, savings abroad, except for money in public sector	+	%GDP
Domestic financial development	Domestic credit for private sector	PRVT	Domestic credit is provided by a domestic financial system, including public credit	+	%GDP
Domestic capital reserve	Total domestic investments	CAP	Total domestic investments	+	%GDP
Human capital	People with secondary education and above	SECP	Number of students admitted to secondary schools, including both public and private education	+	%

3.2. Estimation Techniques

In this paper, various relevant methodologies are employed to examine the impact of our interest variable—foreign direct investment—on economic growth. Those employed estimation techniques are used to investigate the stationary or cointegration issue, or to estimate the long-run relationship. In particular, the LLC test (Levin et al. 2002), IPS test (Solma et al. 2013), ADF test (Dickey and Fuller 1979), PP test (Phillips and Perron 1988), and Breitung test (Breitung 2001) are used for the unit root test, and the Johansen test is used for the cointegration test before FMOLS is employed to estimate the long-run relationship between the foreign direct investment and economic growth.

3.3. Data and Descriptive Statistics

To investigate the relationship between foreign direct investment and economic growth, this study employs panel data for 30 developing countries over the 2000–2014 period, a period of interest which includes the global financial crisis with a total of 450 observations. Data are collected from the World Development Indicators (WDI) published by the World Bank (2019). The choice for the time period selected in this study can be explained by the following reasons. First, we prefer to have some countries from the Association of Southeast Asian Nations (ASEAN) region among other emerging and developing countries in the study. As such, this data period includes four ASEAN countries (Indonesia, Laos, the Philippines, and Vietnam) whose economies have been highly integrated after the establishment of the ASEAN Economic Community, a major milestone in the regional economic integration agenda in ASEAN. This important event took effect in 2015. Second, some data are not available for some variables before 2000 (e.g., human capital for Sudan and Guyana, or total domestic investment for Laos). A list of selected countries and descriptive statistics are presented in Tables 2 and 3, respectively. Table 4 demonstrates the correlation matrix among variables.

Table 2. List of selected countries.

No.	Country Name	No.	Country Name	No.	Country Name
1	Armenia	11	Guatemala	21	Pakistan
2	Bangladesh	12	Guyana	22	Philippines
3	Bhutan	13	India	23	Senegal
4	Bolivia	14	Indonesia	24	Sri Lanka
5	Cameroon	15	Kenya	25	Sudan
6	Congo Rep.	16	Kyrgyzstan	26	Swaziland
7	Cote d'Ivoire	17	Laos	27	Tajikistan
8	El Salvador	18	Lesotho	28	Ukraine
9	Georgia	19	Moldova	29	Vanuatu
10	Ghana	20	Morocco	30	Vietnam

Table 3. Descriptive statistics.

Variable	Measurement	Mean	Median	Max	Min	S.D.	Obs.
GDP	%	6.98	6.95	8.09	5.46	0.60	450
FDI	%GDP	3.71	2.46	38.81	0.04	3.93	450
CAP	%GDP	22.99	21.77	68.02	7.42	8.73	450
M ₂	%GDP	43.45	38.96	127.55	7.87	23.60	450
PRVT	%GDP	28.60	25.35	114.72	2.10	18.95	450
SECP	%	7.54	7.18	14.25	2.49	2.66	450

Table 4. Correlation matrix.

Variable	LGDPC	M ₂	PRVT	CAP	FDI	SECP	VIF
LGDPC	1						
M ₂	0.30	1					3.78
PRVT	0.35	0.83	1				3.55
CAP	0.08	0.31	0.16	1			1.17
FDI	0.15	−0.03	−0.01	0.13	1		1.04
SECP	−0.17	−0.00	0.13	0.03	0.14	1	1.07

Note: VIF—Variance-inflating factor.

Results from Table 4 show that the correlation coefficients between the independent variables are relatively low, ranging from 0.00 to 0.35, except for between M₂ and PRVT (about 0.83). However, the VIF (Variance-inflating factor) of M₂ and PRVT are 3.78 and 3.55, respectively. Since the VIF values are within the (2,10) range, the probability of multicollinearity between independent variables is very low.

4. Empirical Results

4.1. Results of Unit Root Test

To investigate the stationary and determine the integration level of the selected variables, we employed various recently developed tests, such as the LLC test (Levin et al. 2002), IPS test (SoIma et al. 2013), ADF test (Dickey and Fuller 1979), PP test (Phillips and Perron 1988), and Breitung test (Breitung 2001). The testing results obtained in Table 5 suggest that only GDPC and FDI are stationary at their level form while other variables are not, and that all variables are stationary at their first difference.

Table 5. Unit root test.

Variable	LLC Test	Breitung Test	IPS Test	ADF Test	PP Test
Level					
LGDPC	−6.45 ***	−4.04 ***	−1.43 *	90.92 ***	87.33 **
FDI	−7.11 ***	−3.91 ***	−4.60 ***	120.24 ***	111.05 ***
CAP	0.02 **	0.04	0.20	59.97	59.55
PRVT	−0.29	5.55	2.09	45.38	41.56
M ₂	−3.60 ***	2.74	0.48	49.96	73.39
SECP	−8.18 ***	−0.33	−3.68 ***	117.00 ***	107.73 ***
1st Difference					
ΔLGDPC	−10.86 ***	−4.68 ***	−5.75 ***	132.71 ***	151.90 ***
ΔFDI	−19.83 ***	−11.05 ***	−13.23 ***	240.27 ***	326.57 ***
ΔCAP	−13.23 ***	−5.52 ***	−8.03 ***	165.62 ***	220.30 ***
ΔPRVT	−12.70 ***	−6.00 ***	−7.04 ***	151.94 ***	193.31 ***
ΔM ₂	−16.57 ***	−9.29 ***	−10.77 ***	209.56 ***	297.39 ***
ΔSECP	−9.35 ***	−1.89 ***	−4.99 ***	128.04 ***	168.38 ***

Note: ***, **, and * denote 1%, 5%, and 10% significant levels respectively. The estimated model includes both intercept and trend.

4.2. Results of Cointegration Test

In the next step, we examine whether a long-run relationship exists among the interested variables. We employed the Johansen cointegration test. Findings are in Table 6 and show that at least 2 cointegration vectors at the significant level of 5%. In other words, there exists a long-term relationship between the dependent variable and the independent variables in the proposed research model.

Table 6. Cointegration test results.

Assumption of No Cointegration	Trace Test		Maximum Eigenvalue test	
	Statistic	Critical Value	Statistic	Critical Value
No cointegration	127.14 **	95.75	45.10 **	40.08
1 cointegration	82.04 **	69.82	32.45 **	33.88
2 cointegration	49.60 *	47.86	27.72 *	27.58
3 cointegration	21.88	29.80	12.98	21.13
4 cointegration	8.90	15.49	8.80	14.26
5 cointegration	0.10	3.84	0.10	3.84

Note: **, and * denote 5%, and 10% significant level respectively.

Note: **, and * denote 5%, and 10% significant level respectively.

4.3. Vector Error Correction Model

The empirical findings in Section 4.2 suggest the variables are cointegrated or they move together in the long run. As such, it is appropriate to employ the Vector Error Correction Model (VECM) to examine both the long-run and short-run relationships between those variables. The VECM is a short-run model where the short-run deviation to be adjusted from the long-run equilibrium. In this research, the VECM is described as follows.

$$\Delta LGDPC_{it} = \theta_{1i} + \sum_{k=1}^n \theta_{11ik} \Delta LGDPC_{it-k} + \sum_{k=1}^n \theta_{12ik} \Delta M2_{it-k} + \sum_{k=1}^n \theta_{13ik} \Delta PRVT_{it-k} + \sum_{k=1}^n \theta_{14ik} \Delta CAP_{it-k} + \sum_{k=1}^n \theta_{15ik} \Delta FDI_{it-k} + \sum_{k=1}^n \theta_{16ik} \Delta SECP_{it-k} + \lambda_{1i} ECT_{it-1} + \varepsilon_{1it} \quad (2)$$

$$\Delta FDI_{it} = \theta_{2i} + \sum_{k=1}^n \theta_{21ik} \Delta LGDPC_{it-k} + \sum_{k=1}^n \theta_{22ik} \Delta M2_{it-k} + \sum_{k=1}^n \theta_{23ik} \Delta PRVT_{it-k} + \sum_{k=1}^n \theta_{24ik} \Delta CAP_{it-k} + \sum_{k=1}^n \theta_{25ik} \Delta FDI_{it-k} + \sum_{k=1}^n \theta_{26ik} \Delta SECP_{it-k} + \lambda_{2i} ECT_{it-1} + \varepsilon_{2it} \quad (3)$$

where Δ denotes the first difference and n is the optimal lag length determined by Akaike Information Criterion (AIC). Estimation results are presented in Table 7.

In the $\Delta LGDPC$ equation, the lagged error term (ECT) is negative and statistically significant, suggesting that M_2 , $PRVT$, CAP , FDI , and $SECP$ all play an important role in determining GDP per capita.

The sign and significance of θ_{1i} , a (6×1) column vector, reveal short-run relationship between GDP per capita and the relevant variable. Particularly, the one-period lagged first difference of M_2 is positive and statistically significant while its two-period lagged first difference is negative and not statistically significant. The one-period lagged first difference of $PRVT$ is negative and statistically significant; however, its two-period lagged first difference is positive and statistically insignificant. In relation to our interest variable, the estimated results show that both two one-period and two-period lagged first difference results are negative and statistically significant. The findings are also consistent with previous studies (Aitken and Harrison 1994; Alfaro et al. 2004; Konings 2001; Djordjevic et al. 2015; Lyroudi et al. 2004; Schoors and Tol 2002; Stanisic 2008). They claimed that domestic firms shared their markets with foreign counterparts.

Table 7. VECM results.

Exploratory Variables	Δ LGDP
Δ LGDP(−1)	0.317 [5.89]
Δ LGDP(−2)	0.090 [1.647]
Δ M ₂ (−1)	0.002 *** [4.85]
Δ M ₂ (−2)	−0.000 [−0.025]
Δ PRVT(−1)	−0.002 *** [−3.71]
Δ PRVT(−2)	0.000 [0.57]
Δ CAP(−1)	0.000 [0.52]
Δ CAP(−2)	−0.001 [−0.95]
Δ FDI(−1)	−0.001 ** [−1.82]
Δ FDI(−2)	−0.001 *** [−2.42]
Δ SECP(−1)	0.001 [0.25]
Δ SECP(−2)	0.000 [0.058]
Constant	−0.020 [7.47]
ECT(−1)	−0.001 *** [−2.75]
R-squared	0.26
Adj. R-squared	0.23
F-statistic	9.52

Note: ***, and ** denote 1%, and 5% significant level respectively. *t* statistics are given in square brackets.

4.4. Fully Modified Least Squares Estimation

The long-run estimates are estimated by the FMOLS (Fully Modified Least Squares estimation). It is widely known that both FMOLS and DOLS are often used to investigate long-run relationships (Vo and Vo 2017; Vo et al. 2019b). In this research, we are motivated to use FMOLS since Banerjee (1999) argued that the FMOLS and DOLS estimates are asymptotically equivalent for data with observations higher than 60. The empirical findings are presented in Table 8. The long-run effects are quite similar across the variables. It is clear that in the long-run, FDI, PRVT, M₂, CAP, and SECP are positively and significantly related to GDP per capita. The positive long-term relationship between FDI and GDP per capita is also found in the (Alfaro et al. 2004; Caves 1974; Blomström et al. 1994; Blomström and Kokko 2002; Barry and Bradley 1997; Borensztein et al. 1998; Bosworth et al. 1999; Mansfield and Romeo 1980; Markusen and Venables 1999; Olokoyo 2014; Roman and Padureanu 2012).

Table 8. Fully Modified OLS (FMOLS) result.

Variable	FDI	PRVT	M ₂	CAP	SECP
Coefficient	0.001 ***	0.007 ***	0.005 ***	0.005 ***	0.023 ***
<i>t</i> statistic	[2.61]	[38.25]	[27.44]	[16.48]	[19.37]

Note: *** denotes 1% significant level.

5. Conclusions and Policy Implications

The study aims to assess and estimate the impact of FDI on economic growth in 30 developing countries that are in the lower-middle-income group in 2000–2014, both in the short run and the long run. VECM and FMOLS techniques are used to examine this impact. Results from the study contribute to the literature on the relationship between FDI and growth in developing countries, with a focus on this relationship in both the short and long run during the important of 2000 to 2014 period, which includes the global financial crisis.

Empirical results from the study can be summarized as follows. Firstly, FDI capital flows can hinder a country's economic growth in the short run, but also have a positive effect in the long run. Secondly, domestic credit for the private sector affects economic growth negatively in the short run, while money supply is determined to have a positive effect in both the short and long run for economic growth. Human capital, total domestic investment, and domestic credit for the private sector have a positive effect on economic growth in the long run.

As a result, it can be asserted that FDI is an important factor for economic growth in a long run, especially for emerging and developing economies. Efforts to attract FDI to supplement domestic investment in lower-middle-income developing economies should be encouraged. However, it should be considered that policies to attract FDI need to be constructed with a long-term view to maximize the positive effects of FDI on a country's economy. Policies that aim to attract FDI at all cost in the short run will not bring fundamental benefits to the economy. Lower-middle-income developing countries have been trying to attract FDI to seek its positive benefits. The impact of FDI on economic growth is not always positive, as it depends on characteristics of the investment resulting from FDI, such as type, sector, scope, duration, proportion of domestic businesses in the sector, and so on. Governments should put in place policies to improve the quality of human resources and labor skills. Since FDI always comes with technology, there needs to be highly skilled labor in order to utilize the new technology and to create a positive technological diffusion effect.

At the same time, other than prioritizing the attraction of FDI, governments should look into policies on human capital, money supply, total domestic investment, and total credit for the private sector in order to enhance economic growth and absorb the maximum FDI benefits. Money supply always brings positive effects in increasing economic growth in both the short and long run. Therefore, the formulation and flexible use of monetary policies to support growth should be prioritized.

Despite the efforts put into the study, certain limitations cannot be avoided. Firstly, the period utilized in this study may not be sufficient for an econometric study on a macroeconomic subject matter (usually 15 years). Secondly, the presence of a global economic crisis in the time period being utilized in this paper may lead to economic and political instability in developing and emerging markets included in the sample. This potential issue has not been considered in the study. It is expected that subsequent studies should take these important considerations into account in order to mitigate the limitations of this paper.

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Article

Corporate Social Responsibility and SMEs in Vietnam: A Study in the Textile and Garment Industry

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Abstract: This study explored the influence of factors on the implementation of corporate social responsibility (CSR) in companies. The study used a quantitative approach in which a survey was conducted. The final 250 among various respondents in the textile and garment industry were used. The final respondents were top-, middle-, and low-level managers in 250 small and medium enterprises (SMEs) in Vietnam. The results indicate that competitive context, social influences, the understanding of managers about CSR, and the internal environment of companies are the four drivers of CSR. In the four drivers, competitive context has the strongest impact on adopting CSR. The finding implies that stakeholders' pressure influences SMEs in this industry because of the high expectations from international stakeholders.

Keywords: corporate social responsibility; textile and garment industry; Vietnam

1. Introduction

Corporate social responsibility (CSR) has had a long history of development in the world (Carroll 2009). However, it is practiced differently in countries because of the different contexts (Nguyen et al. 2017; Omran and Ramdhony 2015; Gupta 2009). Most CSR studies take place in developed countries; thus, there is a need to examine CSR in developing countries (Eweje 2006). Research about CSR in Vietnam, a developing country, is sparse (Nguyen et al. 2017; Nguyen and Truong 2016). Current CSR research additionally focuses on large organizations rather than small and medium enterprises (SMEs) (Jenkins 2006; Morsing and Perrini 2009). It is hard to use the theories and practices of large enterprises on SMEs due to SMEs' characteristics (Davies and Crane 2010). Thus, there need to be more studies with findings which are useful and applicable to SMEs.

Research on CSR and SMEs has only recently emerged (Murrillo and Lozano 2006; Morsing and Perrini 2009; Vo 2012). Literature needs more studies on these topics. One of the research gaps is the engagement of CSR in SMEs (Murrillo and Lozano 2006; Vo 2012). Research is needed to explore why SMEs adopt CSR. Some researchers state that not many SMEs conduct CSR due to the lack of resources (see, e.g., Lepoutre and Heene 2006; Kuskys and Lozano 2007; Sweeney 2007; Nguyen and Pham 2016), or the lack of CSR understanding (Tran and Jeppesen 2016). Others say that SMEs implement CSR because of ethical reasons (Longo et al. 2005; Jenkins 2006), business performance and regulation (Williamson et al. 2006), relationship with the community and company image improvement (Longo et al. 2005), and capital and human resources (Nguyen and Pham 2016).

CSR was introduced in Vietnam in recent years (Hamm 2012; Tran and Jeppesen 2016), although its definition by Bowen was published in 1953 (Carroll 1979). Many Vietnamese companies have therefore had difficulties in adopting the concept due to their little CSR knowledge. For example, from January to May 2019, European countries refused 17 shipments of seafood from Vietnam because of

the lack of knowledge relating to food safety and hygiene (Bach 2019). The wastewater emissions by the Formosa Plastics Corporation in the Ha Tinh province in 2016, and the food scandal by the Tan Hiep Phat Beverage Group in 2015, are other examples of the limitations of CSR knowledge. The disapprobation of stakeholders to these companies implies that stakeholders have taken notice of social responsibilities in spite of the fact that CSR is new to them (see Phuong 2015; Quang et al. 2016; Nguyen and Truong 2016).

According to a survey by the General Statistics Office of General Statistics Office of Vietnam (2017), a large majority of companies in Vietnam are SMEs (98.1%). In Vietnam, SMEs are companies whose charter capital is below 10 billion Vietnam dong (\$430,000) and whose number of employees is lower than 300 (Vietnamese Government 2001). Vietnam's textile and garment industry contributes to 10 percent of the national industrial values and creates 2.7 million jobs—this shows the importance of the industry in the Vietnamese economy. Additionally, a characteristic of the industry is that most companies have collaborated with international partners (Song 2018). These are our reasons for selecting the industry for our research. It may help to understand how to promote CSR in SMEs, which is little known (Murrillo and Lozano 2006). SMEs in other industries may not want to practice CSR, but SMEs in the textile and garment industry in Vietnam may do so due to the high expectations of their international stakeholders.

Although the industry exported products worth more than 36 billion US dollars in 2018—reaching the top three in the world, together with China and India (Song 2018)—problems still occurred relating to CSR. For example, in July 2019, the Big C supermarket, a foreign supermarket in Vietnam, announced that it was stopping its collaboration with 200 textile and garment SMEs because of product quality (Kieu 2019). These may show the lack of CSR in their business strategy. In SMEs, owners/managers have the power in their hands to make decisions in personal ways (Spence 1999). Therefore, this study explores the understanding of the CSR of Vietnamese managers in SMEs, in order to understand what CSR means in their companies, and which drivers force them to practice CSR. The purpose of this research was to study factors that affect the implementation of CSR in SMEs in the textile and garment industry in Vietnam. The study used a survey of 250 managers in 250 SMEs in Vietnam in the textile and garment industry. The results indicated that SMEs adopt CSR because of a competitive environment, social influences, the understanding of managers about CSR, and the internal environment of SMEs.

The next section of this article is a review of the existing literature on CSR and SMEs. Next, we elaborate on the collection of the data for the study. Then, we present our research findings and discuss them. The last part is a conclusion in which we show the limitations of the study and the implications for future research.

2. Theoretical Background and Hypotheses

CSR was defined as “the commitment of business to contribute to sustainable economic development, working with employees, their families, the local community, and society to improve their quality of life, in ways that are both good for business and good for development” (World Bank 2006). Campbell (2006) defined that “CSR sets a minimum behavioral standard that aims at doing no harm to stakeholders and if it has happened then rectifies it as soon as it is identified.” Business companies have to have ethical behaviors, minimize negative influences, and maximize their benefits to society. They need to practice social responsibilities as per the requirements of stakeholders and society.

Garriga and Mele (2004) classified the theories used in CSR research into four groups: instrumental theories, integrative theories, political theories, and ethical theories. The first two groups focus on business management issues, whereas the last two concern society power and ethical codes. A large number of CSR studies use a management perspective, which concerns what motivates business organizations to become engaged in CSR (Basu and Palazzo 2008). One of the groups of integrative theories' stream is stakeholder management that focuses on stakeholder satisfaction. Research by Mitchell et al. (1997) showed that an organization's CSR activities affect its stakeholders' interest and behavior. This also means that the pressure of stakeholders (internal and external) can

motivate organizations to conduct CSR activities. Internal stakeholders include staff, workers, and managers. Their opinions may influence the way to practice CSR in their companies. In other words, managers' ideas and their understanding of CSR can be a driver for CSR implementation in their organizations. External stakeholders can be associations, government agencies, the community, customers, partners, and suppliers (Akkucuk 2015). Most of Vietnam's textile and garment goods are exported, approximately 90 percent of the whole industry (Song 2018; Luu 2018), so international stakeholders may constitute a motive to put CSR into companies' business strategies due to competition—this is one of my research focuses.

Research about CSR was originally undertaken in developed countries (e.g., Carroll 1979, 1991; Carroll 2009); however, the CSR concept is now used in different parts of the world. Visser (2008) said that compared to developed countries, developing countries have different emphases of CSR domains because of "indigenous cultural traditions of philanthropy, business ethics . . ." (p. 481). There is a call to study CSR in developing countries (such as Vietnam), in order to contribute knowledge to world literature (Eweje 2006; Carroll 2016). That is because CSR is influenced by the context where it is applied (Ortenblad 2016; Nguyen et al. 2017). In other words, social expectations about social responsibilities of business organizations in Vietnam may be different to those in developed countries. The way to practice CSR may differ from country to country due to the influence of social contexts. For example, Vietnamese organizations tend to donate to religious festivals and provide 13th month wages' rewards for employees around New Year because of social expectations (Tran and Jeppesen 2016). Social influences may be a motive affecting the implementation of CSR in developing countries such as Vietnam. Literature shows that little research on CSR in SMEs has been conducted (e.g., Tilley 2000; Jenkins 2006; Morsing and Perrini 2009). The reasons for this relate to the importance of large organizations in the economy (Tilley 2000). Researchers may think that SMEs can use the theories and practices of CSR that were drawn from the study findings of large enterprises. However, the characteristics of SMEs are different to those of large ones (Spence and Rutherford 2003). For example, in SMEs, in most cases, ownership and management are not separate, so owners have the power to decide all business activities based on their personal preferences (Spence 1999; Perez-Sanchez et al. 2003; Davies and Crane 2010). The acceptance of putting CSR in SMEs can depend on the opinions and understandings of owners/managers about CSR, and this issue needs more research. Another SME issue relates to the lack of financial resources (Kusyk and Lozano 2007; Sweeney 2007), which means that SMEs may not focus on investment into CSR immediately—this study examines this.

The concept of CSR has been present in Vietnam since 2002, when it was introduced by international organizations such as the World Bank (Tran and Jeppesen 2016). Research about CSR in Vietnam also began at the same time. My literature review shows that there is little research on it, particularly relating to SMEs. Most research focuses on customers' perception of CSR (see, e.g., Bui 2010; Thi and Van 2016; Tran et al. 2017; Van et al. 2019). In other words, it explored how Vietnamese customers understand CSR. Findings showed that the concept of CSR is still new to research participants. In addition, many studies in Vietnam used the CSR dimensions by Carroll (1991) such as economic, legal, ethical, and philanthropic responsibilities (see, e.g., Bui 2010; Thi and Van 2016). They have not pointed out drivers such as the internal environment of SMEs that impact the implementation of CSR in firms—this is explored in our research.

Our review on the available literature shows that research about CSR in Vietnam usually studies the views of consumers, rather than managers, especially relating to SMEs (see, e.g., Bui 2010; Thi and Van 2016; Tran et al. 2017; Van et al. 2019). Collecting CSR opinions by customers may be easier than that by managers—this implies that our research, which studies manager perspectives, may be invaluable for literature. The study by Tran and Jeppesen (2016) was one of the few exploring the voice of managers about CSR in SMEs in Vietnam. Tran and Jeppesen (2016) interviewed 20 managers and 125 workers in 20 Vietnamese textile, garment, and footwear firms. Their study explored the way to practice CSR in firms, such as physical environment, working conditions, wages, and benefits. Their

research findings showed that CSR was not implemented in firms because financial resources were limited, and managers and workers did not understand the concept of CSR.

Nguyen and Pham (2016) are other researchers studying factors influencing the implementation of CSR in Vietnamese firms. Four factors, e.g., the regulatory system, knowledge of CSR, capital and human resources, were used for the test in their research. They sent a questionnaire to 207 firms in different business fields. Their research results showed that the only two factors affecting the way the firms practiced CSR are capital and human resources. As can be seen, SMEs in Vietnam may not be ready for the adoption of CSR due to cash limitations; however, in the industry of textiles and garments, they may be, due to the pressure of international partners or a competitive environment. Factors impacting the adoption of CSR in firms in Vietnam such as a competitive context, social influences, the understanding of managers about CSR and the internal environment of firms have not been the focus in these studies as of yet. Our research examines them from the view of managers who can play a decisive role in putting CSR in firms' developmental strategy.

As analyzed above, in order to study factors affecting the engagement of CSR in SMEs, the hypotheses were developed as follows:

H1. *An understanding of managers about CSR has a significant impact on the implementation of CSR in SMEs.*

H2. *The external and internal environment of SMEs positively affects their engagement in CSR. The environment consists of a competitive context, social influences, and the internal environment of companies.*

3. Method

Pilot tests and face-to-face interviews with four Vietnamese managers in the textile and garment industry were conducted to adjust, enhance, and validate the observed variables and the suggested measurement scales. Based on the feedback from the participants, all observed variables were corrected (see also Table 1).

Quantitative research was a survey on 330 top-, middle-, and low-level managers in different SMEs in Vietnam. We chose the firms based on the list of registered SMEs in the textile and garment industry provided by the Ho Chi Minh City Tax Department. The managers were not in the same companies. The surveys in Vietnamese, undertaken from March to October in 2017, were used for the study. After the returned questionnaires were reviewed and the invalid ones were eliminated, 250 valid answered questionnaires were coded to SPSS 23.0 for analysis purposes.

We measured CSR from the managers' perspectives using 5 factors with 25 observed items: the understanding of managers about CSR (4 variables: LD1, LD2, LD3, and LD4), the internal environment of companies (6 variables: MTNB1, MTNB2, MTNB3, MTNB4, MTNB5, and MTND6), competitive context (6 variables: MTCT1, MTCT2, MTCT3, MTCT4, MTCT5, and MTCT6), social influences (4 variables: MTVM1, MTVM2, MTVM3, and MTVM4), and the implementation of CSR in SMEs (5 variables: CSR1, CSR2, CSR3, CSR4, and CSR5). These variables were employed using research by Burke and Logsdon (1996), Spence et al. (2003), Murrillo and Lozano (2006), Porter and Kramer (2007), and Darnall et al. (2010). These were translated into Vietnamese. The scale was designed as a 5-point Likert scale, from 1—Totally disagree to 5—Totally agree (see Table 1). The study used Cronbach's alpha to test the reliability of the scale, exploratory factor analysis (EFA) to identify relationships between measured variables, and Pearson to study the correlation coefficient between dependent and independent variables (see also Section 4). The language used for the data collection and data analysis was Vietnamese. Thus, the codes for the items were named based on the Vietnamese language (Table 1). The findings of the research were translated into English for this paper.

Table 1. Descriptive statistics.

Code	Observed variable (n = 250)	N	Min	Max	Mean	Std. Deviation
The implementation of CSR in SMEs						
CSR1	CSR is embedded in firms' business responsibilities.	250	2.0	5.0	3.35	0.691
CSR2	CSR has brought specific benefits for companies.	250	2.0	5.0	3.46	0.706
CSR3	Firms voluntarily practice CSR.	250	2.0	5.0	3.42	0.714
CSR4	Practicing CSR is a part of the strategy and business plan of companies.	250	2.0	5.0	3.48	0.695
CSR5	Firms have an annual report of CSR for stakeholders as required.	250	2.0	5.0	3.33	0.675
The understanding of managers about CSR						
LD1	You understand and participate in CSR programs in your company.	250	2.0	5.0	3.54	0.910
LD2	You participate in evaluating the benefits of CSR in your company.	250	2.0	5.0	3.51	0.870
LD3	You understand that stakeholders (shareholders, employees, competitors, suppliers, customers) have an influence on the strategy and plans of your company.	250	2.0	5.0	3.46	0.957
LD4	You think that companies need to have responsibilities to their stakeholders.	250	2.0	5.0	3.48	0.875
The internal environment of SMEs						
MTNB1	Employees put pressure on your companies in terms of implementing CSR in practice.	250	2.0	5.0	3.57	.839
MTNB2	Following labor laws and ensuring fair working conditions for employees have an influence on the practice of CSR in your company.	250	2.0	5.0	3.53	.870
MTNB3	Following health and safety policies and making a report about these have an influence on the practice of CSR in your company.	250	2.0	5.0	3.72	1.041
MTNB4	Policies to motivate employees to improve practical skills and competencies have an influence on the practice of CSR in your company.	250	2.0	5.0	3.61	.805
MTNB5	Listening to employees' opinions about important issues has an influence on the practice of CSR in your company.	250	2.0	5.0	3.58	0.857
MTNB6	CSR is a part of the marketing strategy of your company.	250	2.0	5.0	3.56	0.891
Competitive context						
MTCT1	Customers have an influence on the strategy, plans and decisions of your company.	250	2.0	5.0	3.49	0.879
MTCT2	International partners have important requirements to the practice of CSR in your company.	250	2.0	5.0	3.50	0.970
MTCT3	Suppliers and business partners have an influence on the strategy, plans and decisions of your company.	250	2.0	5.0	3.52	0.906
MTCT4	Policies and standards of the industry and market about CSR have an influence on company.	250	2.0	5.0	3.52	0.915
MTCT5	Suppliers have an influence on the plans and decisions of CSR implementation in your company.	250	2.0	5.0	3.66	0.727
MTCT6	Formal and informal surveys of customer satisfaction have an influence on the practice of CSR in your company.	250	2.0	5.0	3.51	0.919
Social influences						
MTVM1	Local communities have an influence on the strategy, plans and decisions of the CSR implementation in your company.	240	2.0	5.0	3.55	0.953
MTVM2	Governmental agencies have an influence on the strategy, plans and decisions of the CSR implementation in your company.	250	2.0	5.0	3.55	0.914
MTVM3	Associations and non-governmental organizations have an influence on the strategy, plans and decisions of the CSR implementation in your company.	250	2.0	5.0	3.59	0.906
MTVM4	Society has an influence on the strategy, plans and decisions of the CSR implementation in your company.	250	1.0	5.0	3.56	0.944

4. Research Findings

4.1. Descriptive Statistics

After we deleted items with missing data, our final sample of 250 respondents was used for analysis. Respondents were top managers (46.4%), middle managers (34.4%), and low-level managers (19.2%). They were from companies with fewer than 50 employees (4.8%), between 50 and 200 employees (45.6%), between 200 and 300 employees (42.8%), and over 300 employees (6.8%). In terms of charter capital, the majority of companies (65.6%) were below \$430,000; the remaining ones (34.4%) were from \$430,000 to \$4,300,000. Almost all respondents were managers with more than three years' experience in the same position.

The statistical results described 25 observed items. The average value for the 25 observed items ranges from 3.33 to 3.72. Means are different between different components (see Table 1).

4.2. Cronbach's Alpha and EFA Analysis

The scale's reliability was tested via Cronbach's alpha. Cronbach's alphas of all variables were acceptable (>0.7). Item-total correlations were good (>0.3) (Table 2). Item reliability was also assessed by examining the factor loadings of each item with its respective latent variables. Kaiser-Meyer-Olkin (KMO) and Barlett's test was 0.852 for the all factors ($\text{sig.} = 0.000 < 0.005$). All observed items were eligible to be continued with EFA analysis.

Table 2. Cronbach's alpha of observed variables.

Observed Variable	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Item-Total Correlations	Cronbach's Alpha if Item Deleted
Cronbach's Alpha The understanding of Managers about CSR (LD): 0.733				
LD 1	10.45	4.280	0.571	0.646
LD 2	10.48	4.684	0.482	0.697
LD 3	10.53	4.154	0.561	0.652
LD 4	10.50	4.661	0.485	0.695
Cronbach's Alpha The Internal Environment of companies (MTNB): 0.812				
MTNB1	18.01	10.659	0.591	0.779
MTNB2	18.05	10.335	0.627	0.771
MTNB3	17.85	9.532	0.619	0.773
MTNB4	17.96	11.368	0.417	0.802
MTNB5	18.00	10.622	0.580	0.781
MTNB6	18.01	10.598	0.553	0.787
Cronbach's Alpha Competitive Context (MTCT): 0.818				
MTCT 1	17.72	10.948	0.547	0.796
MTCT 2	17.71	10.134	0.619	0.781
MTCT 3	17.69	10.792	0.552	0.795
MTCT 4	17.69	10.527	0.592	0.786
MTCT 5	17.55	11.549	0.571	0.794
MTCT 6	17.71	10.400	0.616	0.781

Table 2. Cont.

Observed Variable	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Item-Total Correlations	Cronbach's Alpha if Item Deleted
Cronbach's Alpha Social Influences (MTVM): 0.744				
MTVM 1	10.70	4.871	0.483	0.716
MTVM 2	10.69	4.680	0.580	0.660
MTVM 3	10.66	4.909	0.517	0.696
MTVM 4	10.69	4.609	0.570	0.666
Cronbach's Alpha The Implementation of CSR in SMEs (CSR): 0.850				
CSR 1	9.72	5.301	0.710	0.806
CSR 2	9.61	5.242	0.685	0.813
CSR 3	9.66	5.472	0.636	0.826
CSR 4	9.60	5.718	0.575	0.842
CSR 5	9.76	5.519	0.705	0.809

EFA analysis was conducted to examine whether the items produced proposed factors, and if the results support the proposed five-factor solution. According to statistics results, all variables were grouped into five components at eigenvalue >1 and a cumulative sum of squared loadings $>50\%$. All factors loadings were higher than 0.5 except MTCT5, therefore, this observed variable was removed from the analysis. The five groups were named internal environment, competitive context, managers, social influences, and CSR. Hence, the measurement scale meets the satisfactory level of reliability and validity.

4.3. Correlation and Regression Analysis

The Pearson's analysis was used to analyze the linear correlation between the dependent variable and independent variables. The correlation number had to be between -1 and 1 (IBM 2016). Table 3 shows that the variables are linearly related. The lowest correlation with the dependent variable is MTNB (0.402), whereas the highest is MTCT (0.681) (see Table 3). In terms of the regression equation, the adjusted R square (0.652) in Table 4 explains that the independent variables actually affect the dependent variable. The ANOVA test (Table 5) shows that the survey results are significant.

Table 3. Correlations.

		CSR	LD	MTNB	MTCT	MTVM
CSR	Pearson Correlation Sig. (2-tailed)	1				
LD	Pearson Correlation Sig. (2-tailed)	0.505 **	1			
MTNB	Pearson Correlation Sig. (2-tailed)	0.402 **	0.329 **	1		
MTCT	Pearson Correlation Sig. (2-tailed)	0.681 **	0.386 **	0.257 **	1	
MTVM	Pearson Correlation Sig. (2-tailed)	0.611 **	0.404 **	0.383 **	0.343 **	1

** Correlation is significant at the 0.01 level (2-tailed).

Table 4. Model summary.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.811 ^a	0.658	0.652	0.32987

^a Dependent Variable: CSR.

Table 5. ANOVA.

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	51.244	4	12.811	117.733	0.000 ^b
	Residual	26.660	245	0.109		
	Total	77.904	249			

^b Predictors: (Constant), MTVM, MTCT, MTNB, LD.

4.4. Hypothesis Test

Linear regression was conducted to test research hypotheses and the results are presented in Tables 4–6. The results show that the model is consistent with the data set (Sig. = 0.000 < 0.05) and CSR factors explain 65.2 percent of the implementation of CSR in SMEs (see Table 4). The VIFs (variance inflation factors) <2 indicate that there is no multi-collinearity issue in the data set. Table 6 shows that the four independent variances (LD, MTNB, MTCT, and MTVM) with sig. <0.05 are linearly related with the dependent variance (CSR). Research hypotheses indicate that H1 and H2 are accepted at the significance level of 1 percent. This means that the understanding of managers about CSR, and the external and internal environment of SMEs positively affect their engagement in CSR.

Table 6. Coefficients.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
Constant	0.257	0.157		1.642	0.102		
LD	0.118	0.036	0.142	3.274	0.001	0.744	1.344
MTNB	0.105	0.036	0.119	2.871	0.004	0.810	1.234
MTCT	0.393	0.034	0.478	11.451	0.000	0.802	1.246
MTVM	0.276	0.035	0.344	7.923	0.000	0.739	1.353

5. Discussion

The research findings show that all proposed hypotheses were accepted. Impacts on the implementation of CSR in SMEs, are the understanding of managers about CSR, competitive context, social influences, and the internal environment of companies. Table 3 shows that MTCT and MTVM are the two strongest correlations with the dependent variance (CSR) compared to the others. Respondents highly value the relationships between SMEs' engagement in CSR, and competitive context and social influences (Table 6). The research hypothesis that the external environment (competitive context and social influences) positively affects SMEs' implementation of CSR was thus confirmed.

Table 3 also indicates that the correlations of LD and MTNT with the dependent variance were strong. The standardized coefficient of LD and MTNT (Table 6) showed significant relationships with the CSR variance. The proposed hypotheses about the influence of managers' CSR understanding and the internal environment of companies on the implementation of CSR in SMEs were confirmed.

The research findings showed that competitive context (observed variable MTCT) was the strongest driver to impact the strategy, plans, and decisions around CSR in SMEs (see Table 1, Table 3, and Table 6). This is a reason for SMEs to engage in CSR in order to reach their own business objectives.

The context here relates to customers, international partners, suppliers, business partners, policies and standards of the industry and market, and formal and informal surveys of customers. The large majority of goods (90%) in Vietnam's textile and garment industry are exported to other destinations such as the United States, Japan, and Europe (Song 2018; Duyen 2019). Thus, the expectations of external stakeholders, particularly international customers and business partners, may be important for companies in Vietnam in terms of the international standards of CSR and the industry. The pressure of shipment returns by European partners such as in 2018 (Bach 2019) can be an example to answer why competitive context is the most important impact on adopting CSR in companies. This finding is different to other research on CSR in SMEs (e.g., De Kok and Uhlaner 2001)—their research said that SMEs are often challenged from local rather than international markets and deal with less stakeholder stress. The difference can be due to the export market-specific characteristics of the industry in Vietnam. Another interesting point here is that SMEs have to put CSR in their business plans immediately because of stakeholder pressure and competitive context. Although SMEs have financial limitations compared to large enterprises (Kusyk and Lozano 2007; Sweeney 2007), they will adopt CSR soon owing to business requirements and stakeholders' satisfaction.

Social influences are ranked second among the four drivers (Table 1, Table 3, and Table 6). These are local communities, governmental agencies, associations, nongovernmental organizations, and society. This finding implies that there are requirements of society toward SMEs, meaning that companies are dependent on the society for their existence and developments. SMEs have to focus on social and political issues in their business activities. Vietnam is facing many pollution problems (World Health Organization 2018), so the society and local communities have put pressure on business companies due to fears around air and water pollution (see, e.g., Tan 2015; Le 2016; Ortmann 2017; Vinh 2019). Many environmental protest campaigns and movements have been organized by local people for many years. The campaigns led to the attention of governmental representatives in provinces and cities of Vietnam. Some provinces have thus established regulations on environmental issues. For example, Hue, a city in Central Vietnam, has a regulation on protecting the environment in the textile and garment industry (People's Committee of Hue 2018).

The understanding of managers about CSR is ranked third in the four factors (Table 6). Their understanding is about the influence of stakeholders on the strategy and plans of companies (Table 1). The respondents also agreed that participation in CSR programs and evaluating the benefits of CSR in companies is important for managers. The finding shows that there is a relationship between the implementation of CSR in companies and the understanding of managers about CSR (Table 6). This implies that the more managers understand CSR, the more they put CSR in their strategy and business plans (see also Table 1). In SMEs, decision-making tends to be based on the personal choices of managers (Spence 1999; Perez-Sanchez et al. 2003), so their understanding of CSR can support adopting CSR more directly and quickly than large companies do. This finding can help to consider that the CSR theories, which can successfully be applied to large enterprises, may need to be adjusted slightly for SMEs.

The last factor affecting the implementation of CSR in business is the internal environment of SMEs (Table 6). The managers in this study agreed that employees put pressure on their companies in terms of implementing CSR (Table 1). They also said that companies need to follow labor laws, health and safety policies, policies to motivate employees to improve practical skills and competencies, ensure fair working conditions for employees, and listen to employees' opinions. These issues have an influence on the strategy and plans of SMEs. As analyzed above, most companies in the textile and garment industry in Vietnam are exporters. Thus, they need to follow the standards of the CSR of countries where they supply goods. The majority of garment and textile goods are exported to other countries (Song 2018), therefore, international CSR standards (e.g., International Standards ISO 26000), which emphasize issues relating to employees, employment relationships, and labor practice, are all issues that the managers in this study were aware of. Moreover, Vietnam has recently had many protest campaigns relating to working conditions and employee wages (see, e.g., Dinh and Nguyen 2018).

For example, on 24 March 2018, thousands of workers in Pou Chen Corporation in the Dong Nai province, were on strike against the new salary policy that had been set by the company (Le 2018). Thus, internal environment is one of the drivers that force SMEs to engage in CSR.

Our research findings were different compared to those of other studies. For example, Tran and Jeppesen (2016) concluded that: “the CSR practices are not implemented because the business case for CSR in SMEs cannot be identified or because the western concept of CSR is not understood by managers and workers” (p. 605). However, our research found that SMEs adopt CSR due to the high expectations of stakeholders. The difference can be because of the research samples and time taken for data collection, even though the two studies explored CSR in the same field: the textile and garment industry. Tran and Jeppesen (2016) studied 20 managers in 20 firms, whereas our research surveyed 250 managers in 250 SMEs. Moreover, our research collected the data in 2017, while Tran and Jeppesen did theirs in 2011. This explains that the concept of CSR may now become popular in Vietnam and managers may recognize the importance of CSR for their business. In addition, our research found that competitive context, social influences, the understanding of managers about CSR, and the internal environment of SMEs are the four drivers influencing the implementation of CSR in SMEs. However, Nguyen and Pham (2016) said that SMEs only practice CSR if they have the cash and human resources. This implies that SMEs may not want to implement CSR due to the limitation of resources. Nevertheless, they can be ready to do it due to the pressure of international partners, competitive environment, local community, and society.

6. Conclusions

The relationship between the environment of SMEs and their engagement in CSR was tested in this research. The research also tested the link between the understanding of managers about CSR and the implementation of CSR in SMEs. The findings provide evidence of manager awareness about CSR practice in Vietnam. The research results indicated that competitive context, social influences, the internal environment of SMEs, and the understandings of managers about CSR are the four drivers of CSR. In the four drivers, competitive context has the strongest impact on adopting CSR in SMEs. This finding is different owing to the export market-specific characteristics of the textile and garment industry in Vietnam. The study results imply that stakeholder pressure influences companies due to the high expectations from international customers and partners, employees, local communities, and society. Another interesting finding relates to the characteristic of SMEs—personal decision making by managers/owners—in that the more managers/owners understand CSR and its benefits, the more CSR is incorporated in their business strategies. Although SMEs have financial limitations compared to large enterprises, SMEs can immediately add CSR to their business agenda because of stakeholder pressure and competitive context. This study provides evidence for the development of the theory of CSR that needs to consider more SMEs.

This study was conducted in Vietnam, where scholarship is emerging. This contributes to a broader understanding of CSR in SMEs, especially in the developing world. The research is also significant because it explores SMEs’ engagement in CSR in a country where CSR is new to the public. Another contribution of this study relates to the research sample. The study collected data from the perspectives of SMEs, not those of large enterprises. In other words, our research findings reflect the view of SME managers who have an important role in making decisions about why firms need to add CSR to their business strategy. Finally, this research provides empirical evidence from the textile and garment industry. SMEs may have resource limitations, but they are ready to practice CSR due to the pressure of a competitive context and social influences.

There are limitations in this study that need to be considered in future research. Firstly, this study was conducted only in the textile and garment industry. Thus, generalizability of the research results is limited. Research in future should explore other industries so that it can discover similarities and differences among them. Secondly, our research surveyed SMEs only. Future studies need to examine large companies in order to compare the practice of CSR between SMEs and large enterprises in the

developing world, such as in Vietnam. Finally, future studies should be cross-country to develop a better understanding of the use of CSR theories in different countries.

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Article

Financial Development and Income Inequality in Emerging Markets: A New Approach

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Abstract: Financial development has been considered an efficient and effective mechanism for the sustainable economic growth and development of emerging markets in past decades. However, various concerns have emerged in relation to the influences of financial sector development on income inequality. It is the claim of this paper that findings from the current literature are incomplete. This is because various proxies have been utilized inconsistently for both financial development and income inequality in previous empirical studies. This study extends the current literature on this important finance–inequality nexus by examining a sample of 21 emerging countries for the period of 1961–2017. Various estimation techniques were employed with the aim of ensuring robust findings. Findings from this paper confirm the existence of an inverted U-curve relationship between financial development and income inequality, implying that income inequality may rise at the early stage of financial development and fall after a certain level is achieved. Policy implications have emerged from the findings of this study.

Keywords: financial development; income inequality; FMOLS; DOLS; emerging markets

JEL Classification: O11; O12; O15; F62; F63

1. Introduction

It is generally accepted that financial development fosters economic growth by enabling the efficient allocation of capital together with reducing financial constraints (Rousseau and Yilmazkuday 2009; Yilmazkuday 2011; Vo et al. 2019a, 2019b). However, the current literature appears to largely overlook the effect of financial development on income inequality. Debates have emerged in relation to the influences of the financial sector on income inequality, especially after the global financial crisis in 2008. Understanding the relationship between financial development and income inequality is important because policymakers can assess the indirect impact of the financial sector on growth via income inequality.

The literature on the finance–inequality linkage is inconclusive. Greenwood and Jovanovic (1990) argued that income inequality increased at the early stage of financial development and then the degree of inequality decreased after a certain level of financial development. Galor and Zeira (1993) and Banerjee and Newman (1993) stated that income inequality would be lower when financial markets were fully developed. Similarly, a well-functioning financial market was said to be essential for reducing income inequality (Younsi and Bechtini 2018). In contrast, Rajan and Zingales (2003) posited that the development of the financial sector may widen existing income inequality.

In addition, a theoretical guide to the measurement of financial development has not been properly developed, although market-based and/or bank-based indicators are commonly used in empirical studies.

Various proxies for financial development have been utilized, including the domestic credit to private sector–GDP ratio (Sehrawat and Giri 2015; Batuo et al. 2010; Law et al. 2014; Park and Shin 2017); the share of market capitalization-to-GDP ratio (Sehrawat and Giri 2015; Park and Shin 2017); and deposit money banks as a share of GDP (Kim and Lin 2011; Kappel 2010), among others. As such, the use of various proxies can influence the findings of empirical studies of the finance–inequality nexus.

In addition, previous empirical studies have been devoted to the examination of the short-run relationship between financial development and income inequality; this relationship in the long run has been largely ignored. We consider that a single-country investigation is necessary to provide useful policy implications. However, an examination of a group of various countries that share many similarities in relation to the level of financial development and economic growth is also desirable. As such, on the grounds of the theoretical ambiguity of the finance–inequality nexus and the lack of a theoretical guide to the measurement of financial development, we are motivated to consider the following fundamental questions: (i) How does financial development affect income inequality in the long-run? (ii) Does the foregoing relationship vary with the choice of a proxy for financial development? In response to these objectives, the aim of this study was to validate the relationship between financial development and income inequality in the long run and to verify the validity of the nexus by employing various variables as proxies for financial development.

On the grounds of the above considerations, emerging countries have attracted our attention. Two superpower economies—China and India—are generally recognized as emerging markets. These two countries continue to be increasingly influential players globally. Emerging markets play the key role in global economic growth and stability, according to the World Bank. However, despite the tremendous growth of emerging markets over the past decade, empirical analyses on the impact of financial development on income inequality have largely been ignored. As such, this study extends the current literature on the finance–inequality nexus through an investigation using available data for 21 emerging countries over the period of 1961–2017. Various robustness checks were conducted to ensure that the estimated results are unbiased.

The remainder of this paper is structured as follows. Section 2 provides an overview of the current literature on the issue. Data and methodology are presented in Section 3. Empirical results are discussed in Section 4, followed by a robustness check in Section 5. Section 6 provides concluding remarks.

2. An Overview of the Literature

The relationship between financial development and income inequality has received great attention from academics, practitioners, and in particular, policymakers in recent decades (Agnello et al. 2012; Ang 2010; Claessens and Perotti 2007; Clarke et al. 2006; De Haan and Sturm 2017), in addition to the determinants of income inequality (Afonso et al. 2010; Atkinson 2003; Dowrick and Akmal 2005; Roine et al. 2009; Malinen 2012; De Gregorio and Lee 2002; Huber and Stephens 2014; Li et al. 1998; Milanović 2000; Pan-Long 1995; Nguyen et al. 2019; Malinen 2012). For example, Atkinson (2003) considered explanatory factors of income inequality for nine OECD countries over the period of 1945–2001. The author found that various determinants could significantly affect income inequality variation, such as technological change, globalization, public policy, and sources of income. De Gregorio and Lee (2002) examined the relationship between human capital and income inequality for a broad range of countries from 1960 to 1990. Their empirical results showed an inverted U curve in the relationship, although a significant proportion of income inequality variation remains unexplained. In addition, Roine et al. (2009) investigated long-run determinants of income inequality for a group of 16 countries over the period of 1900 to 2000. They stated that income inequality was significantly affected by economic growth and financial development. In contrast, trade openness had no clear impact on income inequality.

Various studies were conducted to figure out how financial development affects income inequality. Empirical findings can be classified into three different groups. First, the finance–inequality widening hypothesis proposed by Rajan and Zingales (2003) posited that the development of financial sectors

increases income inequality. Second, finance–inequality narrowing hypothesis suggested by [Galor and Zeira \(1993\)](#) and [Banerjee and Newman \(1993\)](#) argued that a better-functioning financial system reduced income inequality. Finally, the inverted U-shaped hypothesis suggested by [Greenwood and Jovanovic \(1990\)](#) fundamentally combined the two foregoing outcomes, where the finance–inequality linkage is non-linear. Specifically, this hypothesis suggests that income inequality increases at the early stage of financial development and then decreases after a certain level of financial sector development.

Some studies found a positive relationship between financial development and income inequality ([Jauch and Watzka 2016](#); [Seven and Coskun 2016](#); [Jaumotte et al. 2013](#)). For instance, [Jauch and Watzka \(2016\)](#) examined the relationship between financial development and income inequality in 138 developing and developed countries over the period of 1960–2008. Using the fixed effect and generalized method of moments (GMM) techniques, their results indicated that financial development provided a significantly positive effect on income inequality, indicating a rejection of a negative impact of financial development on income inequality or the finance–inequality narrowing hypothesis. Similarly, as countries were classified based on four different levels (e.g., high-income, upper-middle-income, lower-middle-income, and low-income), empirical findings on a sample including various countries also confirmed that there appeared to be a positive relationship between financial development and income inequality. [Seven and Coskun \(2016\)](#) found a statistically significant contribution of bank development on the growth effect of income inequality. The results emerged from the use of GMM techniques from a database of 45 emerging countries over the period 1987–2011. Prior to these studies, [Jaumotte et al. \(2013\)](#) stated that an increase of income inequality was associated with an increase of financial globalization, which was the case for 20 advanced countries as well as 31 developing and emerging countries for the research period from 1981 to 2003.

On the other hand, various scholars have demonstrated that the reduction of income inequality was triggered by the enhancement of financial sectors ([Batuo et al. 2010](#); [Hamori and Hashiguchi 2012](#); [Kappel 2010](#); [Mookerjee and Kalipioni 2010](#); [Law et al. 2014](#)). In other words, the development of the financial sector was negatively related to income inequality. For example, [Hamori and Hashiguchi \(2012\)](#) utilized a multi-step study, starting with fixed-effects estimation and then moving on with a dynamic panel model. In relation to the fixed-effects estimations, the authors found that the estimates of M_2 –GDP ratio and domestic credit to private sector as a percentage of GDP, which represented the development of finance, were negative and statistically significant at the level of 1%. In addition, for the dynamic panel model where difference GMM was utilized, the contribution of financial development to income inequality was considered. Findings from this study presented evidence confirming the finance–inequality narrowing hypothesis, regardless of the proxies for financial development.

In addition, various empirical studies found a non-linearity in the relationship between financial development and income inequality ([Kim and Lin 2011](#); [Park and Shin 2017](#); [Younsi and Bechtini 2018](#); [Zhang and Chen 2015](#)). [Park and Shin \(2017\)](#) confirmed that the impact of financial development on income inequality varied depending on the level of financial development. At the early stage of financial development, the development of the financial sector alleviated income inequality. In contrast, income inequality increased as financial development was further increased. Additionally, a non-linear effect of financial development on income inequality was found in a group of 65 countries from 1960 to 2005 ([Kim and Lin 2011](#)). Using a threshold regression technique, which allows one to simultaneously deal with endogeneity and to account for threshold nonlinearity, the authors found that after a certain level of financial development, income inequality would be reduced through the growth of finance and that income inequality would be counteracted by financial development.

In relation to various finance–inequality linkages, scholars have also been motivated by different types of proxies for financial development. Various proxies for financial development have been proposed, including the domestic credit to private sector–GDP ratio ([Sehrawat and Giri 2015](#); [Batuo et al. 2010](#); [Law et al. 2014](#); [Park and Shin 2017](#)); the share of market capitalization-to-GDP ratio ([Sehrawat and Giri 2015](#); [Park and Shin 2017](#)); deposit money in banks as a share of GDP ([Kim and Lin 2011](#);

Kappel 2010)), among others. As such, it is noticeable that the use of proxies for financial development influences the interpretation of its influence on the finance–inequality nexus.

3. Data and Model

3.1. Data

This paper employed unbalanced panel data of 21 emerging countries as classified by the International Monetary Fund (IMF) where required data were available. Only Venezuela and Russia, two emerging markets, were excluded due to a lack of required data. Data were collected from the World Development Indicators (WDI) from the World Bank. Annual data of economic growth per capita, financial development, inflation, and government expenditure–GDP ratio are available and accessible. Unfortunately, the WDI does not provide sufficient data on income inequality. In response to the problem, the Standardized World Income Inequality Database (SWIID), proposed by Solt (2016), was utilized. Our choice was largely based on data availability. Together with emerging countries, the SWIID also covers income inequality data for other countries, constituting a database of 192 countries, with the first observation dated back to 1960. Noted that only the Gini coefficient is provided in the SWIID database.

Although various methods have been developed to measure income inequality, the use of the Gini coefficient proposed by Deininger and Squire (1996) appears to be appropriate for the purpose of this paper, and the measurement is also widely adopted. As such, the Gini coefficient was utilized in this work to measure income inequality. Our choice was based on the following two considerations. First, the use of the Gini coefficient allows our results to be compared with previous studies. Second, the Gini coefficient achieves a high-quality standard (Li and Zou 1998; De Dominicis et al. 2008). In addition to the WDI, our dataset also incorporates the index of financial development (Svirydzenka 2016) developed by the IMF Strategy, Policy, and Review Department, in order to ensure that empirical findings achieved from the paper are robust. Details of variables are reported in Table 1. The descriptive statistics are presented in Table 2.

Our dataset consists of 21 emerging countries, including Argentina, Bangladesh, Brazil, Bulgaria, Chile, China, Colombia, Hungary, India, Indonesia, Malaysia, Mexico, Pakistan, Peru, the Philippines, Poland, Romania, South Africa, Thailand, Turkey, and Ukraine. Note that available data for Argentina, Brazil, and the Philippines are from 1961 to 2017, whereas the period is shorter for other countries.

Table 1. Summary of variables. IMF: International Monetary Fund; SWIID: Standardized World Income Inequality Database; WDI: World Development Indicators.

Variable	Definition	Proxy	Source
<i>Gini</i>	Income inequality measurement	Post-tax, post-transfer income	SWIID
		Pre-tax, pre-transfer income	SWIID
<i>g</i>	Economic growth	Annual percentage growth rate of GDP per capita	WDI
<i>Inflation</i>	A measurement of the overall level of prices in the economy	Percentage change in the cost to the average consumer of acquiring a basket of goods and services	WDI
<i>GovExp/GDP</i>	General government final consumption expenditure as a share of GDP	Ratio of government final consumption expenditure–GDP ratio	WDI

Table 1. Cont.

Variable	Definition	Proxy	Source
FD	A measurement of financial development	Domestic credit to private sector–GDP ratio	WDI
		Domestic credit to private sector by banks–GDP ratio	WDI
		Domestic credit to private sector by financial sector–GDP ratio	WDI
		Stock market capitalization as percentage of GDP	WDI
		New broad-based index of financial development	IMF

Table 2. Descriptive statistics.

Variable	Gini	g	FD	Inflation	GovExp/GDP
Min	26	−22.55	1.38	−7.63	2.97
Max	59.1	13.63	166.50	7481.66	27.39
Mean	42.45	2.75	43.52	63.60	12.46
S.D.	7.94	4.24	34.63	401.53	4.10
Observations	830	830	830	783	823

Note: The above table employs post-tax, post-transfer income as proxy for the Gini coefficient and the domestic credit to private sector–GDP ratio as proxy for financial development.

3.2. Model

This paper employs the following equation to consider the effects of financial development on income inequality. Following [Kuznets \(1955\)](#), we incorporate both linear and non-linear, proxied as a squared term of economic growth, denoted by g and g^2 respectively. We also add a set of control variables, denoted by X_{it} , including inflation and government consumption–GDP ratio.¹ This is because wealthy people can hedge better against inflation through access to financial markets while the poor, who are generally geared with debt, tend to experience unexpected consequences from high inflation since the contracts are written in nominal terms ([Yilmazkuday 2012](#)). Moreover, a large proportion of government consumption-to-GDP ratio can be a consequence of either redistributing income or rent-seeking activities ([Jauch and Watzka 2016](#)):

$$Gini_{it} = \alpha + \beta_1 FD_{it} + \beta_2 FD_{it}^2 + \beta_3 g_{it} + \beta_4 g_{it}^2 + \beta_j X_{it} + \varepsilon_{it}.$$

The sign and significance of β_1 and β_2 reveal how financial development affects income inequality. Following the finance–inequality narrowing hypothesis, β_1 should be significant and negative and β_2 should be insignificant. According to the finance–inequality widening hypothesis, β_1 should be significant and positive and β_2 should be insignificant. As the inverted U-shaped hypothesis suggests, β_1 should be significant and positive and β_2 should be significant and negative.

There is extensive literature on the finance–inequality nexus using the fixed effect (FE) method and generalized method of moments (GMM). However, some issues have emerged in these techniques,

¹ We would like to thank an anonymous referee for suggesting other control variables, such as human capital and trade openness. It is arguable that human capital and trade openness may play an important role in determining a variation of income inequality. However, for the purpose of this paper, these two variables were not utilized for the following reasons. In relation to human capital, [Milanović \(2000\)](#) stated that human capital and economic growth should not be used concurrently due to a severe collinearity between them. In relation to trade openness, various empirical studies considered that its effects on income inequality were still a matter of controversy ([Bensidoun et al. 2011](#); [Mahesh 2016](#); [Urata and Narjoko 2017](#)).

leading to biased estimates. It is argued that the FE comes at a cost, and the GMM technique suffers from the problem of instrument proliferation as the time dimension increases (De Dominicus et al. 2008); (Grijalva 2011). In addition, these techniques are dedicated to the estimation of short-run relationships, which is not the focus of this study. As such, this paper utilizes the dynamic OLS (DOLS) and fully modified OLS (FMOLS).

It is widely noted that the relationship between income inequality and economic growth is endogenous. Therefore, estimations without considering a potential endogeneity will produce misleading results. Fortunately, the above issue can be reduced by employing FMOLS and DOLS regression techniques. Al Mamun et al. (2018) considered that endogeneity can be alleviated using the FMOLS regression technique. Risso et al. (2013) stated that the FMOLS and DOLS estimators deal with the problem of endogeneity.

4. Empirical Findings

In this section, we use appropriate econometric techniques to reveal the underlying relationship between income inequality and financial development for a sample of 21 emerging markets.

4.1. Slope Homogeneity Test

Table 3 reports the mean of each investigated variable. Variations in the averages could suggest heterogeneity across panels. For example, while the average GDP per capita growth was quite high in China (8.67%), Bulgaria (4.52%), and Thailand (4.48%), it was low in South Africa (0.46%) and Ukraine (−0.45%). Similarly, the magnitudes of financial development and inflation varied significantly across the analyzed countries. Breitung (2005) stated that if the panel was heterogeneous, the estimated coefficients would be biased.

Table 3. The mean of each variable.

Country	Gini	g	FD	Inflation	GovExp/GDP	Observed Period
Argentina	40.13	1.31	17.71	185.73	11.16	1961–2015
Bangladesh	32.50	2.76	21.00	6.32	4.83	1974–2016
Brazil	50.61	2.27	45.86	335.17	14.72	1961–2015
Bulgaria	33.09	4.52	50.24	4.10	17.73	2001–2016
Chile	46.87	2.63	56.18	45.42	11.79	1968–2015
China	36.28	8.67	95.37	5.44	13.91	1978–2015
Colombia	50.86	2.24	33.02	15.79	13.43	1970–2015
Hungary	27.86	2.30	45.94	4.24	21.11	2001–2016
India	43.03	3.81	29.91	7.54	10.97	1980–2017
Indonesia	35.81	3.49	32.24	9.83	8.94	1980–2017
Malaysia	44.72	3.93	90.24	3.53	13.97	1970–2016
Mexico	47.90	1.77	22.18	21.07	9.50	1963–2016
Pakistan	34.59	2.37	24.32	8.75	11.13	1964–2013
Peru	52.25	1.41	19.41	293.18	11.09	1972–2011
Philippines	43.05	1.70	27.89	9.10	9.90	1961–2015
Poland	31.45	3.64	39.23	2.23	18.37	2001–2016
Romania	31.38	3.60	23.09	22.87	15.31	1996–2016
South Africa	57.17	0.46	104.65	9.67	17.78	1975–2015
Thailand	42.79	4.48	71.22	4.62	11.88	1962–2013
Turkey	42.69	3.03	29.05	41.31	12.48	1987–2016
Ukraine	28.03	−0.45	36.31	264.86	19.64	1992–2016

Source: The above table employs post-tax, post-transfer income as a proxy for the Gini coefficient and a domestic credit to private sector–GDP ratio as a proxy for financial development.

4.2. Cross-Section Dependence Test

Correlation of the residual across entities seems to be common in macro data where a group of highly connected countries are examined. Spill-over effects across countries are often considered as

sources of the linkages. Estimations which ignore cross-section dependence will result in inconsistent estimates or lead to inaccurate conclusions. Thus, in order to verify the existence of cross-section dependence, we conducted the CD test proposed by Pesaran (2015). The empirical results are reported in Table 4.

Table 4. Results from Pesaran's CD test for cross-section dependence.

Variable	Gini	g	g ²	FD	FD ²	Inflation	GovExp/GDP
CD test	1.30	17.65 ***	4.88 ***	23.78 ***	22.27 ***	17.69 ***	1.12
p-value	0.19	0.00	0.00	0.00	0.00	0.00	0.26

Note: *** significant at 1% level. Null hypothesis is of cross-section independence.

For our dataset, the null hypothesis of cross-section independence was rejected at the 1% level of significance to some variables of economic growth, financial development, and inflation, suggesting that cross-section dependence should be accounted for in the regression techniques.

4.3. Panel Unit Root Test

On the grounds of the issue of heterogeneous panels and cross-section dependence, we employed the *t*-test for unit roots, as proposed by Pesaran (2003). As presented in Table 5, referring to the *p*-value in the first and second columns, it is suggested that all variables contained unit roots. However, the statistical estimates in the third and fourth columns indicate that the first difference of those was stationary. In summary, the considered variables were integrated of order one, or I(1).

Table 5. Results from panel unit root test.

Variable	Level		First Difference		Order of Integration
	Constant (1)	Constant and Trend (2)	Constant (3)	Constant and Trend (4)	
Gini	0.77 (0.77)	1.74 (0.96)	−11.50 *** (0.00)	−9.55 *** (0.00)	I (1)
g	0.01 (0.50)	0.53 (0.70)	−13.41 *** (0.00)	−11.04 *** (0.00)	I (1)
g ²	0.52 (0.70)	1.07 (0.85)	−1.70 ** (0.04)	−4.62 *** (0.00)	I (1)
FD	2.56 (0.99)	4.48 (1.00)	−4.38 *** (0.00)	−3.28 *** (0.00)	I (1)
FD ²	2.04 (0.97)	3.37 (1.00)	−4.40 *** (0.00)	−2.93 *** (0.00)	I (1)
Inflation	0.55 (0.71)	1.27 (0.89)	−11.45 *** (0.00)	−9.64 *** (0.00)	I (1)
GovExp/GDP	−1.03 (0.15)	0.25 (0.60)	−6.03 *** (0.00)	−3.78 *** (0.00)	I (1)

Note: The *p*-values are reported in parentheses. The Z[t-bar] is reported. ** significant at 5% level, *** significant at 1% level. Null hypothesis assumes that all series are non-stationary.

4.4. Panel Cointegration Test

We continued to conduct another test—the panel cointegration test—before determining how financial development affects income inequality. To examine the existence of a long-run equilibrium relationship between the variables of interest, we employed the tests of Kao (1999); Pedroni (1999, 2004); and Westerlund (2005). Findings are presented in Table 6. The results of the Pedroni and Kao tests were statistically significant at the level of 1%, and significant estimates emerged from the Westerlund test. These results indicate that the variables were cointegrated in all panels or there was a long-run equilibrium relationship between them.

Table 6. Panel cointegration test results.

Cointegration Test	Statistics
<i>Pedroni</i>	
Phillips–Perron t	3.58 *** (0.00)
Panel ADF statistic	3.85 *** (0.00)
<i>Kao</i>	
Modified Dickey–Fuller t	2.61 *** (0.00)
Dickey–Fuller t	2.83 *** (0.00)
Augmented Dickey–Fuller t	3.09 *** (0.00)
Unadjusted modified Dickey–Fuller t	2.40 *** (0.00)
Unadjusted Dickey–Fuller t	2.55 *** (0.00)
<i>Westerlund</i>	
Variance Ratio	1.42 * (0.07)

Note: The p -values are reported in parentheses. * significant at 10% level, *** significant at 1% level. Null hypothesis assumes no cointegration.

4.5. Estimation Results

Table 7 presents the long-run estimates of a pool of 21 selected emerging countries. We proceeded in several steps, starting with the panel FMOLS and then dealing with the DOLS estimators. Note that the domestic credit to private sector–GDP ratio and the post-tax income were employed to measure financial development and income inequality, respectively.

Table 7. Regression results (post-tax, post-transfer income).

Regressors	FMOLS	DOLS
g	0.037 * (0.096)	1.435 *** (0.000)
g^2	−0.002 (0.536)	−0.083 *** (0.001)
FD	0.197 *** (0.000)	0.295 * (0.052)
FD^2	−0.003 *** (0.000)	−0.006 * (0.064)
<i>Inflation</i>	−0.010 (0.122)	−0.175 *** (0.000)
<i>GovExp/GDP</i>	0.017 (0.542)	0.679 *** (0.000)
Number of observations	754	705
R^2	0.499	0.93

Note: * significant at 10% level, *** significant at 1% level. p -values are in parentheses. DOLS: dynamic OLS; FMOLS: fully modified OLS.

Regardless of the estimation techniques employed in this paper, the results were similar to the estimates of economic growth. The coefficient of g was positive and significant and the coefficient of g^2 was negative, although it was only significant under the FMOLS estimation. The results imply that the

income inequality–economic growth nexus follows the prediction of [Kuznets \(1955\)](#). Furthermore, they indicate a turning point for annual percentage growth rate of GDP per capita of 9.25 and 8.6 for FMOLS and DOLS, respectively.

Both FMOLS and DOLS estimators support an inverted U curve between financial development and income inequality. At the level of 10%, the coefficient of FD was positive while that of FD^2 was negative, indicating that the hypothesis of [Greenwood and Jovanovic \(1990\)](#) is confirmed in our study. The estimated turning point for FD was 32.8 and 24.5 for the above two estimations.

This finding is also supported by the study of [Younsi and Bechtini \(2018\)](#), in which the BRICS members were investigated, or the study of [Zhang and Chen \(2015\)](#), which is dedicated to China. From another point of view, the results also indicate a rejection of the linearity of the financial development–inequality nexus.

Regardless of the control variables, we suggest that their effects on income inequality were quite consistent across estimations. Particularly, inflation was negatively related to income inequality, indicating that as inflation increases, income inequality decreases. [Jauch and Watzka \(2016\)](#) argued that debtors would benefit from high inflation due to a reduction in their debt obligation, as most contracts are written in nominal terms. That relationship was also found in the study of [Park and Shin \(2017\)](#). On the other hand, the government expenditure–GDP ratio was positively associated with income inequality. [Jauch and Watzka \(2016\)](#) stated that a large share of government expenditure in the economy operated by the elite through rent-seeking activities could widen inequality.

Overall, the use of the domestic credit to private sector–GDP ratio as a measure of financial development rejects the linearity of the financial development–inequality nexus and supports its non-linearity, as presented in Table 7. However, the conclusion seems to be somewhat arbitrary due to the choice of proxy for income inequality and financial development. Thus, in the following section, we perform robustness checks in relation to the use of various proxies for financial development.

5. Robustness Checks

Thus far, this paper has used inequality in disposable (post-tax, post-transfer) income. As such, we use the inequality in market (pre-tax, pre-transfer) income as a robustness check.

The results from Table 8 suggest that there is an inverted U curve in the relationship between income inequality and economic growth as well as between income inequality and financial development. The results not only further strengthen the findings presented in Table 7 but also confirm the inverted U curve hypothesis of [Greenwood and Jovanovic \(1990\)](#).

Table 8. Regression results (pre-tax, pre-transfer income).

Regressor	FMOLS	DOLS
g	0.044 * (0.07)	0.499 (0.379)
g^2	−0.003 (0.239)	−0.031 (0.381)
FD	0.254 *** (0.000)	0.423 *** (0.009)
FD^2	−0.004 *** (0.000)	−0.008 ** (0.022)
<i>Inflation</i>	−0.011 (0.140)	−0.103 ** (0.047)
<i>GovExp/GDP</i>	−0.045 (0.148)	−0.319 (0.208)
Number of observations	754	705
R^2	0.529	0.913

Note: * significant at 10% level, ** significant at 5% level, *** significant at 1% level. p -values are in parentheses.

Development finance refers to economic analysis of the role of financial resources and financial institutions in the development of an economy (Rao 2003). Ouyang and Li (2018) argued that financial development was a multifaceted phenomenon. From that argument, they stated that using only one proxy variable to measure financial development would provide misleading conclusions. Indeed, it is observable that financial structure, financial market size, and the efficiency of financial intermediaries for each country are quite different from their counterparts in other countries (Ang 2008). Thus, in addition to the domestic credit to private sector–GDP ratio variable, we also employed other variables as proxies for financial development, including (i) stock market capitalization as percentage of GDP, (ii) domestic credit to private sector by banks-to-GDP ratio, (iii) domestic credit provided by financial sector-to-GDP ratio, and (iv) the IMF-proposed financial development index. The first three variables were obtained from the WDI while the last is available in the IMF database.

The IMF-proposed financial development index is an overall index which accounts for the depth, access, and efficiency of the financial sector. It was developed on a sample of 183 countries and is available on an annual basis over the period of 1980–2013. As such, we expected that the variable would provide a comprehensive picture of how financial development affects income inequality. Empirical estimates are presented in Table 9.

Table 9. Regression results using various proxies for financial development including stock market capitalization as percentage of GDP, domestic credit to private sector by banks-to-GDP ratio, domestic credit provided by financial sector-to-GDP ratio, and the IMF-proposed financial development index.

Regressors	Gini (Disposable Income)		Gini (Market Income)	
	FMOLS	DOLS	FMOLS	DOLS
<i>Panel A: Stock market capitalization as percentage of GDP</i>				
g	0.219 *** (0.000)	0.105 * (0.096)	−0.053 (0.494)	0.147 (0.405)
g^2	−0.016 ** (0.016)	0.009 (0.397)	0.003 (0.762)	0.040 * (0.084)
FD	0.014 (0.348)	−0.045 *** (0.001)	0.012 (0.477)	0.083 * (0.081)
FD^2	−0.000 *** (0.000)	0.000 *** (0.001)	−0.001 *** (0.001)	−0.002 *** (0.000)
<i>Inflation</i>	−0.025 (0.184)	−0.035 ** (0.020)	−0.017 (0.392)	−0.02 (0.715)
<i>GovExp/GDP</i>	−0.083 (0.324)	0.179 ** (0.036)	−0.108 (0.199)	0.285 (0.223)
Number of observations	436	214	436	214
R^2	0.502	0.982	0.58	0.914
<i>Panel B: Domestic credit to private sector by banks-to-GDP ratio</i>				
g	0.027 (0.210)	−0.034 * (0.078)	0.056 ** (0.047)	−0.058 ** (0.019)
g^2	−0.001 (0.572)	−0.002 (0.280)	−0.005 (0.124)	0.004 (0.125)
FD	0.147 *** (0.000)	0.054 *** (0.000)	0.227 *** (0.000)	0.084 *** (0.000)
FD^2	−0.002 *** (0.000)	−0.000 *** (0.000)	−0.004 *** (0.000)	−0.000 *** (0.000)
<i>Inflation</i>	−0.012 * (0.064)	0.000 (0.105)	−0.017 (0.102)	0.000 * (0.086)
<i>GovExp/GDP</i>	0.028 (0.300)	−0.405 *** (0.000)	−0.042 (0.292)	−0.360 *** (0.000)
Number of observations	754	712	754	712
R^2	0.506	0.951	0.611	0.925

Table 9. Cont.

Regressors	Gini (Disposable Income)		Gini (Market Income)	
	FMOLS	DOLS	FMOLS	DOLS
<i>Panel C: Domestic credit provided by financial sector-to-GDP ratio</i>				
δ	0.118 *** (0.000)	−0.146 *** (0.000)	0.089 *** (0.000)	−0.029 (0.328)
δ^2	−0.009 *** (0.002)	−0.003 (0.313)	−0.009 *** (0.000)	0.008 ** (0.020)
FD	0.201 *** (0.000)	0.031 *** (0.000)	0.118 *** (0.000)	0.030 *** (0.002)
FD ²	−0.001 *** (0.000)	−0.000 *** (0.000)	−0.000 ** (0.035)	−0.000 * (0.063)
Inflation	−0.014 (0.141)	0.000 *** (0.000)	−0.006 (0.491)	0.008 ** (0.010)
GovExp/GDP	0.062 (0.168)	−0.023 (0.203)	−0.070 * (0.067)	0.004 (0.881)
Number of observations	709	709	709	711
R ²	0.5252	0.936	0.536	0.934
<i>Panel D: IMF-proposed financial development index</i>				
δ	0.083 * (0.063)	0.015 (0.755)	0.115 ** (0.010)	0.029 (0.646)
δ^2	−0.041 (0.381)	0.001 (0.896)	−0.043 (0.365)	0.003 (0.743)
FD	10.479 *** (0.000)	7.375 (0.116)	7.933 *** (0.000)	10.982 * (0.0600)
FD ²	−18.003 *** (0.000)	−18.614 *** (0.000)	−12.283 *** (0.000)	−25.116 *** (0.000)
Inflation	−0.024 (0.278)	0.002 (0.190)	−0.027 (0.226)	0.002 (0.181)
GovExp/GDP	0.058 *** (0.001)	−0.003 (0.966)	0.083 *** (0.000)	0.118 (0.130)
Number of observations	652	473	652	474
R ²	0.558	0.970	0.632	0.974

Note: * significant at 10% level, ** significant at 5% level, *** significant at 1% level. *p*-values are in parentheses. The IMF-proposed financial development index starts in 1980 and ends in 2013.

It is observed that the impact of financial development on income inequality holds firmly. That is, there is an inverted U curve in the relationship between them. These findings imply that the growth of the financial sector exacerbates income inequality at its early stages of development before it narrows income inequality after a certain threshold.

6. Concluding Remarks

The relationship between financial development and inequality has attached great attention from academics, practitioners, and policymakers in the past few decades. Various debates have emerged in relation to the influences of the financial sector on income inequality, especially after the global financial crisis of 2008. In addition, a theoretical consensus on the finance–inequality nexus has not been reached among scholars. As such, this study was conducted to provide additional empirical evidence on the influence of financial development, which is heavily pursued by many emerging markets, on income inequality. We extended the finance–inequality nexus framework through an investigation on a sample of 21 emerging countries over the period of 1961–2017. Various proxies of financial development were utilized in this paper. In addition, this paper employed various estimation techniques, focusing on the long-run relationship between financial development and income inequality, accounting for endogeneity in order to ensure that the estimated findings are robust.

Our results indicate that there is an inverted U curve relationship between financial development and income inequality in emerging markets. That is, it seems that at the early stage of financial

development, the expansion of a financial sector is likely to be associated with an increase in income inequality. Once a certain level of a financial development is achieved, income inequality is expected to fall. These findings hold for various proxies of financial development as well as income inequality.

The empirical findings of this paper offer additional evidence for the governments of emerging countries to formulate and implement their respective economic policies. As there is a tradeoff between income inequality and the development of a national financial sector, it is necessary for any policy to ensure that the achievements of the economic development are redistributed to the people—especially those at the bottom of the national income distribution level. In addition, it appears to be crucial to target financial development towards the poor in society, and to the small and medium firms. Our results also indicate that income inequality is expected to be reduced after a certain level of financial development. In other words, financial development is essential for reducing income inequality. Moreover, there is no doubt that financial development plays a key role in sustainable economic growth and development. Overall, these considerations suggest that the development of a financial sector should receive proper attention from policy makers. Financial development continues to be considered as an important and effective mechanism to achieve sustainable economic growth and development of the emerging markets. However, financial reform should be carefully implemented. Policy makers should be aware of valuable lessons learned from the global financial crisis of 2008.

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Article

Double Taxation Treaties as a Catalyst for Trade Developments: A Comparative Study of Vietnam's Relations with ASEAN and EU Member States

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Abstract: Employing a panel gravity model and Generalized Least Squares (GLS) estimation technique, this study documents the effect of double taxation treaties on the bilateral trade of Vietnam with ASEAN member states, thereby making an extensive comparison with its EU partner countries. Our findings indicate the significant contributions of the tax treaties to Vietnam's trade performance, not exclusively with ASEAN but also with EU partner countries. Nevertheless, under some circumstances, the conclusion of tax treaties seems ineffective in strengthening export capacity or narrowing trade deficits for Vietnam. This is primarily due to the unidirectional movement of trade associated with tax treaty conditions, viz., imports from the advanced economies into Vietnam. Besides, the role of tax treaties as a dynamism of Vietnam's export growth remains opaque during recent years.

Keywords: double taxation treaty; trade; gravity model; ASEAN

1. Introduction

In foreign trade, the coexistence of multiple tax systems among countries generally results in the imposition of tax on a single income in two different countries. This phenomenon occurs since most countries exercise their taxing rights based on the following basic principles:

- (i) Those identified as residents of a country must fulfil their tax obligations in that country for all of their income regardless of the sources of income;
- (ii) Those identified as non-residents of a country must fulfil their tax obligations for all of their incomes arising therein. Methods to identify residents and sources of income vary across nations, and in some circumstances, a business entity or individual may be a resident of two or more countries. Double taxation could, therefore, be present in several means, for example, two or more countries may levy taxes on the global income of a single taxpayer, who is identified as the resident of these countries. In another case, a taxpayer's income which is recognized to generate in the territory of multiple countries must be taxed jointly by the related governments.

Clearly, such double taxing treatment can be a significant obstacle to the development of cross-border trade and investment, and as well be the root cause of income tax fraud. To overcome the issue, sovereign states (separate and distinct political entities) may enter into a reciprocal agreement under the name of "double taxation treaty" or "double taxation agreement". It is designed to avoid or minimise double taxation of the same income of an investor by both countries, thereby contributing to the elimination of trade barriers and advancing trade and investment cooperation and facilitation between the contracting states. The agreement applies to direct taxes, viz. personal income tax,

corporate income tax and property taxes. Among the central terms of the double taxation treaty refers to the separation of the taxing rights between the two countries as well as the empowerment for one of the two countries to tax in case tax exemption is applied. Once the taxing rights are clearly separated between countries, it is possible to rely on the tax regulation of the taxing country to ascertain the tax regime applicable to an income.

Together with the higher trends in globalisation and multilateralisation, today's double taxation treaties have a critical role to play in promoting cross-border trade and investment. As pointed out by [Braun and Zagler \(2014\)](#), over the past two decades, the number of double taxation treaties concluded has surpassed 3000, constituting up to 65% of the treaties worldwide, where the tendency for cooperation between developing and developed countries has become increasingly common. Since Vietnam's entrance to the World Trade Organization (WTO) in 2006 and subsequently, a series of bilateral and multilateral free trade agreements, foreign direct investment (FDI) attraction, as well as import and export activities of this country have recorded notable initial achievements towards comprehensive and sustainable socio-economic development. Over the period from 1992 to 2017, despite the successful conclusion of the tax treaties with a total of 77 trading partners, most of which are upper-middle-income and high-income economies, the benefits of the signed double taxation treaties, especially from foreign trade, to Vietnam seem negligible. This stresses the importance of critically re-assessing the tax treaties' implications for Vietnam throughout different stages of development. Our research objective is, thus, to gauge the impact of double taxation treaties on Vietnam's bilateral trade in general, imports and exports in particular with ASEAN (Association of Southeast Asian Nations) Free Trade Area (AFTA) trading partners by applying [Bergstrand \(1985\)](#)—generalized gravity model from 2001 to 2016. Besides, in gaining comprehensive insight into the tax treaties' effect, empirical results would also be compared among different trade blocs (AFTA, ASEAN+3 and the EU—European Union).

Our findings show that the significant contributions of the tax treaties to Vietnam's trade performance, not exclusively with ASEAN but also with EU partner countries. Nevertheless, under some circumstances, the conclusion of tax treaties seems ineffective in strengthening export capacity or narrowing trade deficits for Vietnam. This is primarily due to the unidirectional movement of trade associated with tax treaty conditions, viz., imports from the advanced economies into Vietnam. Besides, the role of tax treaties as a dynamism of Vietnam's export growth remains opaque during recent years. The tax treaties are somewhat ineffective in developing countries that have been caused by inexperienced negotiation or the shifting of tax revenue from developing to developed countries ([OECD 2015](#); [Kadet 2016](#); [Braun and Zagler 2017](#); [Zolt 2018](#)). However, a developing country would likely continue to enter the tax treaties for some reason such as attracting foreign investors or strengthening export capacity ([Zolt 2018](#)). Different from prior research focusing on the tax treaties between developed and developing countries; we would like to analyse the benefits and disadvantages of double taxation treaties on bilateral trade of Vietnam—a developing country with other developing countries, as well as developed countries in specific areas (ASEAN and EU). The rest of the paper is organised as follows: Section 2 discusses the literature review; Section 3 provides an overview of Vietnam's tax treaty signing situation and trade activities with ASEAN; the research methodology is presented in Section 4; Section 5 analyses the main findings and discussions; the last Section is the conclusion.

2. Impact of Double Taxation Treaties: What Does Literature Say?

2.1. Theoretical Background

Theoretical issues of double taxation treaty have been discussed openly in the existing literature, where inheritance and development over time are demonstrated. According to the neoclassical economic school of thought ([Rasmussen 2011](#); [Miller and Oats 2016](#)), double taxation is defined as the phenomenon of a taxpayer being taxed on the same taxable income or capital in a given period of time

by two or more states, whereby the total tax payable is higher than the taxable amount determined under domestic law. This definition merely reflects juridical aspects of double taxation, rather than referring to its economic perspective, i.e., two taxpayers might still be taxed on the same income by two different states. To remedy this shortcoming, [OECD \(2017\)](#) provides a clear and complete definition as follows: “International juridical double taxation is the imposition of comparable taxes in two or more states on the same taxpayer concerning the same subject matter and for identical periods, which causes the taxpayer to bear a greater tax burden than what would have been incurred under domestic tax law. In addition, in case two or more taxpayers are taxed on the same item, then double economic taxation occurs”.

[Barbuta-Misu and Tudor \(2010\)](#) argue that greater economic integration might be associated with more complicated and unpredictable double taxation. At the turn of the 21st century, together with the great explosion of science and technology, there is a growing tendency for interference in economic activities among nations through the outward investment activities of multinational enterprises (MNEs), as well as free movements of labour. This gives rise to some issues, for instance, an individual who may have multiple nationalities, residing in a certain country but working in different countries, or a company headquartered in one country, but its branches and subsidiaries are established abroad. Profound transformations in the global economy have unquestionably had a huge impact on the formation of wealth and the source of income of individuals and corporations, thus leading to the phenomenon of double taxation.

In regard to the influence of double taxation, it might be an obstacle to the development of international trade. A trader is better off trading within the state boundaries and suffers tax in one country only. However, it is a widely accepted commercial reality that international trade is economically good for the countries concerned and that international trade should be encouraged. Thus, countries believing in the benefits of international trade would make every endeavour to provide a more conducive environment for cross-border trade by putting down rules to avoid or minimise double taxation. This requires countries to agree bilaterally and mutually on specific terms and rules of how income from international trade or cross-border transactions are treated by the two countries so that the final tax suffered will not be worse off than if the profits or gains are derived from similar non-cross-border transactions. Therefore, it is a typical development for two states to enter into a double taxation treaty, if the trade volume is expected to increase.

A double taxation treaty is set in pursuit of the following objectives:

First, delimitation of the taxing rights between the two contracting parties

For every single type of income and asset, the double taxation treaty ascertains the taxing rights between signatories for the avoidance of double taxation and the prevention of fiscal evasion, alongside the removal of tax barriers to foreign trade. On the other hand, the treaty also aims for the standardisation of definitions of tax terminologies between contracting states. The introduction of such uniform principles and procedures would thus facilitate the recovery of tax dues. Under the tax treaty, taxing rights are merely enforced on particular individual residents and are limited to a specified range of taxes. Besides, the tax treaty caps the tax rates applicable to certain income of non-residents of the source country, exempts or lowers the tax payable for residents of the contracting countries, or allows residents of a country to deduct taxes already paid in the other contracting country from their domestic tax obligation.

Second, prevention of fiscal evasion and fiscal avoidance

Double taxation treaty is inclined to hinder the evasion and avoidance of taxes on income and asset through the exchange of information on taxpayers as well as a legal framework for administrative co-operation and mutual assistance in tax matters between the two governments. Thanks to this, the tax treaty could potentially contribute to the development of economic relations between signatories.

Third, the equitable treatment of tax obligations

The treaty on double taxation guarantees the equitable treatment of taxation among taxpayers holding multiple citizenships in an identical situation. By setting out the types of taxable income and asset, as well as the delimitation of the taxing rights, the treaty could effectively prevent disputes between residents of the contracting parties.

Fourth, establishing a unified procedure for dispute settlement

Owing to tax treaties, the contracting states have reached agreement on a dispute resolution mechanism arising from the observance of the tax laws of each related party regarding cross-border transactions. Resolution of the disputes in association with the tax treaty is carried out based on a reciprocal agreement between the competent authorities of the two parties. This does not necessarily mean authorities of the two sides always reach a final consensus. Even in such cases, double taxation may still occur.

2.2. Empirical Evidence

There is a large and growing body of literature regarding double taxation treaties as well as its implications for relevant aspects, particularly foreign investment and international trade. First and foremost, the effect of double taxation treaty on investment has received considerable attention of the academics (e.g., [Azémar and Delios 2008](#); [Barthel et al. 2010](#); [Baker 2014](#); [Braun and Fuentes 2014](#); [Braun and Zagler 2014](#)). Specifically, in examining the association between tax competition and FDI, based on the evaluation of the interaction between Japan and host developing countries' tax systems between 1990 and 2000, [Azémar and Delios \(2008\)](#) found that some countries have proactively introduced the special preferential terms with great appeal for Japanese investors, during the process of negotiating taxation agreement with Japan. Empirical analysis reveals that despite fierce competition among developing countries in terms of tax systems, this does not mean Japanese investors could easily acquire the preferential corporate tax rate of 0% as committed by host countries under the agreement. Based on a dataset of developed to less-developed country-pairs and propensity score-matching approach, [Baker \(2014\)](#) demonstrates that double taxation treaties are ineffective in spurring investment from developed to less developed countries since numerous developed countries unilaterally provide large-scale bailout packages in the form of double taxation treaties for preventing tax evasion. This could help eliminate the major economic benefits and risks derived from the tax treaties to FDI location decisions of MNEs.

Although discussions on tax treaties' impact the investment attraction and take place in both directions, the overall results show that the tax treaties could trigger off FDI inflows. Utilising unpublished data on bilateral FDI flows between developed and developing economies, [Barthel et al. \(2010\)](#) conclude double taxation treaty is an important catalyst which could stimulate FDI into developing countries to increase by 29% on an annual basis. From the perspective of advanced countries, [Braun and Fuentes \(2014\)](#) investigate the impact expected by developing country partners when entering into the tax treaties with Austria using empirical methods and find that the formation of double taxation treaties with Austria could foster investment from Austria into middle-income countries. This is since double taxation treaties prove effective in (i) eliminating the double taxation; (ii) protecting legitimate rights of the potential foreign investors; (iii) creating advantages over domestic taxes through tax deductions, thereby favouring the attraction of FDI; (iv) combating fiscal evasion. Alternatively, based on [Blonigen \(2005\)](#), study concerning the determinants of overseas investment decisions of MNEs, taxation is found to be an external factor. Accordingly, he confirms that measures to eliminate double taxation could exert a profound influence on MNEs' investment motivation. Outside of tax policy, institutional quality, infrastructure conditions, and market efficiency should also be taken into account for financing decisions of the MNEs.

FDI inflows are crucial to trade development, as it helps segment manufacturing processes, thus contributing to the diversification of product mix and market structure for MNEs ([Braunschweig 2014](#)). Based on fresh evidence suggesting that the double taxation treaties tend to encourage FDI inflows, the

pass-through of the tax treaties into bilateral trade is reasonably predicted to be positive. It is theoretically possible that substitution and complementary effects exist in the nexus between international trade and foreign investment of an MNE. Accordingly, a surge in demand for intermediate goods in the vertical chain integration could create substitution and complementary effects through the trade-in final goods. In order to separate the two types of effects in the FDI-exports relationship, [Blonigen \(2005\)](#) examines disaggregated product-level data and finds that the complementary effect arises from the multi-product nature of the firm in the production chains, as well as the MNEs' expectations of the positive interaction between FDI and foreign trade ([Forte 2004](#)).

In summary, the potential effect of double taxation treaties on bilateral trade activities has so far not been studied to the same extent as on FDI flows, leaving a huge gap for those who wish to explore the full-range implications of the taxation treaties. This study, thus, analyses the contributions of the double taxation treaties signed by Vietnam to its bilateral trade activities with ASEAN rather than trying to revisit the tax treaties' impact on FDI flows like the current literature.

3. Vietnam's Tax Treaty Signing Situation and Trade Activities with ASEAN

3.1. Vietnam's Tax Treaty Signing Situation

Recognizing the necessity for the bilateral and multilateral co-operation agreements in the context economic renovation (commonly known as 'Doi Moi') and the open-door policy, since the early 1990s, Vietnam has actively negotiated and successfully concluded 'the agreements for the avoidance of double taxation and the prevention of fiscal evasion with respect to taxes on income' with a total of 77 countries and territories, of which, 37 are in Europe, 21 in Asia-Pacific, 6 in the Americas (including the United States and Canada), 5 in Africa and 8 in the Middle East. As can be seen, Europe and Asia-Pacific are the two most important regional markets for which Vietnam is heading. In the ASEAN region, Vietnam entered into the double taxation treaties with all member states, where the latest agreement was reached with Cambodia by the end of March 2018 (see [Table 1](#)).

Table 1. List of Vietnam's double taxation treaties with ASEAN member countries.

No.	Double Taxation Treaty	Signing Date	Effective Date
1	Vietnam–Thailand	23 December 1992	29 December 1992
2	Vietnam–Singapore *	2 March 1994 12 September 2012	9 September 1994 11 January 2013
3	Vietnam–Malaysia	7 September 1995	13 August 1996
4	Vietnam–Laos	14 January 1996	30 September 1996
5	Vietnam–Indonesia	22 December 1997	10 February 1999
6	Vietnam–Myanmar	12 May 2000	12 August 2003
7	Vietnam–Philippines	14 November 2001	29 September 2003
8	Vietnam–Brunei	16 August 2007	1 January 2009

* Vietnam and Singapore have passed a protocol to their double taxation treaty, which came into effect in 2013 and amended some of the restrictive provisions. Source: Vietnam Chamber of Commerce and Industry (VCCI)'s WTO Center.

According to the [Action Aid \(2017\)](#), most FDI providers already entered into the tax treaties with Vietnam. These partners account for 91% in terms of FDI project number and 84% in terms of registered investment capital in Vietnam. Of the top 32 major FDI providers, 26 have signed the tax treaty with Vietnam and 10 had had double taxation treaties since the 1990s, when Vietnam was in the early stage of attracting FDI.

Compared with other developing economies, the treaties of Vietnam are generally more protective of its taxing right with some exceptions. A double taxation treaty is established when a country

has or exercise the right to tax income of an individual or a foreign company within its boundaries (source taxation) or to tax income of a resident when he or she resides abroad (residence taxation). In principle, restrictions on source taxation apply to both parties to the tax treaty. However, in the case of capital flows take place in one direction, for instance, from developed to developing countries, these restrictions could be detrimental to the counterparty of developing countries.

Action Aid's international tax treaties dataset (which compares the critical provisions of 519 tax treaties) evaluates every single treaty using a 'source index' scoring system ranging between 0 and 1, where a higher value indicates the developing country has preserved more taxing rights under the treaty. Vietnam's taxation agreements with G20 members yield a higher average source index than many other developing countries (which implies more protective taxing right for Vietnam). Over time, Vietnam's tax treaties have become more protective, manifested through the upward trend in the source index. Despite this general trend, some original treaties concluded in the 1990s are relatively restrictive on Vietnam's right to tax foreign investment. Considering Vietnam's tax treaties with high-income countries, the treaty with the United Kingdom is the most restrictive with 0.16 points, followed by Singapore with 0.18 points and France with 0.19 points, though Vietnam and Singapore have negotiated a protocol to their tax treaty which became active from 2013 and amended several restrictive terms. Besides, the double taxation treaties with the top 4 FDI providers to Vietnam, including Republic of Korea, Japan, Singapore, and Taiwan, are among 25% of Vietnam's most restrictive treaties, with each having a source index lower than 0.52 (see Figure 1).

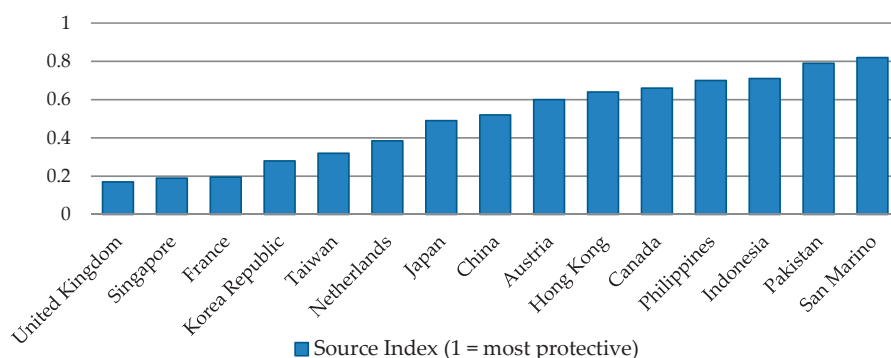


Figure 1. Degree of protection of taxing rights of Vietnam against foreign companies in tax treaties. Source: Action Aid Tax Treaties Dataset. Notes: Dataset analyses treaties between 1970 and 2016. It includes re-negotiated treaties but ignores protocols other than those concluded at the time of the original treaty.

3.2. Bilateral Trade between Vietnam and ASEAN during 2001–2016

As illustrated in Figure 2, Vietnam has always been facing a trade deficit with ASEAN over the past 16 years. However, as exports to ASEAN grow faster than imports from this region (Figure 3), Vietnam's trade deficit (as well as trade deficit rate) with ASEAN has been gradually narrowing. Specifically, the year 2001 saw a deficit of 1.62 billion USD (the United States DOLLAR) with a trade deficit rate of 61.2%; the deficit in 2010 recorded 6.1 billion USD with a trade deficit rate of 63.5%; the deficit in 2015 reduced to 5.6 billion USD with a trade deficit rate of 76.5%; the year of 2016 witnessed a rebound in the trade deficit to 6.7 billion USD due to a decreasing in exports from 18.2 billion in 2015 to 17.4 billion USD in 2016 whilst imports moving up to 24.1 billion USD in compared to 23.8 billion USD in 2015. Between 2009 and 2013, as exports grew faster than imports, Vietnam's trade deficit position has improved markedly. This somewhat marks the initial success of Vietnam in pursuit of export promotion strategies during recent years.

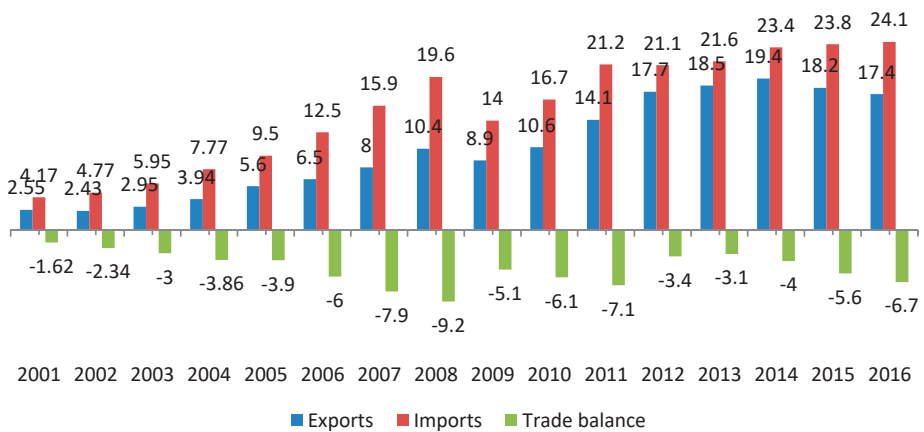


Figure 2. Exports, imports and trade balance between Vietnam and ASEAN, 2001–2016 (in billions of USD). Source: Vietnam Customs from www.customs.gov.vn/.

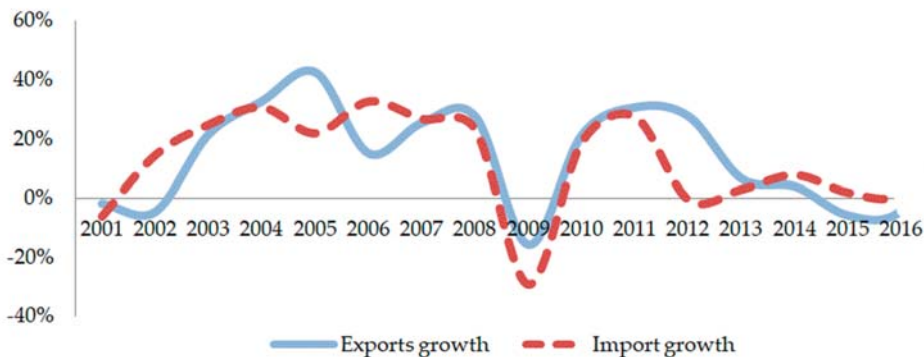


Figure 3. Vietnam’s exports and imports with ASEAN (annual growth), 2001–2016. Source: Authors’ calculations using Vietnam Customs dataset from www.customs.gov.vn/.

In respect of intra-bloc trade, Vietnam focuses on trade with three key partners, namely, Thailand, Singapore and Malaysia. According to Vietnam Customs statistics, the trade value of Vietnam with ASEAN reached ‘top four’ in 2016 with 11.8% of the total import-export values of Vietnam after China, EU and the US.

4. Methodology

4.1. Gravity Equations

Since being introduced by Tinbergen (1962), the gravity model has become a widespread practical instrument for clarifying the origins, features, and movements of bilateral trade between nations as well as the role of bilateral or regional trading arrangements in trade promotion (Van Bergeijk and Brakman 2010). Derived from Newton’s law of universal gravitation, the reduced-form gravity model is formulated on the assumption that bilateral trade is subject to the economic size (measured by GDP—Gross Domestic Product or GNI—Gross National Income) of trading countries and their geographical distance. The inclusion of solely geographical distance as a ‘multilateral resistance’ indicator seems rather unconvincing, as, in effect, there remain possible alternatives having an adverse effect on trade, for instance, tariffs, exchange rate movement, and

border effect. In an extension of this approach, [Sattinger \(1978\)](#) and [Bergstrand \(1985\)](#) developed the generalised form of the gravity model, where the trade between pairs of countries is a function of incomes (Y_i và Y_j), the geographical distance between the economic centres of the two countries (D_{ij}), the ‘bilateral resistance’ components and the formation of free trade agreements (A_{ij}) (see Equation (1)).

$$X_{ij} = G \times Y_i^{\beta_1} \times Y_j^{\beta_2} \times D_{ij}^{\beta_3} \times A_{ij}^{\beta_4} \quad (1)$$

Admittedly, the merits of the gravity model are not only in its coverage of the factors belonging to both exporting and importing countries but in its adaptable capability in assessing policy effectiveness. Besides, as indicated by [Kahouli and Omri \(2017\)](#), experiments with the gravity model on a large-scale sample could yield more robust results than with others since it deals with data between pairs of countries.

By modifying the gravity specification to fit the distinct characteristics of Vietnam’s bilateral trade flows as suggested by [Limão and Venables \(2001\)](#); [Carrère \(2006\)](#); [Braunschweig \(2014\)](#); [Nho et al. \(2014\)](#); [Nguyen \(2018\)](#), we construct Equation (2) as follows.

$$\ln T_{ij,t} = \beta_0 + \beta_1 \ln Y_{i,t} + \beta_2 \ln Y_{j,t} + \beta_3 \ln N_{j,t} + \beta_4 \ln D_{ij} + \beta_5 \ln \text{Rer}_{i/j,t} + \beta_6 \text{Border} + \beta_7 \text{Landlocked}_j + \beta_8 \text{Bloc} + \beta_9 \text{Dtt}_{ij,t} + \varepsilon_{ij,t} \quad (2)$$

Regression analysis is carried out in turns with three dependent variables (in log form), incorporating bilateral trade flows (exports + imports) between Vietnam and partner country j (T_{ij}), export value of Vietnam to country j (X_{ij}) and import value from country j into Vietnam (M_{ij}). The explanatory variables are defined as follows.

- $\ln Y_{i,t}$ and $\ln Y_{j,t}$: denote logs of the per capita GDP of Vietnam and country j at time t , respectively (in constant 2010 USD);
- $\ln N_{j,t}$: refers to a log of the population of country j at time t . It is noteworthy that both Y_j and N_j indicators showcase the market capacity of the trading partner;
- $\ln D_{ij}$: is the log of great circle distance¹ (in kilometres) between the capital cities of Vietnam and country j , which represents the trade costs of Vietnam;
- $\ln \text{Rer}_{i/j,t}$: denotes the log of real exchange rate of VND (Vietnamese dong) against trading partner j ’s currency, measured based on the nominal exchange rate adjusted for the effect of the price index. The formula for this indicator is as follows.

$$\text{Rer}_{i/j} = \frac{\text{Ner}_{i/\$}}{\text{Ner}_{j/\$}} \times \frac{\text{CPI}_j}{\text{CPI}_i} \quad (3)$$

where $\text{Ner}_{i/\$}$ and $\text{Ner}_{j/\$}$ are the nominal exchange rate of VND and j ’s currency vis-à-vis USD, i.e., the value of each currency in exchange for a single dollar; CPI_i and CPI_j refer to the consumer price index of Vietnam and country j . For each pair of countries, the Rer is normalized by setting 2001 as the base year (2001=100). Besides, it is worth noting that a rise in the $\text{Rer}_{i/j}$ refers to the depreciation of VND against partner currency;

- **Border**: a dummy variable capturing the border effect, taking the value of 1 if Vietnam and j share a common land border, 0 otherwise;
- **Landlocked_j**: a dummy variable for landlocked trading partner, taking the value of 1 if country j does not have direct access to the sea, 0 otherwise. In theory, being entirely enclosed by land would be detrimental to these partner countries in developing international trade by sea, thereby inhibiting their economic development;

¹ The minimum geographical distance on the surface of the earth.

- Bloc: a set of dummies representing the regional trade agreement effect, which encompass three separate cases as follows.
 - ASEAN: receives the value of 1 if country j is a member of ASEAN and participates in ASEAN Free Trade Area (AFTA), 0 otherwise;
 - ASEAN+3: receives the value of 1 if country j join the comprehensive partnership agreement between ASEAN and the ‘plus three’ nations, namely, China, Japan and Republic of Korea, 0 otherwise;
 - EU: receives the value of 1 if country j is a member of the EU, 0 otherwise;
- $Dtt_{ij,t}$: a dummy variable denoting the existence of tax treaty, taking the value of 1 if country j has successfully concluded the double taxation treaty with Vietnam, 0 otherwise;
- t denotes for the time.

Besides, to address the question of how different trade blocs could affect the nexus between bilateral trade and double taxation treaties, we propose adding an interaction term between trade bloc and tax treaty to the trade gravity function. Thus, Equation (4) is given by:

$$\ln T_{ij,t} = \beta_0 + \beta_1 \ln Y_{i,t} + \beta_2 \ln Y_{j,t} + \beta_3 \ln N_{j,t} + \beta_4 \ln D_{ij} + \beta_5 \ln Rer_{i/j,t} + \beta_6 \text{Border} + \beta_7 \text{Landlocked}_j + \beta_8 \text{Bloc} + \beta_9 Dtt_{ij,t} + \beta_{10} \text{Bloc} \times Dtt_{ij,t} + \varepsilon_{ij,t} \quad (4)$$

where

- $\text{Bloc} \times Dtt_{ij,t}$: denotes the interaction term between trade bloc and tax treaty;
- Other variables are in Equation (2).

4.2. Data

This study examines the effect of tax treaties on Vietnam’s trade activities using annual-based panel data of 67 top trading partners of Vietnam within a 16-year timescale from 2001 to 2016. Data are obtained from a diverse range of sources, specifically:

- Data on bilateral trade volume (including exports and imports) of Vietnam with each trading partner are collected from the International Trade Center (ITC) database;
- Data on per capita GDP and population are extracted from the World Development Indicators (WDI);
- Distance between trading partners is calculated based on the ‘great circle distance between capital cities’ database (www.chemical-ecology.net).
- Data on exchange rate of each currency against USD and CPI—Consumer Price Index (used to work out the real exchange rate) are obtained from the International Financial Statistics (IFS).
- Data on the membership of AFTA, ASEAN+3 and the EU are recorded from the official websites of these organisations (asean.org and europa.eu). The list of double taxation treaties of Vietnam is updated from the website of Vietnam’s General Department of Taxation (www.gdt.gov.vn).

Summary statistics for variables in the model are presented in Table 2.

Table 2. Summary statistics of variables (number of observations: 1072).

Variables	Unit	Mean	Std. Dev.	Min	Max
Bilateral trade between Vietnam and j (T_{ij})	USD thousand	2,276,979	6,173,491	20	7.20×10^7
Exports from Vietnam to j (X_{ij})	USD thousand	1,092,218	2,896,238	10	3.85×10^7
Imports from j into Vietnam (M_{ij})	USD thousand	1,184,762	3,942,454	3	5.00×10^7
GDP per capita of Vietnam (Y_i)	USD	1233	285	800	1735
GDP per capita of j (Y_j)	USD	26,717	22,364	382	111,968
Population of j (N_j)	People	7.42×10^7	2.17×10^8	284,968	1.38×10^9
Distance between Vietnam and j (D_{ij})	km	7328	3931	482	18,958
Real exchange rate of VND per foreign currency (Rer_{ij})		383	2470	1.97	31,947
Border effect (Border)		0.05	0.21	0	1
Landlocked country ($Landlocked_i$)		0.11	0.31	0	1
Trade bloc (Bloc)	Including 3 dummies as follows.				
• ASEAN		0.13	0.34	0	1
• ASEAN+3		0.18	0.38	0	1
• EU		0.37	0.48	0	1
Tax treaty effect (Dtt_{ij})		0.55	0.50	0	1

5. Results and Discussions

5.1. Empirical Results

Tables 3–5 summarise estimation results of the gravity model on bilateral trade, exports and imports of Vietnam using Generalized Least Squares (GLS) method to obtain unbiased estimation due to the problem of heteroskedasticity in the data.

Table 3. Estimation results on Vietnam's bilateral trade flow.

Explanatory Variables	ASEAN		ASEAN+3		EU	
	Equation (2)	Equation (4)	Equation (2)	Equation (4)	Equation (2)	Equation (4)
$\ln Y_i$	2.82 ***	2.80 ***	2.84 ***	2.83 ***	2.83 ***	2.86 ***
$\ln Y_j$	1.06 ***	1.07 ***	1.02 ***	1.02 ***	1.02 ***	1.02 ***
$\ln N_j$	1.03 ***	1.02 ***	1.01 ***	1.00 ***	1.01 ***	1.01 ***
$\ln D_{ij}$	−1.17 ***	−1.16 ***	−1.20 ***	−1.19 ***	−1.33 ***	−1.37 ***
$\ln Rer_{ij}$	0.19 ***	0.19 ***	0.19 ***	0.19 ***	0.19 ***	0.21 ***
Border	1.14 ***	1.31 ***	0.98 ***	1.06 ***	1.08 ***	1.07 ***
Landlocked	−0.36 **	−0.39 ***	−0.34 **	−0.35 **	−0.37 **	−0.42 ***
Bloc	0.62 ***	0.15	0.45 ***	0.13	−0.05	−0.31 **
Dtt_{ij}	0.24 **	0.20 *	0.25 **	0.22 **	0.31 ***	0.17 **
$Bloc \times Dtt_{ij}$		0.60 **		0.37		0.46 **

Notes: Dependent variable $\ln T_{ij}$ —log of bilateral trade flows between Vietnam and country j. Equations (2) and (4) are estimated sequentially with three separate cases of the regional trade agreements (Bloc). *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table 4. Estimation results on Vietnam's exports.

Explanatory Variables	ASEAN		ASEAN+3		EU	
	Equation (2)	Equation (4)	Equation (2)	Equation (4)	Equation (2)	Equation (4)
$\ln Y_i$	3.18 ***	3.18 ***	3.19 ***	3.21 ***	3.11 ***	3.12 ***
$\ln Y_j$	0.97 ***	0.97 ***	0.92 ***	0.92 ***	0.89 ***	0.89 ***
$\ln N_j$	1.06 ***	1.06 ***	1.03 ***	1.04 ***	1.06 ***	1.06 ***
$\ln D_{ij}$	−0.84 ***	−0.84 ***	−0.93 ***	−0.94 ***	−1.14 ***	−1.16 ***
$\ln Rer_{ij}$	0.26 ***	0.26 ***	0.25 ***	0.26 ***	0.22 ***	0.24 ***
Border	1.30 ***	1.24 ***	1.11 ***	1.00 ***	1.17 ***	1.17 ***
Landlocked	−0.28 *	−0.27 *	−0.26 *	−0.24	−0.40 **	−0.44 ***
Bloc	0.85 ***	0.99 ***	0.43 **	0.87 ***	0.32 ***	0.15
Dtt_{ij}	0.13	0.14	0.16	0.20 *	0.17	0.06
$Bloc \times Dtt_{ij}$		−0.18		−0.50		0.31

Notes: Dependent variable $\ln X_{ij}$ —log of export volume of Vietnam to country j. Equations (2) and (4) are estimated sequentially with three separate cases of the regional trade agreements (Bloc). *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

Table 5. Estimation results on Vietnam's imports.

Explanatory Variables	ASEAN		ASEAN+3		EU	
	Equation (2)	Equation (4)	Equation (2)	Equation (4)	Equation (2)	Equation (4)
$\ln Y_i$	2.31 ***	2.26 ***	2.33 ***	2.30 ***	2.35 ***	2.37 ***
$\ln Y_j$	1.45 ***	1.47 ***	1.40 ***	1.39 ***	1.40 ***	1.40 ***
$\ln N_j$	1.14 ***	1.13 ***	1.11 ***	1.09 ***	1.11 ***	1.11 ***
$\ln D_{ij}$	−1.47 ***	−1.44 ***	−1.51 ***	−1.50 ***	−1.67 ***	−1.70 ***
$\ln \text{Rer}_{ij}$	0.18 ***	0.18 ***	0.18 ***	0.18 ***	0.21 ***	0.22 ***
Border	1.59 ***	2.02 ***	1.35 ***	1.61 ***	1.52 ***	1.51 ***
Landlocked	−0.42 **	−0.49 ***	−0.38 **	−0.43 **	−0.37 **	−0.41 **
Bloc	0.93 ***	−0.25	0.68 ***	−0.28	−0.25 *	−0.40 **
Dtt_{ij}	0.58 ***	0.46 ***	0.59 ***	0.51 ***	0.71 ***	0.61 ***
$\text{Bloc} \times \text{Dtt}_{ij}$		1.51 ***		1.11 ***		0.28

Notes: Dependent variable $\ln M_{ij}$ —log of import value of country j into Vietnam. Equations (2) and (4) are estimated sequentially with three separate cases of the regional trade agreements (Bloc). *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$.

A glance at the result tables reveals the regression coefficients of the fundamental variables of the trade gravity model, incorporating the economic capacity of Vietnam and partner countries (Y_i and Y_j), the market size of partner countries (N_j) and the multilateral resistance are statistically significant at 1%. Aside from that, the impact direction of those augmented factors encompassing the real exchange rate (Rer_{ij}), the border effect (Border) and the landlocked country (Landlocked) endorse most previous studies. Specifically, a rise in:

- (i) the per capita incomes of Vietnam and its partners.
- (ii) the population of the partner countries.
- (iii) the downfall of VND, could foster the bilateral trade of Vietnam. Such positive tendency is also reflected through the effect of both sharing a common border and signing a double taxation treaty.

As regards the role of regional trade agreements, while trade turnover of Vietnam with ASEAN member states as well as the ‘plus three’ partner countries under ASEAN+3 is well above average in the sample, the trade results with the EU member states remain below the average (except for exports). On the other hand, based on the coefficient of the interaction term ($\text{Bloc} \times \text{Dtt}_{ij}$), we find that the signing of double taxation treaties tends to: (i) promote Vietnam’s trade development with ASEAN and EU member countries; (ii) stimulate the import turnover from ASEAN and the ‘plus three’ partners under ASEAN+3 into Vietnam; (iii) have little or no effect on export promotion programs of Vietnam. Finally, geographical distance and the landlocked characteristic of trading partners are recognized as major multilateral resistance indicators to the development of Vietnam’s trade activities.

5.2. Discussions

From the empirical analysis of the impact of double taxation treaties on Vietnam’s bilateral trade in general, exports and imports in particular with ASEAN over 16 years, notable conclusions can be drawn as follows.

First, the growth in the per capita incomes of either Vietnam or its trading partners could contribute to bilateral trade expansion (including both exports and imports); however, the effect from Vietnam’s side still plays a decisive role. Likewise, market size (as characterised by the population) of the trading partner is found to have a significant positive impact on the two-way merchandise trade. These findings are entirely compatible with those of [Bergstrand \(1985\)](#); [Novy \(2013\)](#); [Nho et al. \(2014\)](#); [Nguyen \(2018\)](#), accordingly, bilateral economic capacities and market size are deemed key drivers of external trade development. Developed countries with massive industrial production could boost exports of goods to emerging markets without difficulty, and at the same time, their high-income levels could also fuel demand for imports of goods from developing countries.

Second, in line with previous studies ([Bergstrand 1985](#)), the geographical distance (a “multilateral resistance” component) is found to have a significant and negative impact on bilateral trade flows,

whereby a 1% increase in the distance from Hanoi (the capital city of Vietnam) to a trading partner's economic centre would lead, on average, to a 1.15% fall if this partner belongs to the ASEAN or a 1.45% fall if this partner belongs to the EU.

Third, exchange rates play a critical part in regulating trade flows. Empirical results reveal that an increase in the real exchange rate, otherwise a depreciation in the value of VND, tends to promote Vietnam's trade growth. According to Miles (1979); Warner and Kreinin (1983), the downfall of the domestic currency would have a significant impact on both export and import prices, thus affecting the competitiveness of exports. In order to boost exports, since 2001, Vietnam has constantly strived to maintain a competitive exchange rate of VND against foreign currencies under the fixed regime (within a low bandwidth, from $\pm 1\%$ to $\pm 3\%$). Although depreciated by nearly 20% during the Asian currency crisis, the value of VND has gradually improved with a far slighter decline since then (Figure 4). In order to enhance trade competitiveness in the context of an ever-growing number of regional trade agreements and burgeoning trade wars, since 2016, Vietnam has decided to move to a managed floating regime with the introduction of the 'reference central rate' of VND per USD². It is strongly believed that this move to currency basket peg could help maintain monetary stability and the flexibility in monetary policy management, under which, the objective of VND devaluation could be reached in sequence, with negative external shocks being avoided.

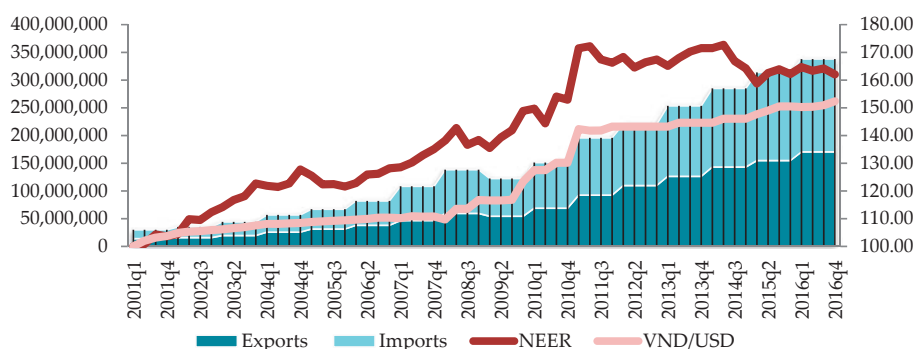


Figure 4. Exchange rate, exports and imports of Vietnam, 2001–2016. Source: Authors' calculations using data from International Trade Centre (ITC) Trade Map, International Monetary Fund (IMF) International Financial Statistics (IFS) and Vietnam's Ministry of Finance (MOF). Notes: Exports and imports of Vietnam (left axis: thousands of USD). VND/USD exchange rate and nominal effective exchange rate (NEER) of VND against a basket of 8 most important trading partner currencies (right axis: index).

Fourth, the border effect contributes enormously to the development of Vietnam's bilateral commercial activities. Accordingly, sharing a border allows partner countries to benefit from trade with Vietnam, approximately 1–2% greater than countries with no border. Notably, during recent years, China has been emerging as Vietnam's largest export and import markets thanks to distinguishing advantages in terms of geographical closeness and cultural identity between the two countries.

Fifth, the landlocked characteristic of trading partner turns out to be a multilateral resistance term in the trade gravity specification. This finding coincides with Carrère's (2006) study, whereby being entirely enclosed by land might hinder the trading countries from approaching the global market by sea, which could be seriously detrimental to their economic development.

² The central reference rate is pegged to three benchmarks: (i) demand and supply of VND; (ii) the exchange rates for a basket of 8 major trading partner currencies, including USD, EUR, CNY, THB, JPY, SGD, KRW and TWD; (iii) adjustments to balance macroeconomic needs.

Sixth, in regard to the existence of bloc trade, whilst AFTA and ASEAN+3 comprehensive partnership framework (where Vietnam is a member) make a comprehensive contributions to Vietnam's bilateral trade activities in general, exports and imports in particular, the influence of the EU as a political and economic union is reflected in stimulating exports of goods from Vietnam to EU member states and restricting the imports of goods from the EU into Vietnam, thereby improving the trade deficit for Vietnam. AFTA was officially established in 1992 with the primary goals of enhancing ASEAN's competitive edge as a production base in the global market. An essential step of the AFTA agreement is to facilitate intra-regional trade by removing tariff and non-tariff barriers on a common path, taking into account varied development stages of its member states. As a result, a Common Effective Preferential Tariff (CEPT) scheme was introduced. As committed, members must bring down tariffs to 0–5% within 10 years, specifically: Brunei, Indonesia, Malaysia, Philippines, Singapore, and Thailand must complete tariff reductions by 2003 (extended to 2010), for Vietnam by 2006 (extended to 2015, with flexibility until 2018). Fukase and Martin (1999) argue that the implementation of CEPT scheme contributes to the shift of intra-ASEAN manufacturing structure so that highly developed countries (including Singapore, Malaysia, and Thailand) would spur investment in labour-intensive sectors, concurrently benefit from AFTA's preferential tax rates. Additionally, AFTA also boosts FDI attraction from the three strategic partners under ASEAN+3 into Vietnam in sectors that can make full use of the collective resources of ASEAN and low-cost labour of Vietnam. Such movements would facilitate Vietnam's access to both ASEAN and ASEAN+3 markets. Compared with the EU partner countries, the improvement in bilateral trade flows of Vietnam with ASEAN and ASEAN+3 appears far more impressive since Vietnam's foreign policy during recent years focused on promoting strategic economic and political relations within ASEAN region, in addition to the particular advantages in terms of geographical and cultural proximity or the history of trade.

Seventh, the regression results of the trade effect of tax treaties moderated by the trade blocs suggest that double taxation treaties tend to facilitate Vietnam's two-way trade with member countries of AFTA and the EU. However, when 'peeling off' the story, we find that trade flows generated by the tax treaties' effect are primarily one-way, viz., imports from developed countries into Vietnam.

Vietnam has concluded double taxation treaties with 77 countries, surpassing the number signed by Laos, Cambodia, Myanmar or the Philippines. Theoretically speaking, a tax treaty could benefit Vietnam's economy directly from the attraction of FDI or indirectly from the facilitation of international trade. Nevertheless, according to Action Aid (2017), when Vietnam rolls out 'red carpet' for foreign investors and MNEs through the introduction of double taxation treaties and special tax incentives. This may reinforce inequalities in investment (between domestic and foreign enterprises) and commercial activities (between developed and developing countries). This can be explained as follows: Tax incentives being equal between host countries, merchandise imported from developed countries with rigorous quality standards and tax advantages from signing treaties could without difficulty approach and dominate the emerging markets. Conversely, stringent technical barriers to trade, set up by developed countries, could be useful in restricting imports from emerging countries. Besides, it is also possible to interpret the 'imports dominance' effect of tax treaties based on the analysis of the 'transfer mispricing' dynamism among foreign-invested enterprises'. Specifically:

- According to Vietnam Chamber of Commerce and Industry (VCCI) statistics, the period of 2011–2016 saw a marked increase in the proportion of foreign-invested enterprises whose report losses (to relieve the tax burden), of which the net loss margin of wholly foreign-invested enterprises always outweighs that of joint venture enterprises (Figure 5 will provide an overview on shares of domestic and foreign direct investment enterprises to trade volume of Vietnam, and Table 6 will give a snapshot of the business performance of FDI enterprises in Vietnam from 2001–2016 due to a limited data source and assessment). This situation arises since, in comparison

to other developing economies, Vietnam's tax treaties tend to safeguard its taxing right to a higher degree against developed countries from ASEAN or the EU³.

- In principle, in order to record a net loss in the income statement, foreign-invested enterprises may be in “cahoots” with their foreign affiliation under common ownership or control to increase the cost of importing materials and/or reduce the export price. Alongside the preferential treatment brought by tax treaties, some accounting adjustment of foreign-invested enterprises, for instance, to increase the input costs and/or lower export revenues, may result in (i) the ‘imports dominance’ effect and (ii) net losses in business. Under the circumstances, enterprises have benefitted from ‘double non-taxation’. A report by IMF (2019) shows that the MNEs can “shift their profits to lower tax jurisdiction” if the developing countries have not much experienced and effective provision to protect against. Somehow, developing with less power negotiation will accept the bilateral tax treaties—even that country cannot benefit from the agreement—due to economic reason such as increasing FDI inflow or diplomatic issues (see more detail in Zolt 2018; IMF 2014, 2019; OECD 2015).

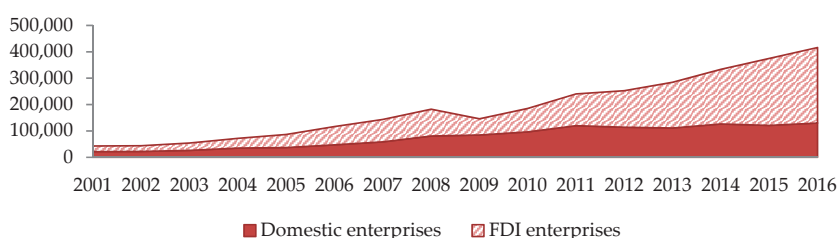


Figure 5. Share of foreign direct investment (FDI) enterprises to the trade volumes of Vietnam, 2001–2016 (in billions of USD). Source: General Statistics Office of Vietnam (GSO) website <https://www.gso.gov.vn/>.

Table 6. Business performance of foreign direct investment (FDI) enterprises in Vietnam, 2011–2016.

Time	Percentage of Enterprises Raising Investment Capital	Percentage of Enterprises with Increased Labour Force	Percentage of Enterprises Reporting Profits	Percentage of Enterprises Reporting Losses	Average Total Revenue (Millions of USD, Constant 2010 Prices)	Average Total Cost (Millions of USD, Constant 2010 Prices)
2011	4.8	28.4	57.7	24.8	1.36	1.08
2012	5.2	31.0	60.4	27.5	1.54	0.97
2013	5.1	30.0	63.6	24.1	1.45	0.94
2014	16.1	62.4	57.9	34.2	1.14	0.71
2015	11.4	62.4	55.1	37.6	0.69	1.42
2016	11.0	63.3	59.0	33.4	0.73	0.49

Source: Vietnam Chamber of Commerce and Industry (VCCI).

6. Conclusions

By employing the extensive dataset of 67 largest trading partners of Vietnam over the period of 2001–2016 in conjunction with the gravity-based approach and GLS analysis techniques, the study confirms the positive contributions of the double taxation treaties to Vietnam's bilateral trade with not only ASEAN but EU member states, which has not yet been clarified in the previous literature. In a particular situation, however, the signing of tax treaties may not be really useful in enhancing export capacity or relieving trade deficits for Vietnam. The reason, as revealed in our empirical analysis of

³ Based on Action Aid's (2017) calculations, Vietnam's average source index reaches 0.56 while the average across all developing countries is just 0.45.

Vietnam's exports and imports, is that bilateral trade under the influence of tax treaties has been moving primarily in one direction, specifically, imports from developed countries into Vietnam. Meanwhile, the role of tax treaties as a dynamism of Vietnam's export growth seems unclear during recent years. Our judgment is based on a detailed analysis of the technical barriers effect of developed partner countries and the 'transfer mispricing' behaviour of foreign-invested enterprises.

Based on the theoretical arguments and empirical findings, Vietnamese government may consider adopting a comprehensive open-door policy to further promote exports in terms of value and quality of the goods, with not only member states within ASEAN and ASEAN+3 but developed countries in the EU. Aside from that, in coping with the invasion of imported goods as a consequence of strengthening bilateral co-operation through free trade agreements, Vietnam should focus its efforts on discussion and passing of a protectionism strategy on specific commodities during each stage of development. As recommended by IMF (2019), prior to entrance to a negotiation, developing countries should first strengthen its tax environment and economic development policies; then they "would be well-advised to sign treaties only with considerable caution". This guarantees that developing countries such as Vietnam can benefit from the agreement instead of focusing only on FDI attraction, or "getting nothing for something", according to Zolt (2018). It could be the future stage to analyze the effects of double taxation treaties on FDI or financial aids.

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Article

Corporate Financial Distress of Industry Level Listings in Vietnam

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Abstract: Any critical analysis of the corporate financial distress of listed firms in international exchange would be incomplete without a serious dissection at the industry level, because of the different levels of risks concerned. This paper considers the financial distress of listed firms at the industry level in Vietnam over the last decade. Two periods are considered, namely during the Global Financial Crisis (GFC) (2007–2009) and post-GFC (2010–2017). The logit regression technique is used to estimate alternative models based on accounting and market factors. The paper also extends the analysis to include selected macroeconomic factors that are expected to affect the corporate financial distress of listed firms at the industry level in Vietnam. The empirical findings confirm that the corporate financial distress prediction model, which includes accounting factors with macroeconomic indicators, performs much better than alternative models. In addition, the evidence confirms that the GFC had a damaging impact on each sector, with the Health & Education sector demonstrating the most impressive recovery post-GFC, and the Utilities sector recording a dramatic increase in bankruptcies post-GFC.

Keywords: listed firms; industry level; corporate financial distress; bankruptcy; distance to default; fundamentals; Global Financial Crisis; Vietnam

JEL Classification: F62; F65; G01; G31; G33; G34

1. Introduction

A key issue in the analysis of the success or failure of firms in corporate finance is that financial distress typically occurs in four sequential stages. The first stage is incubation of the firm's financial situation. In the second stage, management becomes aware of the firm's financial distress, in what is generally called financial embarrassment. The third stage is financial insolvency, in which the firm does not have sufficient funds to meet its financial obligations. Subsequently, insolvency occurs in the final stage of the so-called corporate financial distress cycle.

Various studies have been conducted over the past three decades to predict the corporate financial distress of listed firms in international exchanges. The first model, based on various accounting ratios, was developed by Beaver (1966). The author used a dichotomous classification test to determine financial ratios that were intended to predict bankruptcy. Some years later, a multivariate statistical model that could distinguish failed firms from non-failed firms was developed by Altman (1968).

The author examined 22 financial ratios, divided into five categories, namely (1) profitability, (2) activity, (3) liquidity, (4) solvency, and (5) leverage. A multivariate discriminant analysis (MDA) was conducted based on these five categories to examine and highlight early warning indicators of corporate financial distress for listed firms.

Another school of empirical studies argued that the major causes of insolvency of listed firms were a decline in asset value, a reduction in liquidity, and a decrease in the ability to raise capital. This school of thought argued that business default had three components: (1) value of assets, (2) asset value of uncertain risks, and (3) financial leverage.

In response to this view, an options-based approach has been developed and widely adopted in the commercial world. Black and Scholes (1973) and Merton (1974) discuss the call-option theory, which is a fundamental theory behind a market-based approach. Their contingent claims approach has been widely used in predicting corporate default. Even though numerous empirical studies have been conducted on the corporate financial distress of listed firms, the entire market of all listed firms is the key focus of the analysis, especially for emerging markets, such as Vietnam and other ASEAN countries. Any critical analysis of the corporate financial distress of listed firms would be incomplete without a serious dissection at the industry level, because of the different levels of risks concerned.

This paper takes a different approach to the analysis by focusing on different sectors of the economy. The novelty and originality of the paper arises from a focus on, and empirical analysis of, listed firms at the industry level in a specific emerging market, namely Vietnam.

The structure of the remainder of the paper is as follows. Section 2 presents a summary of the relevant literature on the issue of corporate financial distress and bankruptcy. The alternative models that are considered are discussed and presented in Section 3. Section 4 discusses the data and definitions of the variables used in the empirical analysis. The empirical findings are presented and analyzed in Section 5, followed by some concluding remarks and policy prescriptions in Section 6.

2. Literature Review

The default risk literature has grown rapidly in recent years, both in the quality and quantity of research output. For purposes of predicting bankruptcies, both accounting-based and market-based approaches have strongly influenced the commercial world. Since the seminal contribution by Altman (1968), a large literature related to financial distress has emerged, with multivariate discriminant analysis (MDA) used to classify a set of financial ratios into five categories, namely: (i) profitability, (ii) activity, (iii) liquidity, (iv) solvency, and (v) leverage. Among others, Ohlson (1980) used the logit model, which reflects timing issues and applies less restrictive assumptions than does the MDA technique, to measure the default risk for 105 failed and 2058 non-failed firms from 1970 to 1976 in the USA.

Similarly, Zmijewski (1984) used accounting variables to measure the proportion of financial distress based on the probit regression model and random exogenous sampling. The accounting ratios are net income to total assets, total debts to total assets, and current assets to total liabilities. In Greece, Theodossiou (1991) used both the logit and probit models for the period 1975 to 1986 to identify early warning indicators of financial distress. The empirical results suggested that the logit model was superior to the probit model in indicating financial distress. Some previous papers have predicted future risk using accounting data, including Altman et al. (1977); Altman (2000, 2005); Uğurlu and Aksoy (2006), and Stanisic et al. (2013), among others.

Another stream of risk theory has concentrated on the market-based approach of Black and Scholes (1973) and Merton (1974). Future bankruptcy is predicted using the relationship between the asset value volatility and the debt ratio. The contingent claims approach used in this paper is a fundamental theory for a large number of credit risk models. In some recent studies, researchers used a structural model to measure the default risk, followed by an examination of the correlations between default risk and other variables. In a related development, Bharath and Shumway (2008) examined the precision of the option-based model.

The structural model was compared with a “naïve” alternative model that did not use the default probability. The alternative model has been demonstrated to outperform the other models. The authors found that the structural model was not a sufficient statistic for purposes of the probability of default, whereas its associated functional forms were appropriate for forecasting the default probability. In a seminal contribution, [Koutsomanoli-Filippaki and Mamatzakis \(2009\)](#) calculated the Merton-type bank risk and used VAR analysis to examine the relationship between efficiency and risk. The impacts of one standard deviation shocks to the DD on inefficiency were found to be negative and substantial.

Similarly, [Charitou et al. \(2013\)](#) estimated the predictive accuracy of the Black-Scholes-Merton (BSM) bankruptcy model after expanding the model with the direct addition of market-observable returns to the company’s market value. The outcome sheds new light on the simple model, incorporating the direct market-observable variables, which performed more strongly than did the relatively complicated model.

In a recent paper, [Agrawal et al. \(2016\)](#) used logistic regression and multiple discriminant analysis (MDA) with the Merton Distance-to-Default (DD) approach to match the bankruptcy and non-bankruptcy groups, and predicted the default of the listed firms in India. Although the Z-score was added to the model, the Distance-to-Default was still significant.

[Vasicek \(1984\)](#); [Leland \(2002\)](#); [Crosbie and Bohn \(2003\)](#); [Delianedis and Geske \(2003\)](#); [Vassalou and Xing \(2004\)](#), and [Patel and Vlamis \(2006\)](#), among others, have used the contingent claims approach to measure financial distress.

[Trujillo-Ponce et al. \(2014\)](#) showed that the comprehensive model, including market-based and accounting-based factors, was the most reliable model for predicting financial distress, compared with the Z-score and KMV-Merton model. Using 2186 credit default swaps (CDS) for the European market in both the pre-GFC (2002–2006) and GFC (2007–2009) periods, the comprehensive model was used to forecast the default probability in the volatile periods. The explanatory power of the models was found to be substantially higher during the GFC period.

Furthermore, [Allen et al. \(2011\)](#) measured the credit risk of 22 listed Canadian and Australian banks using the Value-at-Risk (VaR), Conditional VaR (CVaR), Distance-to-Default (DD), and Conditional Distance-to-Default (CDD) criteria, in the pre-GFC (2002–2006) and GFC (2007–2008) periods. Both countries showed a considerable increase in the probability of default between the pre-GFC and GFC periods.

Subsequently, [Allen and Powell \(2012\)](#) applied the same VaR, CVaR, DD and CDD criteria to examine the default risk for all sectors forming part of the Australian All Ords Index, which includes the 500 largest listed companies and 58 commercial banks, for the pre-GFC (2000–2006) and GFC (2007–2008) periods. Almost all the industries displayed a poorer performance during the GFC period.

[Byström et al. \(2005\)](#) examined the relationship between the default risk of the SET50 firm index on the Stock Exchange of Thailand (SET), as well as firm-specific characteristics during the Asian crisis 1996–1998 and post-Asian crisis periods, using the Merton model. The authors found that the financial distress rose rapidly, and noted the contrasting performance among the sectors during the Asian crisis period. The highest risk was found in the Finance and securities sector, whereas the lowest risk was found in the Building and furnishing material sector.

3. Model Specifications

To capture the market-based information, the modified Distance-to-Default (DD) model derived by [Byström \(2006\)](#) is used in the empirical analysis. The foundation of the market-based approach is from the Kealhofer, McQuown, and Vasicek (KMV)—[Merton \(1974\)](#) model, which was developed based on the option theory of [Black and Scholes \(1973\)](#). Specifically, the closed relationship between the market value of equity and the market value of assets are expressed as below:

$$E = VN(d_1) - e^{-rT} F Nd_2 \quad (1)$$

$$d_1 = \frac{\ln\left(\frac{V}{F}\right) + (r + 0.5 \sigma_v^2)T}{\sigma_v \sqrt{T}} \quad (2)$$

$$d_2 = d_1 - \sigma_v \sqrt{T} \quad (3)$$

where:

- E: Market value of the firm's equity
- V: Market value of the firm's assets
- F: Face value of the firm's debt
- r: Risk-free rate
- T: Time to maturity of the firm's debt
- N: Cumulative standard normal distribution function
- σ_E : Volatility of the firm's equity

The relationship between the equity volatility and volatility of the firm's value is expressed as follows:

$$\sigma_E = \left(\frac{V}{E} \right) N(d_1) \sigma_v \quad (4)$$

Solving the above two non-linear equations gives the firm's value, V , and its volatility, σ_v and the face value of the debt (F). The Distance-to-Default is established using the following expression:

$$DD_{\text{Merton}} = \frac{\ln\left(\frac{V}{F}\right) + (\mu - 0.5 \sigma_v^2)T}{\sigma_v \sqrt{T}} \quad (5)$$

Nevertheless, the KMV model is based on several stringent assumptions that seem to lack empirical support. As such, the original model needs to be modified to make it more suitable for emerging markets such as Vietnam. In particular, the default probability should be modelled using three parameters, namely the book value of debt, market value, and volatility of equity.

The model is based on the following three assumptions:

- (i) Drift term $(\mu - 0.5 \sigma_v^2)T$ is small, or close to zero;
- (ii) $N(d_1)$ is assumed to be equal to unity;
- (iii) Book value of debt is assumed to be the accounting leverage ratio.

Depending on the first assumption, the drift term equals zero or the maturity of liability is a year. The traditional Merton model is reduced as follows:

$$DD = \frac{\ln\left(\frac{V}{F}\right)}{\sigma_v} \quad (6)$$

From Equation (4), we replace $\sigma_v = \left(\frac{E}{V}\right)\sigma_E$ and the second assumption of $N(d_1) = 1$ into Equation (6). We have:

$$DD = \frac{\ln\left(\frac{V}{F}\right)}{\left(\frac{E}{V}\right)\sigma_E} \quad (7)$$

In the final assumption, the leverage ratio is presented as $L = \frac{F}{V}$. The DD model is restructured as follows (Pham et al. 2018):

$$DD_{\text{Adjusted Merton}} = \frac{\ln(1/L)}{\sigma_E(1-L)} = \frac{\ln(L)}{\sigma_E(L-1)} \quad (8)$$

where:

Leverage ratio, $L = \frac{F}{(E+F)}$, is calculated according to the market value of equity (E) and the book value of debt (F),

σ_E is the volatility of firm equity.

The Cumulative Normal Distribution is used to measure the Expected Default Frequency (EDF) from the calculated DD value. The final result will be mapped into the S&P rating, as discussed in Lopez (2004).

Three levels of financial distress are defined, as follows:

- (1) $EDF (\%) \leq 0.52\%$: Safe zone, where firms have a healthy financial foundation, with no risk of bankruptcy;
- (2) $0.52\% < EDF (\%) \leq 6.94\%$: Grey zone, or warning zone, where the financial exposure is at a low level of potential bankruptcy;
- (3) $EDF (\%) > 6.94\%$: Bankruptcy zone, or dangerous zone, where the default probability is at a high level.

4. Data, ROC Curve and Definition of Variables

4.1. Data and ROC Curve

Data for a sample of approximately 800 listed firms on the Ho Chi Minh Stock Exchange (HOSE), and Hanoi Stock Exchange (HNX), for the period 2007 to 2017, were obtained from Bloomberg for all 10 industries, as well as from the World Bank (2016) for the macroeconomic variables. Two sub-samples are considered in the empirical analysis, namely the GFC (2007–2009) and post-GFC (2010–2017) periods.

The literature review shows that both the accounting-based and market-based models have commendable features, but also suffer from limitations. This paper uses a comprehensive model that includes accounting, market and macroeconomic indicators to determine whether the performance of the comprehensive model can be improved. In particular, a key difference in this paper relative to other empirical studies is the focus on various sectors and industries in Vietnam. In the following sections, the Receiver Operating Characteristics (ROC) Curve and relevant R^2 checks are used to examine the efficiency of the model. In particular, the Area Under the ROC Curve (AUC) is used in assessing alternative ranking methodologies.

This powerful technique involves direct estimation of predictive accuracy for the logit regression. Chava and Jarrow (2004); Vassalou and Xing (2004); and Agarwal and Taffler (2008) state that the disparity in the cutoff probability is a major trait of the ROC curve. The ROC curve draws the true positive rate, or the percentage of defaults, that are classified accurately as defaults by the model on the y-axis, against the false positive rate, or the percentage of defaults that is classified mistakenly by the model, on the x-axis as the threshold of bankruptcy.

The AUC estimates the predictive accuracy of the model, with an accuracy ratio that is less than 0.5 representing a neglected model, and a ratio that is approximately 1 demonstrating a perfectly fitting model. Two additional methods for comparing the performance of the estimated models are Cox and Snell's R^2 and Nagelkerke's R^2 , as discussed in Cox and Snell (1989) and Nagelkerke (1991), respectively. These checks are based on a similar concept to the calculation of R^2 for the linear regression model in measuring the goodness-of-fit of an empirical model.

4.2. Dependent Variable

Corporate financial distress is defined as a condition whereby a company is not able to meet its financial obligations or commitments, and is therefore a process in which a healthy company is transformed to one that may be approaching bankruptcy. Firms are called unhealthy when their operational profitability is not sufficient to meet their financial obligations. Asquith et al. (1994) stress that the capability of repaying the financial debt of a business is a critical problem. Using this concept, the variance between the current maturities of long-term debt and a company's cash flow is used in Whitaker (1999) analysis.

Similarly, Pindado et al. (2008) and Tinoco and Wilson (2013) present two requirements for recognizing financial distress. The first requirement is the deficit between the earnings before interest, tax, and depreciation (EBITDA), and interest expenses. When the financial obligations might not be covered

by the returns, the firm faces considerable financial risks. The second requirement is the negative growth of the market value of a firm's equity for two consecutive years. The firm size, together with the volatility of the market value of their equity, contribute to detecting the financial distress of a company.

However, almost all Vietnamese listed firms are relatively small by world standards. For example, the economic shock or sudden debt requirements arising from short term economic downturns is unlikely to be met because the current levels of capital of firms may not be sufficient to meet and repay the financial obligations. Consequently, for Vietnam, the variance between the return earnings before interest and taxes and interest expenses (that is, the Interest Coverage Ratio) is used to estimate the probability of default for each year, with the ratio constrained to lie within the range [0, 1].

The firms identified as being financially healthy are assigned the value of 0, while financially distressed firms are accorded the value of 1. Financial distress for each firm is examined for each year in the 10-year period 2007–2017 for which the relevant data are available. Consequently, each firm in the empirical analysis has 10 observations. Tables 1 and 2 present the results of classifications in two stages: 1572 observations are classified as the non-default group (accounting for 86 percent of the observations) in the GFC period (2007–2009), and 3718 observations belonging to the non-default group (accounting for 73 percent of the observations) in the post-GFC period (2010–2017). The correlation matrices among variables are presented in Appendices A and B.

Table 1. Descriptive statistics of dependent variable during GFC (2007–2009).

Classify	Frequency	%	Cumulative
0	1367	86.96	86.96
1	205	13.04	100
Total	1572	100	

Source: Authors' analyses.

Table 2. Descriptive statistics of dependent variable post-GFC (2010–2017).

Classify	Frequency	%	Cumulative
0	3718	73.23	73.23
1	1359	26.77	100
Total	5077	100	

Source: Authors' analyses.

4.3. Explanatory Variables

4.3.1. Accounting Variables

We construct the model using a range of selected explanatory variables, including financial liquidity, profitability, productivity of assets, and solvency, that have appeared in previous empirical studies (see, for example, Altman (1968, 2000, 2005); Taffler (1984); Shumway (2001); Hillegeist et al. (2004); and Wu et al. (2010), among others).

The variables are given as follows:

- (i) the financial, defined as working capital/total assets (WC/TA), is frequently used as a measure of corporate liquidity, and provides strong evidence of existing corporate defaults;
- (ii) the financial ratio, defined as retained earnings over total assets (RE/TA), measures the cumulative profitability over time, with young firms usually possessing a low value of RE/TA as they have not yet had sufficient time to accumulate substantial returns;
- (iii) the financial ratio, defined as earnings before interest and taxes over the total asset (EBIT/TA), indicates the true productivity of a firm's assets;
- (iv) the ability to meet financial obligations is based on the financial ratio, defined as the book value of equity over the total liability (BVE/TL).

These four accounting variables are expected to have individual negative effects on the financial distress of listed firms in international exchanges.

4.3.2. Market Variables

A set of market variables contributing to enhance the predictive power of the distress model is also used. The first market variable is the stock price (PRICE), as discussed in Rees (1995) and Beaver et al. (2005). The second variable is the firm size, or the market value of equity (MVE), as mentioned in Agarwal and Taffler (2008). The third market variable is the volatility of equity (σ_E). Zhang et al. (2009) indicate that the higher is the equity volatility, the greater will be the asset volatility leading to financial default. The final market variable is the leverage ratio (LEVERAGE), which reflects the level of debt used (see Byström 2006). This ratio is computed as the total debt relative to the total market value of equity and total debt.

4.3.3. Macroeconomic Variables

In this paper, two macroeconomic variables, namely the short-term Treasury Bill one-year rate (SHTBRDEF) and Inflation rate, are included. This choice is carefully considered from the list of eleven macroeconomic indicators generally used in other empirical studies. The short-term Treasury Bill one-year rate is a proxy for the interest rate that may strongly affect industrial firms, as discussed in Ali and Daly (2010); Badar and Javid (2013), and Chaibi and Ftiti (2015). An increase in the Treasury Bill one-year rate leads to an increase in the interest rate, a higher cost of financial expenses, and a dramatic increase in the company's probability of default.

Another macroeconomic indicator that is included in the final model is Inflation. A high inflation rate increases the prices of goods and services, thereby leading to an increase in the number of firms that end up in financial difficulties (for further details, see Demirgüç-Kunt and Detragiache (1998); Rinaldi and Sanchis-Arellano (2006); Mare (2015), and Ćurak et al. (2013)).

In summary, a combination of the accounting-based, market-based and macroeconomic variables impacting on the financial distress is used to capture various aspects of the default risk. Thus, the comprehensive model can be presented, as follows:

$$Y = \beta_1 \frac{WC}{TA} + \beta_2 \frac{RE}{TA} + \beta_3 \frac{EBIT}{TA} + \beta_4 \frac{BVE}{TL} + \beta_5 \ln(MVE) + \beta_6 \ln(LEVERAGE) + \beta_7 \sigma_E + \beta_8 PRICE + \beta_9 Treasury\ Bill + \beta_{10} Inflation + \varepsilon$$

where:

Y (Classify): Binary variable denoting non-default ($Y = 0$) and default ($Y = 1$)

$\frac{WC}{TA}$: Working Capital to Total Assets

$\frac{RE}{TA}$: Retained Earnings to Total Assets

$\frac{EBIT}{TA}$: Earnings Before Interest and Taxes (operating profit) to Total Assets

$\frac{BVE}{TL}$: Book Value of Equity to Total Liabilities

MVE : Market Value of Equity

$LEVERAGE$: Leverage ratio

σ_E : Volatility of Equity

$PRICE$: Stock Price

$Treasury\ Bill$: Short-term Treasury Bill one-year rate

$Inflation$: Inflation rate

ε : Random error term.

Tables 3 and 4 report the summary statistics for the explanatory variables in both the GFC and post-GFC periods. The descriptive statistics include the mean, standard deviation, minimum and maximum for $WCTA$ (working capital over total assets), $RETA$ (retained earnings over total assets), $EBITTA$ (earnings before interest and taxes (operating profit) to total assets), $BVETA$ (book value of

equity to total liabilities), *MVE* (market value of firm equity), *PRICE* (stock price), *VOL_MVE* (volatility of the market value of equity), *LEVERAGE* (leverage ratio), *INFLATION* (inflation), and *SHTBRDEF* (short-term Treasury Bill one-year rate).

Table 3. Summary statistics for explanatory variables during the GFC (2007–2009).

Variable	Obs.	Mean	Std. Dev.	Min	Max
Working capital/total asset	1572	0.252	0.224	−0.499	0.998
Retained earnings/asset	1572	0.061	0.067	−0.437	0.422
EBIT/Total assets	1572	0.060	0.074	−0.129	0.664
Book value of equity/Total liabilities	1572	0.712	0.284	0.001	1.000
Price	1572	30594	33927	317	304820
Ln (Market value of equity)	1572	12.221	2.025	6.994	22.284
Volatility of equity	1572	4940	10,900	20.123	336,000
Leverage	1572	1.413	1.313	0.003	12.551
Inflation	1572	12.9	7.2	7.3	23.1
Treasury Bill	1572	8.1	3.3	4.2	12.1

Source: Authors' analyses.

Table 4. Summary statistics for explanatory variables post-GFC (2010–2017).

Variable	Obs.	Mean	Std. Dev.	Min	Max
Working capital/total asset	5077	0.198	0.243	−1.362	1.000
Retained earnings/asset	5077	0.032	0.148	−2.760	0.529
EBIT/Total assets	5077	0.024	0.071	−2.290	0.981
Book value of equity/Total liabilities	5077	0.649	0.313	−0.568	1.000
Price	5077	17,300	18,740	400	202,000
Ln (Market value of equity)	5077	12.129	1.872	6.947	21.136
Volatility of equity	5077	6836	98,955	18.4	530,000
Leverage	5077	0.886	1.012	0.004	11.315
Inflation	5077	7.4	5.4	0.9	18.6
Treasury Bill	5077	7.5	3.1	4.0	12.4

Source: Authors' analyses.

5. Empirical Results and Analysis

This paper considers the financial distress of Vietnamese listed firms under different economic circumstances and for two sub-periods, namely during the GFC (2007–2009) and post-GFC (2010–2017) periods. Tables 5 and 6 present the results of a logit regression of financial distress for both the GFC and post-GFC periods. Alternative models have been used to consider the separate effects from accounting factors, market-based factors, and macroeconomic factors on financial distress and bankruptcy for the Vietnamese listed firms. In addition, on account of the high correlation between Inflation and the Short-term Treasury Bill one-year rate, various models are estimated to try to ameliorate the correlation among the variables.

The following models are estimated in the paper:

- (1) Model 1: all explanatory accounting variables;
- (2) Model 2: all market variables;
- (3) Model 3: all accounting variables *plus* inflation;
- (4) Model 4: all accounting variables *plus* the short-term Treasury Bill one-year rate;
- (5) Model 5: all market variables *plus* inflation;
- (6) Model 6: all market variables *plus* the short-term Treasury Bill one-year rate;
- (7) Model 7: all accounting and market variables *plus* inflation;
- (8) Model 8: all accounting and market variables *plus* the short-term Treasury Bill one-year rate.

Substantial differences can be observed between the two periods in relation to the statistical significance of some explanatory variables. During the GFC period, Models 3 and 4 have only one accounting variable and two macroeconomic indicators that are statistically significant at significance levels of 1 per cent to 10 per cent.

The earnings before interest and taxes over the total asset (EBIT/TA) variable has a negative impact, which represents the productivity of the company's assets, excluding the tax and leverage components or the earning power of the asset. This highlights that the higher is the level of EBIT, the higher is its performance, and therefore the lower is the probability of default.

Two macroeconomic indicators, including the inflation rate and short-term Treasury Bill one-year rate, have positive impacts. The higher is the value of inflation indicates the higher is the likelihood of financial distress. Surprisingly, these variables remain unchanged in relation to the signs and levels of significance after the GFC crisis. In particular, all of the accounting variables are statistical significant in the post-GFC period, including the net financial liquidity of the firm's assets (W C/TA), profitability (RE/TA), productivity of the company's assets (EBIT/TA), and the capability of covering the financial debt (BVE/TL).

For the market-based approach, as presented in Models 5 and 6, there is no evidence of the relationship between the market variables and the default probability during the GFC. However, three market variables, including Price (PRICE), Market value of equity (MVE), and the Leverage ratio (LEVERAGE), have significant effects on financial distress in the post-GFC period.

Tables 7 and 8 present measures of model performance for the eight models for both the GFC and post-GFC periods. All of the models are found to be useful in measuring financial distress for the listed firms in Vietnam because of the high accuracy ratio ($AR > 0.5$). The best model for the two periods is Model 3, which includes the accounting and macroeconomic variables, with the highest AR value of 0.9075 (GFC) and 0.9395 (post-GFC). Furthermore, two critical checks of the logistic regression, namely Nagelkerke's R^2 and Cox and Snell's R^2 , confirm that the best empirical model in both periods is Model 3.

Table 5. Financial distress of Vietnamese listed firms during GFC (2007–2009).

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
WCTA	−0.03 (0.05)		−0.161 (0.28)	−0.142 (0.25)			−0.198 (0.34)	−0.194 (0.34)
RETA	−3.813 (1.49)		−3.867 (1.46)	−3.446 (1.33)			−3.193 (1.17)	−3.093 (1.15)
EBITTA	−97.532 (10.70) ***		−100.221 (10.36) ***	−98.611 (10.50) ***			−100.968 (10.26) ***	−99.567 (10.38) ***
BVETL	0.168 (0.41)		0.155 (0.36)	0.16 (0.38)			0.186 (0.37)	0.183 (0.37)
PRICE		0.000 (1.94) *			0.000 −1.53	0.000 −0.94	0.000 −0.16	0.000 −0.23
MVE		0.102 (1.44)			0.108 (1.51)	0.095 (1.31)	−0.055 (0.70)	−0.064 (0.83)
VOL_MVE		0.000 (0.33)			0.000 (0.26)	0.000 (0.22)	0.000 (0.29)	0.000 (0.32)
LEVERAGE		−0.173 (1.60)			−0.167 (1.53)	−0.143 (1.30)	−0.027 (0.19)	−0.011 (0.08)
INFLATION			0.039 (2.66) ***		0.024 (1.88) *		0.036 (2.34) **	
SHTBRDEF				0.095 (2.54) **		0.094 (2.79) ***		0.093 (2.16) **
_cons	0.004 (0.01)	−3.525 (4.37) ***	−0.472 (1.33)	−0.818 (1.84) *	−4.006 (4.61) ***	−4.475 (4.90) ***	0.257 (0.26)	−0.055 (0.05)
lnsig2u_cons	0.057 (0.09)	1.127 (4.48) ***	0.291 (0.51)	0.203 (0.35)	1.184 (4.68) ***	1.223 (4.84) ***	0.333 (0.59)	0.264 (0.46)
N	1572	1572	1572	1572	1572	1572	1572	1572

Note: Standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Source: Authors' analyses.

Table 6. Financial distress of Vietnamese listed firms post-GFC (2010–2017).

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
WCTA	−0.91 (2.71) ***		−0.883 (2.60) ***	−0.878 (2.58) ***			−0.866 (2.54) **	−0.856 (2.51) **
RETA	−2.617 (4.31) ***		−3.048 (4.71) ***	−3.119 (4.78) ***			−2.822 (4.28) ***	−2.834 (4.31) ***
EBITTA	−181.231 (23.00) ***		−185.327 (22.79) ***	−186.046 (22.80) ***			−184.921 (22.58) ***	−185.308 (22.61) ***
BVETL	−0.652 (2.44) **		−0.665 (2.45) **	−0.676 (2.49) **			−0.973 (3.07) ***	−0.965 (3.04) ***
PRICE		0.000 (6.19) ***			0.000 (6.29) ***	0.000 (6.15) ***	0.000 (−0.71)	0.000 (−1.1)
MVE		−0.295 (6.01) ***			−0.306 (6.17) ***	−0.309 (6.23) ***	−0.051 (1.03)	−0.051 (1.04)
VOL_MVE		0.000 (0.76)			0.000 (0.82)	0.000 (0.82)	0.000 (0.07)	0.000 (0.11)
LEVERAGE		−0.181 (2.26) **			−0.181 (2.25) **	−0.171 (2.12) **	0.189 (1.88) *	0.175 (1.75) *
INFLATION			0.054 (5.43) ***		−0.02 (2.60) ***		0.053 (5.26) ***	
SHTBRDEF				0.095 (5.39) ***		−0.048 (3.62) ***		0.094 (5.26) ***
_cons	1.129 (6.38) ***	2.507 (4.58) ***	0.782 (4.14) ***	0.49 (2.30) **	2.795 (4.98) ***	3.019 (5.30) ***	1.496 (2.42) **	1.239 (1.97) **
lnsig2u_cons	0.622 (3.78) ***	1.298 (12.38) ***	0.651 (3.91) ***	0.647 (3.88) ***	1.302 (12.39) ***	1.308 (12.46) ***	0.675 (4.05) ***	0.673 (4.02) ***
N	5077	5077	5077	5077	5077	5077	5077	5077

Note: Standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Source: Authors' analyses.

Table 7. Model performance measures for GFC (2007–2009).

Measure	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
ROC	0.9061	0.6041	0.9075	0.9072	0.5888	0.5962	0.9073	0.9071
-2 Log Likelihood	736	1201	730	731	1199	1197	730	731
Cox and Snell's R^2	0.264	0.01	0.267	0.266	0.011	0.013	0.266	0.266
Nagelkerke's R^2	0.489	0.019	0.495	0.494	0.021	0.024	0.494	0.494

Source: Authors' analyses.

Table 8. Model performance measures for post-GCD (2010–2017).

Measure	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
ROC	0.9379	0.682	0.9395	0.9394	0.682	0.6813	0.9384	0.9385
-2 Log likelihood	3154.15	5473.52	3125.7	3125.04	5465.1	5462.87	3121.37	3120.03
Cox and Snell's R^2	0.418	0.08	0.422	0.421	0.082	0.082	0.421	0.422
Nagelkerke's R^2	0.608	0.117	0.613	0.613	0.119	0.12	0.613	0.612

Source: Authors' analyses.

Any discussion of the corporate financial distress of listed firms in international exchanges would be incomplete without the presentation of an analysis at the industry level because of different levels of risks associated with the listings. Listed firms are then divided into ten different sectors, as classified by the Global Industry Classification Standard (GICS), and their observations are also classified into three levels of financial distress based on a modified Distance-to-Default (DD) model, as presented in Table 9.

The highest risk industry belongs to Consumer Staples, which includes Food & Staples Retailing, Household & Personal Products, and Food Beverage & Tobacco, with a 59.6 percent indicator of financial distress (that is, in the Grey or Bankruptcy zones). Utilities, Consumer Discretionary, and Energy is a relatively high-risk industry, with an indicator of financial distress of approximately

50 percent. In contrast, the lowest exposure industry belongs to the Health & Education sector, with an indicator of financial distress of 33.8 per cent.

Tables 10 and 11 report the results of the DD analysis for both periods. It is noticeable that the GFC had a damaging impact in each sector. Table 10 shows that almost all the sectors have higher financial risks, with the probability of default (that is, in the Grey or Bankruptcy zones) being nearly 50 percent higher during the GFC than the post-GFC period. The highest bankruptcy rate is the Health & Education (at 80 per cent) industry, while the lowest bankruptcy rate belongs to Utilities (at 38.2 per cent) during the GFC.

Table 11 provides the probability of distress in the post-GFC period, which indicates a tendency to decline sharply in all the sectors, except for the Utilities sector. The Health & Education sector demonstrates the most impressive recovery in the post-GFC period, with the probability of default decreasing substantially from around 80 percent to 20 percent as a result of the use of modern technology.

On the other hand, the Utilities sector, which includes Residential & Industrial Electrics, Water, and Gas & Oil, recorded a dramatic increase in the bankruptcy rate in the post-GFC period. During the GFC, the sector had the lowest risk among all the sectors. It is worth noting that the sector is dominated by state-owned firms that are financially funded directly by the Vietnam Government. However, the loss of economic stimulus packages from the Vietnam Government, together with the strong equitability trend of the state-owned companies, are crucial factors in the sharp increases in the bankruptcy rate during the post-GFC period, with the highest bankruptcy rate of 63.8 percent. Detailed marginal effects are presented at Appendices C and D of the paper.

Table 9. Overall Distance to Default in all sectors for the full sample (2007–2017).

Sector	No. of Observations	Safe	Grey	Bankruptcy
Energy	319	41.4%	6.6%	52.0%
Materials	885	47.2%	5.2%	47.6%
Industrials	2596	47.1%	5.5%	47.5%
Consumer Discretionary	484	46.9%	6.8%	46.3%
Consumer Staples	911	40.4%	7.0%	52.6%
Health & education	176	62.5%	3.4%	34.1%
Financials	882	49.2%	4.3%	46.5%
Technology	115	51.3%	5.2%	43.5%
Telecommunication	104	53.8%	2.9%	43.3%
Utilities	139	41.2%	7.6%	51.1%
Total	6611			

Source: Authors' analyses.

Table 10. Overall Distance to Default in all sectors for GFC (2007–2009).

Sector	No. of Observations	Safe	Grey	Bankruptcy
Energy	73	38.4%	12.3%	49.3%
Materials	197	42.6%	5.1%	52.3%
Industrials	646	42.0%	6.0%	52.0%
Consumer Discretionary	115	37.4%	8.7%	53.9%
Consumer Staples	229	40.2%	8.3%	51.5%
Health & education	50	20.0%	8.0%	72.0%
Financials	163	49.1%	3.7%	47.2%
Technology	31	35.5%	6.5%	58.1%
Telecommunication	27	33.3%	7.4%	59.3%
Utilities	34	61.8%	17.6%	20.6%
Total	1565			

Source: Authors' analyses.

Table 11. Overall Distance to Default in all sectors for post-GFC (2010–2017).

Sector	No. of Observations	Safe	Grey	Bankruptcy
Energy	246	42.3%	4.9%	52.8%
Materials	688	48.5%	5.2%	46.2%
Industrials	1950	48.8%	5.3%	45.9%
Consumer Discretionary	369	49.9%	6.2%	43.9%
Consumer Staples	682	40.5%	6.6%	52.9%
Health & education	126	79.4%	1.6%	19.0%
Financials	719	49.2%	4.5%	46.3%
Technology	84	57.1%	4.8%	38.1%
Telecommunication	77	61.0%	1.3%	37.7%
Utilities	105	36.2%	5.7%	58.1%
Total	5056			

Source: Authors' analyses.

The financial sector has been predicted to remain stable after the GFC. The financial distress has decreased slightly—by around one percent. The root cause of serious distress is primarily the poor performance of the banking system. It should be stressed that almost all commercial banks were heavily affected by the GFC, as well as the restructuring of the banking system by government policymakers.

The Basel II Accord is a set of international banking standards derived from the Basel Committee on Banking Supervision (BCBS). Basel II improves on Basel I by requiring large cash reserves from commercial banks to cover potential risks. Applying Basel II for commercial banks provides ample evidence of the tightening of risky behavior relating to bank management. Several inherent weaknesses of commercial banks could be discovered after the GFC led to the M&A action among banks. To ensure the safety of the banking system, the State Bank of Vietnam (SBV) has decided to apply special controls to commercial banks that have a high rate of non-performing loans (NLPs).

6. Concluding Remarks and Policy Implications

Numerous studies have been conducted over the last four decades regarding the relationships underlying corporate financial distress. Any discussion of the corporate financial distress of listed firms in international exchanges would be incomplete without a critical analysis at the industry level, because of the different levels of risk among the industries. In this paper, listed firms were divided into ten different sectors, as classified by the Global Industry Classification Standard (GICS).

The paper considered the financial distress of Vietnamese listed firms at the industry level during the last decade. To consider the changes, if any, on the level of corporate financial distress in Vietnam, two distinct periods were considered, namely the period of the Global Financial Crisis (GFC) (2007–2009) and the post-GFC period (2010–2017). A logit regression technique was used for empirical estimation. Several alternative models were used to consider the separate effects arising from accounting and market-based factors. An extension of the model in the paper included an analysis of selected macroeconomic factors that affected the corporate financial distress of listed firms in any international exchange at the industry level in Vietnam, including Inflation and the Short-term one-year rate.

In general, the empirical findings from the paper confirmed that the corporate financial distress prediction model of Vietnamese listed firms at the industry level, which includes accounting factors with macroeconomic indicators, appeared to perform much better than did the financial distress model comprising market-based factors with macroeconomic fundamentals.

In addition, the empirical findings presented evidence to confirm that the GFC had a destructive impact on each sector. Almost all sectors of the Vietnam economy had financial risk that was approximately 50 percent higher during the GFC period than in the post-GFC period. Of all the sectors in Vietnam, the highest bankruptcy rate was found to be in the Health & Education sector (at 80 per cent), while the lowest risk was found in the Utilities (at 38.2 per cent) during the GFC period.

For the post-GFC period, the probability of distress showed a tendency to decline sharply for all sectors of the Vietnam economy, except for the Utility sector. The Health & Education sector demonstrated the most impressive recovery after the GFC, where the probability of default decreased from approximately 80 percent during the GFC period (2007–2009) to around 20 percent for the post-GFC period (2010–2017).

The Utilities sector recorded a dramatic increase in bankruptcies after the GFC. During the GFC period, the sector had the lowest risk among all the sectors. It is worth noting that the sector is dominated by state-owned firms that are financially funded directly by the Vietnam Government. In addition, the Financial sector is likely to remain stable after the GFC.

The empirical findings provide additional evidence for the Vietnam Government, as well as those from other emerging markets, to examine and evaluate the risk of the corporate financial distress of listed firms in any international exchange, especially at the industry level. For the case of Vietnam, Utilities should receive special attention as the sector exhibits a high level of risk without adequate support from the Government. Any reform of this sector, without an accompanying comprehensive analysis of risk, will carry a significant level of risk, which would be likely to flow on to the economy as the whole.

In marked contrast, the Financial sector appeared to be strong, both during and after the GFC. This observation confirms the robustness of the existing regulatory framework for the banking sector in Vietnam.

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Appendix A

Table A1. Correlation matrix during crisis, 2007–2009.

Variable	WCTA	RETA	EBITTA	BVETL	PRICE	MVE	VOL_MVE	LEVERAGE	INFLATION	SHTBRDEF
WCTA	1									
RETA	0.179 ***	1								
EBITTA	0.1327 ***	0.4286 ***	1							
BVETL	0.311 ***	0.3292 ***	0.2256 ***	1						
PRICE	0.0252	0.2473 ***	0.0409 *	0.0009	1					
MVE	−0.0676 ***	0.1801 ***	0.0614 **	0.0153	0.4606 ***	1				
VOL_MVE	−0.0319	0.0265	0.0532 **	0.0352	0.0018	0.1522 ***	1			
LEVERAGE	0.1501 ***	0.3271 ***	0.1655 ***	0.4815 ***	0.4028 ***	0.5012 ***	0.1654 ***	1		
INFLATION	0.0403	−0.067 ***	0.0587 **	0.0207	−0.2242 ***	−0.1264 ***	0.0153	−0.0939 ***	1	
SHTBRDEF	−0.0093	−0.0541 **	0.0252	0.0014	−0.3355 ***	−0.1446 ***	0.0197	−0.1874 ***	0.8445 ***	1

Notes: WCTA (working capital over total assets), RETA (retained earnings over total assets), EBITTA (earnings before interest and taxes [operating profit] to total assets), BVETA (book value of equity to total liabilities), MVE (market value of equity), PRICE (stock price), VOL_MVE (volatility of market value of equity), LEVERAGE (leverage ratio), INFLATION (inflation), and SHTBRDEF (short-term one-year rate), *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix B

Table A2. Correlation matrix post crisis, 2010–2017.

Variable	WCTA	RETA	EBITTA	BVETL	PRICE	MVE	VOL_MVE	LEVERAGE	INFLATION	SHTBRDEF
WCTA	1									
RETA	0.4308 ***	1								
EBITTA	0.1529 ***	0.2529 ***	1							
BVETL	0.5473 ***	0.385 ***	0.1602 ***	1						
PRICE	0.1909 ***	0.3431 ***	0.184 ***	0.1787 ***	1					
MVE	0.0679 ***	0.326 ***	0.1105 ***	0.0951 ***	0.4618 ***	1				
VOL_MVE	−0.0117	0.0167	0.0124	0.0223	0.0624 ***	0.2053 ***	1			
LEVERAGE	0.3091 ***	0.2879 ***	0.1927 ***	0.5721 ***	0.3882 ***	0.3435 ***	0.2126 ***	1		
INFLATION	0.0197	0.0948 ***	0.0256 *	0.0175	0.1063 ***	0.083 ***	−0.0007	−0.0387	1	
SHTBRDEF	0.0316 *	0.119 ***	0.0494 ***	0.029 **	0.0648 ***	0.0576 ***	0.0007	0.0015	0.91	1

Notes: WCTA (working capital over total assets), RETA (retained earnings over total assets), EBITTA (earnings before interest and taxes [operating profit] to total assets), BVETA (book value of equity to total liabilities), MVE (market value of equity), PRICE (stock price), VOL_MVE (volatility of market value of equity), LEVERAGE (leverage ratio), INFLATION (inflation), and SHTBRDEF (short-term one-year rate), *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Appendix C

Table A3. Marginal effect post crisis, 2007–2009.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
WCTA	−0.000075		−0.000346	−0.000329			−0.000414	−0.000432
RETA	−0.009701		−0.008298	−0.007984			−0.006677	−0.006901
EBITTA	−0.248119		−0.215074	−0.228503			−0.211114	−0.222159
BVETL	0.000428		0.000332	0.000370			0.000389	0.000408
PRICE		0.000000			0.000000	0.000000	0.000000	0.000000
MVE		0.005573			0.005721	0.004832	−0.000115	−0.000143
VOL_MVE		0.000000			0.000000	0.000000	0.000000	0.000000
LEVERAGE		−0.009482			−0.008831	−0.007280	−0.000057	−0.000025
INFLATION			0.000084		0.001244		0.000076	
SHTBRDEF				0.000220		0.004788		0.000208

Note: See variable definitions in notes to Appendix A.

Appendix D

Table A4. Marginal effect post crisis, 2010–2017.

Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
WCTA	−0.018123		−0.016384	−0.016199			−0.016074	−0.015689
RETA	−0.052113		−0.056582	−0.057523			−0.052396	−0.051922
EBITTA	−3.608555		−3.439809	−3.431021			−3.432932	−3.394622
BVETL	−0.012977		−0.012338	−0.012458			−0.018062	−0.017669
PRICE		−0.000004			−0.000004	−0.000004	0.000000	0.000000
MVE		−0.036388			−0.037685	−0.038076	−0.000942	−0.000941
VOL_MVE		0.000000			0.000000	0.000000	0.000000	0.000000
LEVERAGE		−0.022332			−0.022296	−0.021023	0.003504	0.003213
INFLATION			0.000997		−0.002463		0.000980	
SHTBRDEF				0.001754		−0.005968		0.001714

Note: See variable definitions in notes to Appendix A.

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Article

An Empirical Test of Capital Structure Theories for the Vietnamese Listed Firms

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Abstract: Raising capital efficiently for the operations is considered a fundamental decision for any firms. Since the 1960s, various theories on capital structure have been developed. Various empirical studies had also been conducted to examine the appropriateness of these theories in different markets. Unfortunately, evidence is mixed. In the context of Vietnam, a rising powerful economy in the Asia Pacific region, this important issue has been largely ignored. This paper is conducted to provide additional evidence on this important issue. In addition, different factors affecting the capital structure decisions from the Vietnamese listed firms are examined. The Generalized Method of Moment approach is employed on the sample of 227 listed firms in Ho Chi Minh City stock exchange over the period from 2008 to 2017. Findings from this study suggest that the Vietnamese listed firms follow the trade-off theory to determine their capital structure (i.e., to determine the optimal debt level). In contrast, no evidence has been found to confirm that the pecking order theory can explain the financing decisions of the Vietnamese listed firms, as previously expected. In addition, findings from this study also indicate that ‘Fund flow deficit’ and ‘Change in sales’ are the most two important factors that affect the amount of debt issued for the Vietnamese listed firms. Implications for academics, practitioners, and the Vietnamese government have also been emerged from the findings of this paper.

Keywords: pecking order theory; trade off theory; capital structure; GMM; Vietnam

1. Introduction

Capital always plays a crucial role in all firm activities. As such, raising capital efficiently for the operational activities is considered a fundamental decision for any firms. Since the 1960s, various theories and empirical researches have been conducted to examine the impacts of the capital structure decisions on firm’s value. Among the number of capital structure theories, three notable theories are highly recognized including: (i) the pecking order theory; (ii) the trade-off theory; and (iii) the market timing theory. An intensive literature review indicates that both trade-off and pecking order theories have always been playing a dominate role in firms’ financing decisions. However, debates have also emerged whether which theory that best explains for capital structure decisions of firms. The trade-off theory indicates that profitable firms have a tendency to increase debt to utilize the benefits from tax shields. In contrast, the pecking order theory argues that profitable firms prioritize internal funds first in order to reduce their debt or firms will use external funds when retained earnings are inadequate. Market-timing theory also receives supports, albeit limited, from empirical studies that managers tend to issue new stocks in the good timing of the market. Agha et al. (2013) considered that all three theories exhibit their own weaknesses. In the case of the trade-off theory, even though the theory extensively explains the decision for a capital structure, it ignores an important fact that

debt is negatively correlated with profitability. The pecking order theory on the other hand provides a straightforward explanation for this relationship. However, mixed evidence has also emerged.

Shyam-Sunder and Myers (1999) and Yu and Aquino (2009) suggested that the pecking order theory can explain better for capital structure decisions from firms. Shyam-Sunder and Myers (1999) considered that the pecking order model is more robust than the target adjustment model although the model, once independently tested, appears to perform well. Yu and Aquino (2009) found that the pecking order theory better explains financing behavior of the Philippine listed firms than the trade-off theory.

In contrast to the arguments from Shyam-Sunder and Myers (1999) and Yu and Aquino (2009), Frank and Goyal (2003), and Razak and Rosli (2014) considered that the trade-off theory can better explain the capital structure decisions of firms than the pecking order theory. Frank and Goyal (2003) found that internal financing is insufficient to cover investment expenditures on average. A much stronger relationship between net equity issued and financing deficit is observed than net debt issuance and financing deficit. Razak and Rosli (2014) emphasized that the trade-off theory showed a stronger explanation on financing decisions of selected firms than the pecking order theory.

In practice, private enterprises frequently confront with the problems of capital structure and issued debt. In Vietnam, during the period of 2010–2015, after the global financial crisis in 2008 and the world depression in 2012, deposit interest rate was around 6–8%, while lending interest rate, which firms can issue from banks, was more than 10%, on average. Due to these global economic issues, the tightening monetary policy from the State Bank of Vietnam (SVB) gave pressure on domestic production. It was hard for firms to issue formal debt in order to foster their production, although private enterprises, especially small and medium enterprises account for a large proportion of Vietnamese GDP (approximately 43% in 2010 and 43.2% in 2015).

Since 2014 after the two recent global crisis, SVB changed its direction to loosening policy, in which SBV lowered and stabilized the lending interest rate around 7–8%. Later on, in 2018, Decree number 168 from the Vietnamese Government on the problem of private bond loosened its previous regulation in order to encourage firms to raise their financial funds and diversify their capital structure. In previous Decree (Decree number 90 activated in 2011), firm can only issue private bond if it had positive profit in the previous year. That requirement was removed from the current activated Decree (Decree number 168). Even that, in 2018, total private bond issued from Vietnamese private corporations was approximately 7% of GDP. That was a relatively low rate compared to the average level of the region (21%). These efforts from the Vietnamese Government and SVB seemed to weakly affect to the capital structure of private firms.

Due to the mixed evidence from previous studies, in particular for the case of an emerging market such as Vietnam, this paper is conducted to examine the importance of the capital structure theories in the context of Vietnam and to consider an appropriate model for Vietnamese listed firms to consider when conducting financing decisions. In addition, the paper also considers different factors which have also greatly contributed to the financing decisions of Vietnamese listed firms.

In order to obtain the above objectives, the paper utilizes various models on the ground of previous studies from Shyam-Sunder and Myers (1999), and Frank and Goyal (2003), Yu and Aquino (2009), and Razak and Rosli (2014). The pecking order theory is tested using two distinct models including the (original) pecking order model and the partially aggregated pecking order model. In addition, the trade-off theory is tested using the target adjustment model. In addition, the study uses the effect of factors on leverage model to measure the impact of different factors on capital structure decisions from the Vietnamese listed firms. The paper employs a Generalized Method of Moment (GMM) approach on the ground of a panel dataset of 227 firms from all sectors listed in Ho Chi Minh City stock exchange (HOSE) over the period from 2008 to 2017. The data set excludes listed firms from finance, insurance, and investment sectors.

The paper is structured as follows. Following this introduction, Section 2 reviews relevant literature. Then, Section 3 describes the research methodology utilized in this paper. Data and empirical results are presented in Section 4, followed concluding remarks in Section 5.

2. Literature Review

Corporate capital structure has been widely considered in empirical studies with the focus on the determinants of financing decisions. Various aspects have been studied including the effect of corporate governance (Giroud and Mueller 2010, 2011; Morellec et al. 2012; Wen et al. 2002) or the influence of managerial characteristics (Berger et al. 1997; Coles and Li 2018; Friend and Lang 1988). Findings from these studies indicated that corporate capital structure is mostly affected by firm's characteristics. However, it is noted that none of these studies investigated the appropriateness of the theories on firms' financing decision to explain the corporate capital structure.

To test for the appropriateness and the validity of the theoretical models on financing decision, a number of papers have been conducted. The pecking order theory was validated to explain firm's financing decisions in studies by Shyam-Sunder and Myers (1999), Vijayakumar (2011), Atiyet (2012), Sheikh et al. (2012), Pacheco (2016), Balios et al. (2016), Maças Nunes and Serrasqueiro (2017), Trinh et al. (2017). Razak and Rosli (2014) supported the extended pecking order model whereas Yu and Aquino (2009) argued that the trade-off theory was more appropriate than the pecking order theory in explaining firms' financing decisions. However, Chirinko and Singha (2000) criticized the validity of the tests adopted in Shyam-Sunder and Myers (1999). This paper presents and discusses selected papers on this important research issue in order to identify and highlight the research gap in the context of an emerging market such as Vietnam.

To test traditional capital structure models against the pecking order model, Shyam-Sunder and Myers (1999) used a dataset of 157 US firms over the period from 1971 to 1989. The study started with the year-end values of the book debt ratio of each firm in 1971. Then, the book debt ratios of the later years were generated by ascertaining the funds flow deficit which is calculated by real investment, dividends, operating cash flow and others. The firm is supposed to retire debt in the case of negative deficit, and issue debt in the case of positive deficit. The key empirical results are briefly described as follows: (i) the pecking order model best describes firm's financing behavior; (ii) the adjustment target model, once independently tested, appeared to perform well; (iii) when the two models were jointly tested, the significance of the estimated coefficients from the pecking order model did not vary whereas the performance of the target adjustment model reduced even though the estimated coefficients from the model were still statistically significant; and (iv) firms not only intended to use debt to finance the need of cash in the short term but also in the case when the deficits were unexpected. These findings demonstrate the robustness of the pecking order model in explaining firms' behavior to capital structure decisions.

Yu and Aquino (2009) tested the validity of the pecking order model and the trade-off model to explain a financing behavior of the Philippine listed firms over the period 1990 to 2001. Findings from this study supported for the pecking order model due to the negative relationship between profitability and leverage, while the annual change in total liabilities is mostly explained by financing deficit. Yu and Aquino (2009) used the model of Shyam-Sunder and Myers (1999) and added dummy variable for years 1992–2001 to control time fixed effects when the pecking order model was tested. The results showed that firms followed the trade-off model in selecting capital structure model.

Chirinko and Singha (2000) indicated that the empirical evidence of Shyam-Sunder and Myers (1999) did not evaluate both the pecking order and static trade-off models. Chirinko and Singha considered the plausibility of three alternative external financing patterns and raised a question in relation to the validity of Shyam-Sunder and Myers (1999) conclusions. Chirinko and Singha (2000) argued that using the model of Shyam-Sunder and Myers (1999) provided difficulties in evaluating the validity of the pecking order model. As a result, they suggested that it is essential to have alternative tests to identify capital structure determinants and to distinguish one from other hypotheses.

Frank and Goyal (2003) employed a dataset of the American public trading firms from the 1971 to 1998 period to test the validity of the pecking order theory. Two different approaches were applied in the paper. The first approach is that the fund flow deficit was utilized in order to account for the net debt issued. The second approach is that leverage was used. Frank and Goyal (2003) concluded that internal financing is insufficient to cover investment expenditures on average. This conclusion is in contrast to what is usually suggested. External financing is considerably used.

Razak and Rosli (2014) examined various theories of the capital structure and tested the static trade-off theory and the pecking order theory. The study used data from 200 listed firms in Malaysia over the period 2007 to 2012. Three models were tested including the pecking order model, the extended pecking order model, and the static trade-off model, to explain financing decision of firms in relation to new debt issuance. Findings from this study presented that the issuance of new shares was not affected by internal fund deficits. As such, the pecking order hypothesis expecting firms to issue debt to finance internal fund deficit was statistically rejected. However, findings from the extended pecking order model presented another story. The hypothesis supporting a positive relationship between financial activities and issuance of new debt is statistically accepted. Razak and Rosli (2014) continuously conducted further regression analysis to test the hypothesis of the extended pecking order model. The results indicated that new debt issuance was positively influenced by a long-term debt repayment and capital expenditure.

Kopecky et al. (2018) provided an alternative equilibrating process which markedly differs from the Modigliani (Modigliani and Miller 1958) and Miller (Miller 1977) theorem in terms of the prediction of debt uses, to achieve the same optimal level for firm values. This alternative process reinstitutes the prospect of capital structure irrelevancy. The study indicates that the takeover market can alter the stock market valuations such that firms may find it optimal not to recapitalize, even though predictions of the standard discounted cash flow model with recapitalization costs suggested that they have to recapitalize.

3. Methodology

This paper utilizes four different models on the ground of various studies of Shyam-Sunder and Myers (1999), Frank and Goyal (2003), Yu and Aquino (2009), and Razak and Rosli (2014) in the context of Vietnam. The pecking order theory is tested by two models including the original pecking order model and the partially aggregated pecking order model. In addition, the trade-off theory is tested using the target adjustment model. Together with these analyses, the paper also uses the effect of factors on leverage model to examine the impact of different factors on capital structure decisions from the Vietnamese listed firms. This study uses the panel Generalized Method of Moment (GMM) estimation to test the robustness of the pecking order theory as well as the trade-off theory and to measure the impact of different factors on capital structure decisions of the Vietnamese listed firms. Flannery and Rangan (2006) and Nunkoo and Boateng (2010) observed that recent studies in developed countries have a tendency to use the GMM estimation technique to conduct empirical analyses on the capital structure issues. In addition, Kannadhasan et al. (2018) emphasized that the GMM consistently estimates the dynamic model and deals with the endogenous problems by employing efficient instrumental variable (IV) techniques.

The pecking order model is tested on the ground of the model of Shyam-Sunder and Myers (1999) which has been widely used in previous studies including Frank and Goyal (2003), Yu and Aquino (2009), and Razak and Rosli (2014). The model can be expressed as below:

$$\Delta D_{it} = \alpha + b_{PO}DEF_{it} + e_{it} \quad (1)$$

where ΔD_{it} represents the amount of debt issued or retired by firm i in year i . b_{PO} is the pecking order coefficient and e_{it} is the error term. DEF_{it} is the fund flow deficit of firm i in year i and is calculated using the following equation:

$$DEF_{it} = DIV_{it} + CFI_{it} + \Delta NWC_{it} - CFO_{it}$$

where DIV_{it} , CFI_{it} , ΔNWC_{it} , and CFO_{it} are dividend payments, net investment, change in net working capital, operating cash flows for firm i in year i respectively.

The partially aggregated pecking order model was based on Frank and Goyal (2003) which proposed to use the fund flow deficit (DEF) equation to estimate the amount of debt issued or retired (ΔD).

$$\Delta D_{it} = a + b_{DIV}DIV_{it} + b_{CFI}CFI_{it} + b_{NWC}\Delta NWC_{it} - b_{CFO}CFO_{it} + e_{it} \quad (2)$$

where ΔD_{it} represents the amount of debt issued or retired by firm i in year t . CFO_{it} is the operating cash flows of firm i in year t . DIV_{it} represents dividend payments of firm i in year t . CFI is the investing cash flow of firm i in year t . ΔNWC_{it} represents the change in net working capital of firm i in year t . e_{it} is the error term.

The target adjustment model on the ground of Shyam-Sunder and Myers (1999) study was used to test the validity of the trade-off theory.

$$\Delta D_{it} = \alpha + b_{TA}\Delta D_{it}^* + e_{it} \quad (3)$$

where ΔD_{it} is the amount of debt issued or retired by firm i in year t . D_{it}^* represents the target debt level for firm i in year t calculated by multiplied the historical mean of the debt ratio for each firm with total capital. b_{TA} is the target-adjustment coefficient and e_{it} is the error term.

Frank and Goyal (2003) used other factors to account for firm's leverage. The leverage regression was developed utilizing five factors: profitability (P), log sales (LS), market-to-book ratio (MTB), tangibility of assets (T), and fund flow deficit (DEF).

As such, the effect of factors on leverage model specification is as follows:

$$\Delta D_{it} = a + b_T\Delta T_{it} + b_{MTB}\Delta MTB_{it} + b_{LS}\Delta LS_{it} + b_P\Delta P_{it} + b_{DEF}\Delta DEF_{it} + e_{it} \quad (4)$$

where ΔD_{it} represents the amount of debt issued or retired by firm i in year t . ΔT_i is Change in assets of firm i in year t . ΔP_{it} represents the change in profitability of firm i in year t . ΔLS_{it} is the change in log sales of firm i in year t . ΔMTB_{it} is the change in market-to-book ratio of firm i in year t . DEF_{it} represents fund flow deficit of firm i in year t .

4. Data and Results

Data were collected from financial reports, and annual reports of listed firms operating in all sectors in Ho Chi Minh Stock Exchange (HOSE) over the period 2008 to 2017 except for firms operating in finance, insurance, and investment sectors. Firms with missing or incomplete data were excluded from the analysis. The remaining data forms a balanced panel dataset. Table 1 presents the outcome of descriptive statistics for all variables used in this study. All variables have 2268 observations, except change in log sales (ΔLS) which has 2267 observations.

Table 1. Descriptive Statistics.

Variable	Obs.	Mean	Std. Dev.	Min	Max
ΔD	2268	0.1424	1.5380	(59.1252)	10.6219
DEF	2268	(0.2350)	1.6005	(13.7638)	61.6392
DIV	2268	(0.0588)	0.0736	(1.2161)	0.0730
CFI	2268	(0.0892)	1.4522	(3.3698)	66.0117
ΔNWC	2268	0.0192	0.8129	(17.6784)	16.3728
CFO	2268	0.1063	0.5968	(7.4473)	12.7931
ΔD^*	2268	0.1102	1.4033	(41.2042)	9.3302
ΔT	2268	(0.0095)	3.0170	(101.0872)	101.8906
ΔMTB	2268	0.0627	1.1848	(20.7629)	20.8969
ΔLS	2267	0.1038	0.5555	(4.2825)	12.6414
ΔP	2268	(0.0359)	2.1643	(63.4109)	53.3619

Notes: ΔD_{it} : the amount of debt issued; DEF_{it} : Fund flow deficit; DIV_{it} : Dividend payments; CFI : Investing cash flow; ΔNWC_{it} : Change in net working capital; CFO_{it} : Operating cash flows; ΔD^*_{it} is the target debt ratio; ΔT_{it} : Change in assets; ΔMTB_{it} : Change in market-to-book ratio; ΔLS_{it} : Change in log sales; ΔP_{it} : Change in profitability.

This study employed the panel Generalized Method of Moment (GMM) estimation to test the validity of the models and to measure the impact of different factors on capital structure decisions from Vietnamese listed firms. Table 2 shows the results for different estimations for the pecking order model.

Table 2. Estimation results of the pecking order model.

<i>Explanatory Variable</i>	<i>Dependent Variable Amount of Debt Issued (ΔD)</i>
<i>Fund Flow Deficit (DEF)</i>	−0.572 *** (0.029)
<i>Constant</i>	82.09 *** (14.750)
<i>Number of observations</i>	2268
<i>Number of firms</i>	227

Notes: Standard deviations in parenthesis. *** Significant at 0.01 level.

The hypothesis of the pecking order model is that the amount of debt issued has a positive relationship with the fund flow deficit ($b_{PO} > 0$) indicating that firms prefer to issue debt to finance the fund flow deficit. However, the regression coefficient of the model is negative ($b_{PO} = -0.572$) and statistically significant at the level of one percent ($p < 0.01$). This indicates that the results do not support the pecking order theory in the context of the Vietnamese market. In a nut shell, Vietnamese listed firms do not prefer to issue debt to finance the fund flow deficit.

Table 3 describes Arellano–Bond test for first-order autocorrelation AR(1) and second-order autocorrelation AR(2) in the first-differenced errors which are conducted to verify the consistent degree and robustness of the empirical results. The estimated values confirm that second order autocorrelation is not in existence.

Table 3. Arellano–Bond Test for the pecking order model.

<i>Arellano-Bond</i>	<i>System GMM</i>	
	<i>Z-Value</i>	<i>Pr > z</i>
<i>First-order autocorrelation AR(1)</i>	−3.61	0.000
<i>Second-order autocorrelation AR(2)</i>	−1.44	0.149

Table 4 presents the results obtained for different estimations of the Partially Aggregated Pecking Order Model.

Table 4. Estimation results of the partially aggregated pecking order model.

<i>Explanatory Variables</i>	<i>Dependent Variable Amount of Debt Issued (ΔD)</i>
<i>Dividend Payments (DIV)</i>	−0.821 * (0.423)
<i>Investing Cash Flow (CFI)</i>	−1.117 *** (0.052)
<i>Change in Net Working Capital (ΔNWC)</i>	0.030 (0.125)
<i>Operating Cash Flow (CFO)</i>	−1.272 *** (0.166)
<i>Constant</i>	16.720 (16.240)
<i>Number of observations</i>	2268
<i>Number of firms</i>	227

Notes: Standard deviations in parenthesis. * Significant at 0.1 level, *** Significant at 0.01 level.

The regression coefficient of dividend payments (*DIV*) is negative (−0.82) and statistically significant at the level of 10 percent. The result is consistent with the findings of Vo and Nguyen (2014) and Tran and Vo (2015) who reported a negative relationship between dividend and firm leverage. The regression coefficient of operating cash flows (*CFO*) and investing cash flow (*CFI*) are also negative and significant at the level of one percent. Operating cash flow and investing cash flow have negative relationships with the amount of debt issued (ΔD) while there is no impact of the net working capital (ΔNWC) on the amount of debt issued (ΔD).

The hypothesis of the partially aggregated pecking order model is that the amount of debt issued or retired is positively related to dividend payments (*DIV*), investing cash flow (*CFI*) and change in net working capital (ΔNWC) but is negatively related to operating cash flows of firm (*CFO*). However, the empirical results do not support the hypothesis of the partially aggregated pecking order model.

Table 5 describes Arellano–Bond test for first-order autocorrelation AR(1) and second-order autocorrelation AR(2) in the first-differenced errors are conducted to verify the consistent degree and robustness of the model results. The testing values confirm that second order autocorrelation is absent.

Table 5. Arellano-Bond test for the partially aggregated pecking order model.

<i>Arellano–Bond</i>	<i>System GMM</i>	
	<i>Z-Value</i>	<i>Pr > z</i>
<i>First-order autocorrelation AR(1)</i>	−4.45	0.000
<i>Second-order autocorrelation AR(2)</i>	−0.60	0.549

Tables 6 and 7 present estimation's results and validation test of the target adjustment model (Shyam-Sunder and Myers 1999). Table 8 reports the results attained for different estimations of the effect of factors on leverage model using the system GMM.

Table 6. Estimation Results of the Target Adjustment Model.

Explanatory Variable	Fixed Effects	Random Effects
	Dependent Variable Amount of Debt Issued (ΔD)	
Target Debt Ratio (ΔD^*)	0.714 *** (0.018)	0.739 *** (0.017)
Constant	0.137 * (0.075)	0.131 * (0.075)
Number of observations	2268	2268
Number of firms	227	227

Notes: Standard deviations in parenthesis. * is significant at 0.1 level, *** is significant at 0.01 level.

Table 7. Statistics Test of the Target Adjustment Model.

Statistics Tests	System GMM	
	Chi-Square	Pr > Chi-Square
Hausman	9.78	0.1342
Breusch-Pagan Lagrange multiplier (LM)	152.76	0.0000

Table 8. Estimation results of the effect of factors on leverage model.

Explanatory Variables	Dependent Variable Amount of Debt Issued (ΔD)
Fund Flow Deficit (DEF)	−0.530 *** (0.057)
Change in Log Sales (ΔLS)	0.512 *** (0.177)
Change in Market to Book Ratio (ΔMTB)	(0.040) (0.097)
Change in Profitability (ΔP)	(0.023) (0.036)
Change in Tangibility (ΔT)	0.080 (0.071)
Constant	51.74 ** (22.200)
Number of observations	2267
Number of firms	227

Notes: Standard deviations in parenthesis. ** is significant at 0.05 level, *** is significant at 0.01 level.

The regression coefficient of fund flow deficit (DEF) is negative ($b_{DEF} = -0.530$) and statistically significant at the level of one percent ($p < 0.01$). Change in log of sales (ΔLS) has a positive relationship with amount of debt issued (0.178) and is statistically significant at the level of one percent.

We consider that the above findings are consistent with our observations of the economic environment in Vietnam. Lending interest rate in Vietnam has been maintained at the average level of around 7.8 percent per year for the last five years. This stability of interest rate in Vietnam encourages Vietnamese firms to absorb more debt in order to take the advantage of the financial leverage. Findings from this paper reconfirm this position and observation. Figure 1 below illustrates the lending interest rate in Vietnam from 2008 to 2017.

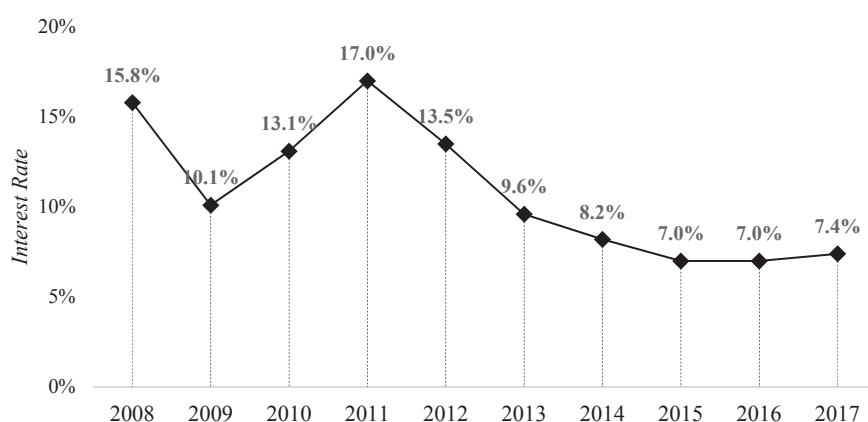


Figure 1. Lending Interest Rate of Vietnam 2008–2017. Source: World Bank.

5. Concluding Remarks

Financing decision is always important for any firm. As such, an appropriate model for firms to follow in making their financing decisions is desired. Unfortunately, mixed evidence has been emerged in previous empirical studies. In addition, limited number of studies addressed this important question in the context of Vietnam. As such, this study is conducted to examine an appropriate model in which the Vietnamese firms employ to determine their capital structures. In addition, the study also measures the impact of different factors on capital structure decisions of the Vietnamese listed firms.

The study develops four models based on studies of [Shyam-Sunder and Myers \(1999\)](#), [Frank and Goyal \(2003\)](#), [Yu and Aquino \(2009\)](#), and [Razak and Rosli \(2014\)](#). The pecking order theory is tested by two models including the original pecking order model and the partially aggregated pecking order model. In addition, the trade-off theory is tested using the target adjustment model. The study also utilizes the effect of factors on leverage model to measure the impact of different factors on capital structure decisions of Vietnamese listed firms. Unlike many other studies, a panel dataset of 227 HOSE listed firms over the period 2008 to 2017 and Generalized Method of Moment (GMM) approach are used. The use of GMM and panel data analysis help to effectively control unobservable firm-specific fixed effects but are very critical in capital structure decisions of firms.

The study finds no evidence that the pecking order theory can explain financing decisions of Vietnamese listed firms over the period 2008 to 2017. On the contrary, the empirical results strongly support that Vietnamese listed firms have followed the trade-off theory to determine their capital structures. The empirical results from the effect of factors on leverage model also suggest fund flow deficit has a negative impact on the amount of debt issued which is consistent with the result from the pecking order model, and change in sales has a positive influence on the amount of debt issued.

On the grounds of the findings from this paper, implications are drawn for academics, investors and firms, and also the Vietnamese government.

First, for academics, the study provides additional empirical evidence to answer one of the most arguable topics in the corporate finance in relation to how firms determine their capital structure. This paper provides empirical evidence that listed firms in Vietnam do not follow the pecking order theory. They have followed the trade-off theory to determine their optimal capital structure. The study also contributes to the capital structure study in Vietnam where the finance literature has not been thoroughly investigated. However, for robustness, studies in the future should consider the potential limitation of this paper as discussed further below.

Second, Vietnamese firms may consider the findings from this paper as a reference and a starting point to choose an appropriate capital structure in order to maximize firm's value. Vietnamese firms appear to have a tendency to substitute between debt and equity to move towards the target debt ratio.

Third, for the Vietnamese government, Vietnamese firms depend heavily on debt to finance their capital structure and Vietnam's financial markets have not yet developed with a variety of choices. According to the NFSC (the National Finance Supervisory Commission) report, the banking system is the main capital supply source for the economy accounting over 60 percent of total supply. Depending heavily on banking loans brings risks to firms in relation to meet their obligations to pay interest expenses and debt repayment, in particular when lending interest rate increases. As a result, the Vietnamese government should put more effort to improve the financial market in terms of products and choices.

This study exhibits some limitations. For example, an extended period is desirable to consider a potential difference between various periods, in particular crisis and normal periods. Advanced techniques on risk measurements can also be considered and utilized such as credit risk measurements (Powell et al. 2017, 2018). In addition, this study only focuses on the Ho Chi Minh City stock market which may not be the complete proxy for the Vietnamese listed firms. The sample should be extended to include firms listed in Ha Noi stock market as well. It is because the ruling of listings between these two markets is significantly different. Last but not least, in addition to testing the appropriateness and validity of the three typical models, the characteristics of firms included in the study should be carefully considered as the difference in firms' characteristics is expected to influence firms' financing decisions.

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Article

Modeling the Impact of Agricultural Shocks on Oil Price in the US: A New Approach

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Abstract: The current literature has generally considered prices of the agricultural commodity as an endogenous factor to crude oil price. As such, the role of the agricultural market in the energy sector has been largely ignored. We argue that the expansion of agricultural production may trigger a significant increase in oil price. In addition, the world has recently witnessed a growth in biofuel production, leading to an increase in the size of the agricultural sector. This study is conducted to examine the impact of different agricultural shocks on the oil and agricultural markets in the US for the period from 1986 to 2018. The study utilizes the Structural Vector Autoregressive (SVAR) model to estimate the relationship between the agricultural market and the crude oil market. Moreover, the variance decomposition is also used to quantify the contribution of agricultural demand shocks on oil price variations. Findings from this paper indicate that different agricultural shocks can have different effects on oil price and that corn use in ethanol plays an important role in the impact of corn demand shocks on oil price. We find evidence that the agricultural market can have an impact on oil prices through two main channels: indirect cost push effect and direct biofuel effect. Of these, the biofuel channel unexpectedly suggests that the expansion of bioethanol may in fact foster the dependency of the economy on fossil fuel use and prices.

Keywords: agricultural commodity prices; volatility; crude oil prices; structural vector autoregressive model; impulse response functions

1. Introduction

The correlation of crude oil price and agricultural commodity prices during the food price crisis of 2007–2008 has led to a rich array of studies on the impact of crude oil price and biofuel expansion on agricultural prices. According to these studies, the increase in crude oil price has increased the prices of many agricultural crops and damaged global food security, as crude oil is one of the main factors of agricultural production (Bayramoğlu et al. 2016; Persson 2015; Adam et al. 2018; Wang et al. 2014). Furthermore, the increase in crude oil price also raised the demand for biofuel as an alternative energy source. The coincidence of biofuel expansion and the occurrence of the food price crisis during 2007–2008 has raised serious concerns about the causality from the former to the latter (Lucotte 2016; Ma et al. 2016; Ahmadi et al. 2016). In particular, the increase in biofuel production has led to an increase in corn demand, as corn is the main feedstock of bio-ethanol in the US. The increase in corn demand led to an increase in corn price and the prices of other agricultural commodities, as these crops compete for planted acreage and other agricultural resources (Wang et al. 2014). Furthermore, the demand for biofuel was strengthened as many developed countries imposed several renewable energy mandates, which greatly increased biofuel consumption. Since then, biofuel has played a key role in connecting the agricultural market and the energy market (De Gorter et al. 2013).

However, the correlation between crude oil price and agricultural commodity prices does not always mean causation from the former to the latter. Previous studies often focused on the causality from crude oil price to agricultural commodity prices, so the possibility of reverse causality is often ignored in the literature. [Baumeister and Kilian \(2014\)](#) argued that the mechanization of agricultural production may increase the energy consumption in the agricultural sector. Therefore, an increase in agricultural production is likely to increase fuel demand and crude oil price. Moreover, an increase in the size of the agricultural and biofuel sectors makes the reverse causality more likely to happen.

Despite its scarcity, the empirical literature has recognized the causality from food prices to energy prices ([Su et al. 2019](#); [Vacha et al. 2013](#); [Avalos 2014](#); [Natanelov et al. 2011](#); [Zhang et al. 2010](#)). However, these studies often employed only the price data without including further information about the agricultural supply and demand. [Baumeister and Kilian \(2014\)](#) and [Serra and Zilberman \(2013\)](#) criticized these time-series models for their inability to identify the transmission mechanisms of the price spillovers between the two markets. Theoretically, the agricultural sector can influence crude oil price through both indirect input cost and direct biofuel channels ([Ciaian 2011](#)). The author showed that the two channels can have different impacts on the crude oil price. In particular, the increase in agricultural supply may lead to a decrease in crude oil demand and crude oil price. However, the increase in agricultural demand caused by ethanol expansion may either increase energy demand or increase energy supply. Therefore, we find that the existing empirical studies are inconclusive about the transmission mechanisms in which the agricultural market can influence the crude oil price.

The contribution of this paper is twofold. Firstly, we confirm the results derived from the theoretical model in [Ciaian \(2011\)](#) that different shocks from the agricultural market can have different effects on oil price. We use the agricultural supply and demand shocks of different crops to test the existence of the indirect input cost and the direct biofuel channels. Our results confirm the existence of the indirect input cost channel in the barley market and the direct biofuel channel in the corn and sorghum market. For the corn market, we identify that agricultural demand shocks play a larger role in the fluctuation of crude oil price, compared to the effect of the agricultural supply shock.

Secondly, our results have important policy implications for the biofuel sector. We find that an increase in corn use in ethanol can have a positive influence on the crude oil price. This is in contrast to the original expectation that the expansion of biofuel can increase the total fuel supply and reduce the dependency of the domestic economy on fossil fuel. Our results show that an increase in corn use in ethanol may lead to an increase in fuel demand and crude oil price, which is an unexpected consequence of biofuel. Such conclusions could not be reached if the analysis only included agricultural prices.

Moreover, the use of corn in ethanol has an additional advantage over using corn price in the sense that corn price and crude oil price are likely to react to changes in monetary and trade policies, global business cycle, and aggregate demand. However, the expansion of corn use in ethanol is most likely to be the result of the renewable energy mandate, which is exogenous to changes of the macroeconomic variables. Therefore, the impact of corn use in ethanol on crude oil price is not likely to be correlated with global economic events.

In general, the novelty of our study is that we include variables which are different in nature, such as oil prices, agricultural prices, agricultural supplies, and corn use in ethanol. This approach differs from existing studies, that often focus on the price spillover effects between the two markets. Our approach is interesting because we can observe a number of interconnected relationships, which might be missed if the analysis only included price variables. In particular, we confirm that the agricultural market can have feedback effects on oil prices. Previous studies did not disentangle the impact of agricultural supply and demand shocks, which can potentially have different effects on oil prices, according to [Ciaian \(2011\)](#). By observing variables other than prices, we find evidence that the agricultural market is more likely to affect oil prices through the direct biofuel channel. We also find that biofuel expansion can lead to an increase in agricultural production, which will eventually increase oil demand.

The following section of this paper is a review of the studies related to the current research. Section 3 presents the methodology and the models used in the empirical section. Section 4 shows the data and preliminary tests. Section 5 presents the results of the empirical analysis and the discussion of the outcomes. Section 6 concludes our research.

2. Literature Review

The literature on the nexus of food versus energy often investigates the relationship between biofuel, agricultural commodity, and crude oil prices. Regarding the studies on biofuel and agricultural markets, many efforts have been devoted to research on price and volatility transmission. Many studies have shown that shocks from the corn market can have an impact on ethanol price, due to corn being a feedstock of bioethanol. [Kristoufek et al. \(2016\)](#) employed the wavelet coherence methodology to study the relationship between ethanol and agricultural commodities in the US and Brazil. The results show that the impact of corn price on ethanol price is unidirectional. The relationships are robust, both in short- and long-term periods. Similarly, [Dutta et al. \(2018\)](#) argued that the volatility in the corn market can have an impact on ethanol price. The paper employed conditional Generalized Autoregressive Conditional Heteroskedasticity (GARCH)-jump models with daily US ethanol and corn prices, both series are based on future contracts. The study found that the relationship is asymmetric because only positive shocks on corn price volatility can induce an increase in ethanol price. [Bentivoglio et al. \(2016\)](#) employed a vector error correction model with the Granger causality test, impulse response function, and forecast error variance decompositions to illustrate that ethanol price is impacted by fluctuations in oil and corn prices, but not the reverse. [Dutta \(2018\)](#) also showed similar results using the Autoregressive Distributed Lag (ARDL) model and the Kyrtsou–Labys nonlinear causality test.

On the other hand, [Hao et al. \(2017\)](#) showed that the ethanol market can also impact agricultural commodity prices. The authors focused on the consequences of biofuel production expansion in the US on the welfare of the poor in developing countries. [Hao et al. \(2017\)](#) investigated the influences of the US ethanol market on the maize prices of developing countries using the panel structural vector autoregression model (panel SVAR). The study divided the developing countries into groups with different political and geographical characteristics, which have potential impacts on the vulnerability of these countries to changes in the US ethanol and maize market. The authors found that the dependency of a country on US Food Aid may have a positive impact on the response of domestic maize prices to US ethanol supply shock. Similarly, coastal countries were found to be more likely to be affected by US ethanol demand shock.

Some studies pointed out that the causal relationship between the agricultural and ethanol markets can run in both ways. [Apergis et al. \(2017\)](#) employed a threshold error correction model (TECM) to show that biofuel and agricultural commodity prices have a bi-directional causal relationship. The study used the daily prices of seasonal biodiesel and agricultural commodities, including corn, sugar, sugarcane, soybean oil, sunflower oil, palm oil, and camelina oil. The results show that the relationships between biofuel price and agricultural commodity prices are non-linear. The non-linear relationships suggest that the analysis of the relationship should be divided into two periods, where the two markets have a stronger bond during the second periods. [Chiu et al. \(2016\)](#) confirmed a bidirectional relationship between corn and ethanol price using the Granger causality test and impulse response function in the Vector Autoregressive (VAR) model and Vector Error Correction Model (VECM).

Most of the studies on this relationship focused on price transmissions. However, there are studies confirming the volatility spillover effect. [Chang et al. \(2018\)](#) showed that there is a strong volatility transmission between the bioethanol market and the agricultural markets. The study employed the diagonal BEKK (named after the authors of the model: Baba, Engle, Kraft, and Kroner) to investigate the spot prices and future prices of corn, sugarcane, and bioethanol. The results show that future prices of bioethanol and agricultural commodities have stronger co-volatility spillovers than their spot prices. These outcomes suggest that the future prices can be used for risk management purpose.

Saghaian et al. (2018) also confirmed the volatility spillover between the corn and ethanol markets. The authors showed that the relationship is bidirectional. However, the spillover effect from the ethanol to the corn market can only be observed using the daily data.

Enciso et al. (2016) employed the Aglink-Cosimo model to investigate the impact of removing biofuel-related policies on the biofuel and agricultural commodity prices and volatilities. According to their results, the biofuel policies can increase biofuel production, consumption, and prices, and reduce their volatilities. Similarly, Zhou and Babcock (2017) showed that corn prices could decrease 5% or 6% if the US biofuel mandates were to be reduced, using the competitive storage model.

The food versus fuel nexus also attracts many studies on the relationship between agricultural commodity and crude oil prices. In this literature, VAR models have been widely used to capture the impact of crude oil price changes on agricultural commodity prices (Lucotte 2016; Ma et al. 2016; Ahmadi et al. 2016). Some studies included the exchange rate and the global business cycle in the analysis of the relationship, as these variables can have an effect on both crude oil and agricultural commodity price (Adam et al. 2018; Wang et al. 2014; Vo et al. 2019). Adam et al. (2018) employed a vector autoregressive model (VAR) to analyze the crude oil price, the rice price, and the exchange rate. Their results show that crude oil price has a unidirectional relationship with rice price, however, the relationship only exists in the short term. The reason is that oil price changes can cause fluctuations in rice price, because crude oil is an important input factor in rice production.

The relationship between crude oil and agricultural commodity prices was impacted by the food price crisis during 2007–2008. Wang et al. (2014) used the SVAR approach to analyze the impact of different oil-related shocks on various agricultural commodity prices. SVAR approach has been widely used as well (Vo et al. 2018; Nguyen and Vo 2019). The study found that the impact of oil-specific demand shocks on the many agricultural commodity prices was only significant after the food price crisis. Han et al. (2015) also argued that the changes in crude oil price and agricultural commodity price relationship are most likely to be affected by the last financial crisis, of 2007–2008. Their analysis employed the multivariate normal mixture models to analyze the interactions of energy price and agricultural commodity prices. Their results show that industrial commodity prices are more likely to affect one another when the price and volatility transmission have a higher possibility to happen after the financial crisis. Using a VECM model, Chen and Saghaian (2015) showed that the relationship between oil, ethanol, and sugar has become stronger after 2008 in Brazil, where oil price tends to impact the other two variables, while sugar price tends to impact ethanol price. Most of the studies capturing the correlation between oil and agricultural markets interpret such correlations as the transmissions and spillovers from the former to the latter (Koirala et al. 2015; Zafeiriou et al. 2018; Allen et al. 2018).

The reason for the stronger bond between the two markets might be caused by renewable energy mandates. Several studies argued that the expansion of biofuel production has attracted land use, water, and other agricultural resources. Because these resources are limited, the expansion may lead to the reduction of food crop supplies (Büyüktaşkın and Cobuloglu 2015; De Martino Jannuzzi 1991; Fradj and Jayet 2016; Herrmann et al. 2017). To and Grafton (2015) provided evidence that a global increase in oil price and biofuel demand has contributed a significant role in agricultural commodity price fluctuations.

On the other hand, some studies also recognized the potential impact of agricultural shocks on the crude oil price. Ciaian's theoretical model (Ciaian 2011) suggests that agricultural shocks can affect crude oil price through different channels. According to this study, when food demand is inelastic, surges in agricultural supply resulting from positive productivity shocks accompanied may reduce the farmers' profit margin and therefore trigger a reduction in production activities and fuel demand. On the contrary, with an elastic food demand, an increase in agricultural productivity may result in an increase in fuel demand, due to the increase in food consumption. Besides the indirect input cost channel, the theoretical framework shows that an increase in biofuel production can lead to opposite effects on crude oil price. On the one hand, biofuel expansion will increase the energy supply and have a negative effect on crude oil price. On the other hand, agricultural production expansion due to an

increase in demand for ethanol feedstock will increase fuel demand and crude oil price. In general, the direct biofuel channel has an ambiguous effect on crude oil price.

Su et al. (2019) showed that the bidirectional relationships between crude oil price and agricultural commodity prices are more likely to be found in the sub-sample periods using the sub-sample rolling estimation. Furthermore, the study also pointed out that agricultural commodities that are not feedstocks of biofuel production can also have bidirectional relationships with oil price.

The existing studies suggest the increasing roles of agricultural shocks in energy markets, specifically the ethanol and crude oil markets. It has been shown that agricultural shocks can be divided into supply and demand shocks, with each type of shock having potentially different impacts. However, the existing studies only employed agricultural commodity prices to investigate the relationship between agricultural and energy markets. Within the extent of our knowledge, our study is the first one to attempt to investigate the impact of agricultural shocks on oil price using agricultural demand and supply shocks. The study reveals that supply and demand shocks can have different impacts on oil price and thus, should be studied individually.

3. Methodology

In this paper, we used the SVAR model to estimate the relationship between agricultural markets and the crude oil market. It has been pointed out that agricultural commodity prices are endogenous to oil price, and vice versa (Zhang et al. 2010; Natanelov et al. 2011; Vacha et al. 2013; Avalos 2014; Su et al. 2019). Therefore, standard regression models cannot capture the bidirectional relationship between the two commodities. Even though VAR models can be used to treat the endogeneity problem, such models are said to have little power to establish a causal relationship between oil and agricultural commodity prices (Baumeister and Kilian 2014). Cooley and LeRoy (1985) pointed out that the estimations of VAR models are often based on ad-hoc assumptions, which may be arbitrary. Thus, we employed the following SVAR model, with exclusion restrictions based on the economic theories and empirical evidence:

$$Az_t = \alpha + \sum_i^p \omega_i z_{t-1} + \varepsilon_t. \quad (1)$$

In the first model, we have $z_t = (\Delta oilpro_t, \Delta aggreg_t, \Delta oilpr_t, \Delta agrip_r_t)$, where $oilpro_t$ denotes the logs of world crude oil production, $aggre_t$ denotes the aggregate demand captured by the Kilian's index (Kilian 2018), $oilpr_t$ denotes the US real imported crude oil price, and $agrip_r_t$ represents the real agricultural commodity prices. ε_t represents the vector of mutually uncorrelated structural shocks in each equation of the system. Δ is the first order difference operator. We ran this model on the full sample period from January 1986 to May 2018.

We imposed matrix A so that its inverse had the following recursive structure:

$$A^{-1} = \begin{pmatrix} a_{11} & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} \end{pmatrix}.$$

The reduced-form of Equation (1) becomes:

$$z_t = \beta + \sum_i^p \Omega_i z_{t-1} + \epsilon_t,$$

$$\text{where } \epsilon_t = \begin{pmatrix} \epsilon_t^{\Delta oilpro} \\ \epsilon_t^{\Delta aggreg} \\ \epsilon_t^{\Delta oilpr} \\ \epsilon_t^{\Delta agrip_r} \end{pmatrix} = \begin{pmatrix} a_{11} & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} \end{pmatrix} \begin{pmatrix} \epsilon_t^{\Delta oilpro} \\ \epsilon_t^{\Delta aggreg} \\ \epsilon_t^{\Delta oilpr} \\ \epsilon_t^{\Delta agrip_r} \end{pmatrix}.$$

We ran the SVAR model for the vector $z = (\Delta oilpro_t, \Delta aggre_t, \Delta oilpr_t, \Delta agrip_t, \Delta agripri_t)$ for the second model, where $agripri_t$ denotes the agricultural supplies of corn, sorghum, and barley. We ran the third model for the vector $z = (\Delta oilpr_t, \Delta cornethanol_t, \Delta cornpr_t, \Delta cornpro_t)$, where $cornethanol$ denotes the logs of corn use in ethanol, $cornpr$ denotes the corn price, and $cornpro$ represents the corn supply.

The orders of the variables in the vectors reflect the exclusion restrictions, which are widely agreed in the economic theories and empirical literature. Firstly, studies on the link between the oil market and the agricultural markets often agreed on the exogeneity of the former to the latter (Kilian 2009; Wang et al. 2014; Qiu et al. 2012; McPhail et al. 2012; McPhail 2011; To et al. 2019). Therefore, oil-related variables have higher orders in the vector of endogenous variables. Within the oil market, oil supply is assumed to only respond to its own shock within the same period. This assumption is based on the fact that major oil producers often have a long-term plan for their production. Therefore, these oil producing countries do not respond to temporary fluctuations in demand shock. The global economic activities often respond to the disruptions of oil supply caused by political events from the Organization of Petroleum Exporting Countries (OPEC), while the global oil supply does not respond contemporarily to the aggregate demand shock. On the other hand, oil prices do not have a contemporaneous impact on the global industrial demand, while the aggregate demand can have an impact on oil demand, as reflected by Kilian (2009).

Within the agricultural market, agricultural demand shocks often have a stronger impact on agricultural commodity prices than agricultural supply shocks (Qiu et al. 2012). The reason is that the agricultural stocks and trade liberalization tend to lessen the impact of agricultural supply shocks on crop prices (Jha and Srinivasan 2001). Therefore, the agricultural prices and corn use in ethanol have a higher order of exogeneity than the agricultural supply variables. For the third model, the response of ethanol demand to shocks to the corn market is considered lagging because ethanol demand is more likely to be affected by the renewable energy mandates (Qiu et al. 2012; McPhail et al. 2012), which explains the exogeneity of corn use in ethanol to other corn demand shocks.

The fluctuations of the global aggregate demand, crude oil demand, and supply shocks, which are often the results of an increase in trade openness, changes in monetary and trade policies, contribute simultaneously and significantly to the fluctuation in demand for agricultural products and crude oil price. The SVAR helps us to disentangle the impact of the agricultural supply and demand shocks from the common factors by decomposing the error terms into mutually uncorrelated shocks.

4. Data and Tests

The main purpose of this paper is to investigate the impact of different agricultural shocks on the US crude oil price over the period from January 1986 to May 2018. In this paper, we used the imported crude oil price to capture the domestic oil price. The real monthly average imported crude oil price and world crude oil production were obtained from the Energy Information Administration (EIA) (<https://www.eia.gov/>). The nominal agricultural commodity prices, agricultural supplies, and corn use in ethanol were collected from the Feed Grains Database of Economic Research Service, USDA (<https://www.ers.usda.gov/>). The nominal agricultural commodity prices were deflated by the Consumer Price Index of the total all items for the United States, retrieved from the Federal Reserve Economic Data (FRED) (<https://fred.stlouisfed.org>). By using the real prices of agricultural commodities and crude oil, we effectively controlled for the simultaneous inflationary effects of monetary policies on both commodity prices. Therefore, we can disentangle the effects of the agricultural supply and demand shocks from the common factor of monetary policies. The changes in global demand for industrial commodities can be captured by the changes in demand for transport services, which are reflected in the variation in ocean freight rate (Kilian 2009). Therefore, we used an index developed by Kilian (Kilian 2018) as a proxy for the aggregate demand¹.

¹ The data can be obtained from the following website: <https://sites.google.com/site/ikilian2019/research/data-sets>.

Regarding the decision of structural breaks and subsample periods, we recognize that there are other important economic and political events that might have a significant impact on crude oil and agricultural prices. For example, [Baumeister and Kilian \(2016\)](#) stated in their work that several supply and demand shocks during 2014 played a large role in the fluctuations of the oil price and other commodities. During this year, the production expansion of both OPEC and non-OPEC countries increased the global oil supply. Additionally, the price reduction of other commodities and the decline in oil stocking behaviors put downward pressure on the oil demand. On the other hand, [Chiu et al. \(2016\)](#) recognized that the relationship between crude oil prices and agricultural prices has changed over time due to multiple structural shifts. In particular, the authors observed that the causal relationship from agricultural prices to oil prices was strengthened during 1998–1999 (after the Asian financial crisis) and 2008–2009 (during the Global financial crisis and Global food crisis). As a result, we recognize that these events are worthy of exploration for future research. However, we decided to focus on the impact of the Energy Policy Act of 2005 on the relationship between oil prices and the agricultural market in this paper.

For the first model, we divided the full sample into two subsamples, including the first period, from January 1986 to December 2005, and the second period, from January 2006 to May 2018. Barley, corn, and sorghum supply series were only available in quarterly data. For the second model, the marketing year of barley supply began on 1 June, and its four quarters included June–August, September–November, December–February, and March–May. Therefore, the first period of barley supply series was Q3 1985 to Q3 2005 and the second period was from Q4 2005 to the Q4 2017 in the barley marketing year. Similarly, the marketing year of corn and sorghum supply began on 1 September, and its four quarters included September–November, December–February, March–May, and June–August. Thus, the first period of corn and sorghum supply was from Q2 1985 to the Q2 2005 and their second period was from Q3 2005 to Q3 2017 in the corn and sorghum marketing year. For the third model, the first period of corn use in ethanol was from Q1 1986 to Q2 2005 and its second period was from Q3 2005 to Q3 2017 in the corn marketing year.

The partition of the dataset was motivated by the implementation of the Energy Policy Act of 2005. Previous studies pointed out that agricultural and energy markets are more likely to interact with each other after the event ([Su et al. 2019](#); [Avalos 2014](#); [Wang et al. 2014](#); [Baumeister and Kilian 2014](#)). Moreover, the shocks of the food crisis and the global financial crisis, which can trigger changes in the joint dynamics between the two markets, also happened during this period. [Baumeister and Kilian \(2014\)](#) argued that the increase in the mechanization of the agricultural production in major agricultural countries can also increase the strength of the relationship between the agricultural and fuel markets. Therefore, the causal relationship from the former to the latter, if any, is more likely to be found during this period, compared to the previous periods.

Table 1 shows the descriptive statistics of the commodity prices, the agricultural supplies, and corn use in ethanol. The commodity prices had higher means and standard deviations during the second period. For each period, corn supply was larger in mean and more volatile than the supplies of other agricultural commodities. Moreover, the mean and volatility of the corn supply increased, while those of the barley and sorghum supplies decreased during the second period. Similarly, there was also an expansion of alcohol supply for fuel use during the second period.

Table 1. Data Description.

January 1986–December 2005						
Variable	Mean	SD	Max	Min	Skewness	Kurtosis
Oil supply	11.06	0.08	11.22	10.90	0.14	2.14
Kilian index	−0.98	41.72	125.00	−81.10	1.08	4.34
Oil price	34.85	10.32	75.68	14.45	1.30	5.70
Barley price	3.58	0.70	5.97	2.43	1.28	4.60
Corn price	3.59	0.91	6.69	2.09	0.67	3.26
Sorghum price	3.33	0.85	6.49	1.89	0.72	3.63
Barley supply	366.48	169.31	937.11	125.11	1.10	4.07
Corn supply	6924.41	2908.72	13,228.27	1720.75	0.22	2.06
Sorghum supply	484.69	350.66	1489.88	70.39	1.01	3.34
Biofuel demand	4.85	0.48	5.96	4.12	0.67	2.62
January 2006–May 2018						
Variable	Mean	SD	Max	Min	Skewness	Kurtosis
Oil supply	11.25	0.04	11.32	11.19	0.40	1.72
Kilian index	3.23	79.92	188.00	−164.00	0.58	2.57
Oil price	81.73	27.55	147.58	28.39	0.05	2.02
Barley price	5.03	0.93	6.78	2.94	−0.19	2.36
Corn price	4.45	1.38	7.87	2.38	0.78	2.46
Sorghum price	4.28	1.32	7.12	2.10	0.63	2.25
Barley supply	199.79	61.10	321.26	98.99	0.46	2.11
Corn supply	8999.50	4061.65	16,908.16	2805.80	0.27	1.93
Sorghum supply	226.60	144.28	618.76	34.33	0.94	3.09
Biofuel demand	6.97	0.34	7.26	6.01	−1.54	4.19

In our structural VAR model, we decomposed the agricultural commodity price variance into agricultural supply shock and agricultural demand shocks in the second model. The third model further divided the corn demand shocks into corn use in ethanol shock and other corn demand shocks. For the oil market, we decomposed oil-related shocks into oil supply shock, aggregate demand shock, and other oil-specific demand shocks.

In this paper, we used the unit root tests based on the augmented Dickey and Fuller (ADF) (Dickey and Fuller 1979), Phillips and Perron (PP) (Phillips and Perron 1988), and Kwiatkowski–Phillips–Schmidt–Shin (KPSS) methods (Kwiatkowski et al. 1992). The null hypothesis of the ADF and PP tests is that the time series has a unit root, while the null hypothesis of the KPSS test is that the time series is stationary. For the ADF test in Table 2A, we cannot reject that 7 out of 10 series were non-stationary at 5% significance level. According to the PP test, there were 5 series that had a unit root. The KPSS statistics reject the hypothesis that nine series followed stationary processes. For the first order difference series, the three tests indicate stationarity at 1% significance level for all series, except for the KPSS statistics of the corn use in ethanol.

Table 2. (A) Unit root tests without structural break. (B) Unit root test with a structural break.

(A)						
Variables	ADF		PP		KPSS	
	Original Series	First Order Difference	Original Series	First Order Difference	Original Series	First Order Difference
Oil production	−0.42	−6.75 ***	−1.07	−21.32 ***	0.14 *	0.03
Kilian index	−2.69 *	−7.03 ***	−3.02 **	−14.21 ***	0.26 ***	0.03
Oil price	−1.78	−9.7 ***	−2.18	−11.11 ***	0.21 **	0.07
Barley price	−2.24	−10.95 ***	−2.27	−20.08 ***	0.3 ***	0.05
Corn price	−2.94 **	−5.34 ***	−2.72 *	−12.57 ***	0.2 **	0.05
Sorghum price	−2.56	−8.12 ***	−2.94 **	−14.63 ***	0.18 **	0.04
Barley supply	−4.12 ***	−4.58 ***	−5.96 ***	−25.4 ***	0.35 ***	0.02
Corn supply	−1.97	−5.71 ***	−11.15 ***	−25.19 ***	0.22 ***	0.02
Sorghum supply	−3.19 ***	−4.94 ***	−5.94 ***	−24.57 ***	0.42 ***	0.02
Bio demand	−0.36	−4.43 ***	−0.19	−10.27 ***	0.37 ***	0.16 **

(B)						
Variables	Model A1: Breaks in Intercept		Model A2: Breaks in Trend		Model A3: Breaks in Intercept and Trend	
	Original Series	First Order Difference	Original Series	First Order Difference	Original Series	First Order Difference
Oil production	−5.96 ***	−11.16 ***	−5.49 ***	−11.08 ***	−5.95 ***	−11.15 ***
Kilian index	−4.29	−11.51 ***	−3.6	−11.34 ***	−4.71	−11.69 ***
Oil price	−4.86 **	−10.05 ***	−4.1	−9.66 ***	−5.15 **	−10.03 ***
Barley price	−4.23	−11.11 ***	−3.03	−11.02 ***	−4.01	−11.13 ***
Corn price	−4.28	−12.92 ***	−3.29	−12.67 ***	−4.64	−13.06 ***
Sorghum price	−4.64 *	−9.04 ***	−3.83	−8.83 ***	−5.59 **	−9.22 ***
Barley supply	−3.77	−5.05 **	−3.18	−5.67 ***	−3.4	−5.62 ***
Corn supply	−2.36	−5.27 **	−2.68	−5.19 ***	−2.56	−5.34 **
Sorghum supply	−1.94	−5.93 ***	−6.78 ***	−5.54 ***	−4.22	−6.01 ***
Bio demand	−3.08	−6.01 ***	−2.06	−5.69 ***	−2.43	−6.12 ***

Notes: *, **, *** denote significance at the 10%, 5%, 1% level respectively.

The conventional unit root tests may fail to reject the unit root hypothesis when the alternative stationarity is true and the series contains structural breaks. Taking account of this possibility, many studies have come up with unit root tests with structural breaks. These tests are more likely to reject the null hypothesis of unit root compared to the traditional Dickey–Fuller unit root test (Zivot and Andrews 2002; Perron 1989). However, the limitation of the model using one structural break is that it may still fail to reject the null hypothesis if the series contains two structural breaks (Perron and Vogelsang 1992; Clemente et al. 1998; Lumsdaine and Papell 1997). Moreover, according to Lee and Strazich (2003), the null hypothesis of these models assumes a unit root without breaks. Therefore, rejection of the null hypothesis does not necessarily mean that the series is trend-stationary with breaks. In contrast, the rejection of the null suggests that the series may contain a unit root with breaks.

In Table 2B, we employed the unit root test with the assumption that the series contained a structural break developed by Zivot and Andrews (2002). The test has three models with different assumptions. The first model assumes that the time series has a structural break in the intercept, the second model assumes a structural break in trend, while the third model tests the stationarity of the series under the assumption of both intercept and trend. The three models show that most of the time series is integrated with the order of one.

5. Empirical Results

5.1. Agricultural Commodity Price and Oil Price Shocks

In the literature of crude oil price and its relationship with agricultural commodity prices, several studies found it helpful to add oil supply and global economic activity as control variables (Kilian 2009; Wang et al. 2014). The reason for this is that oil price might be endogenous to oil supply and the global business cycle, while the global business cycle can affect both oil and agricultural commodity prices. Following previous studies, we first investigated the price relationship using the monthly data and the following model, during the period from 1986m1 to 2018m5:

$$z = (\Delta oilpro_t, \Delta aggreg_t, \Delta oilpr_t, \Delta agripri_t).$$

We considered the Akaike information criterion (AIC) to choose the optimal number of lags. The information criterion suggests two lags for the period 1986m1 to 2005m12 and one lag for the period 2006m1 to 2018m5. Figure 1A,B plots the accumulative response of agricultural commodity prices to the oil-specific demand shocks and the responses of oil price to agricultural commodity price shocks. During the first period, we can see that the agricultural commodity prices did not respond significantly to oil-specific demand shock. The only exception is the marginally significant response of corn price in the second month. However, the effect disappears shortly after that.

The situation changed sharply during the second period. The responses of corn price and sorghum price were positive and statistically significant, while the response of barley price was still insignificant. The response of corn price was significant in a very short period of time, while the effect on sorghum price lasted for 8 months.

Regarding the impact of agricultural shocks on oil price, there was no significant response during the first period. During the second period, the impact of barley-related shocks was still insignificant. On the other hand, corn-related shocks inflicted a significant and lasting impact on oil price (up to 8 months), while the effect of sorghum-related shocks was only marginally significant in the first month.

In general, the relationship between crude oil and agricultural commodity prices depends on the time period and the commodities under investigation. The links between the two markets appear to have been stronger during the second period. There are many studies attributing the difference between the two periods to the expansion of biofuel production. According to our results, corn and sorghum appear to have a stronger connection with crude oil price, compared to barley. In the US,

corn and sorghum are used as feedstocks for biofuel production. Thus, these commodity prices are more likely to react to oil price fluctuations, as well as to trigger changes in the oil market.

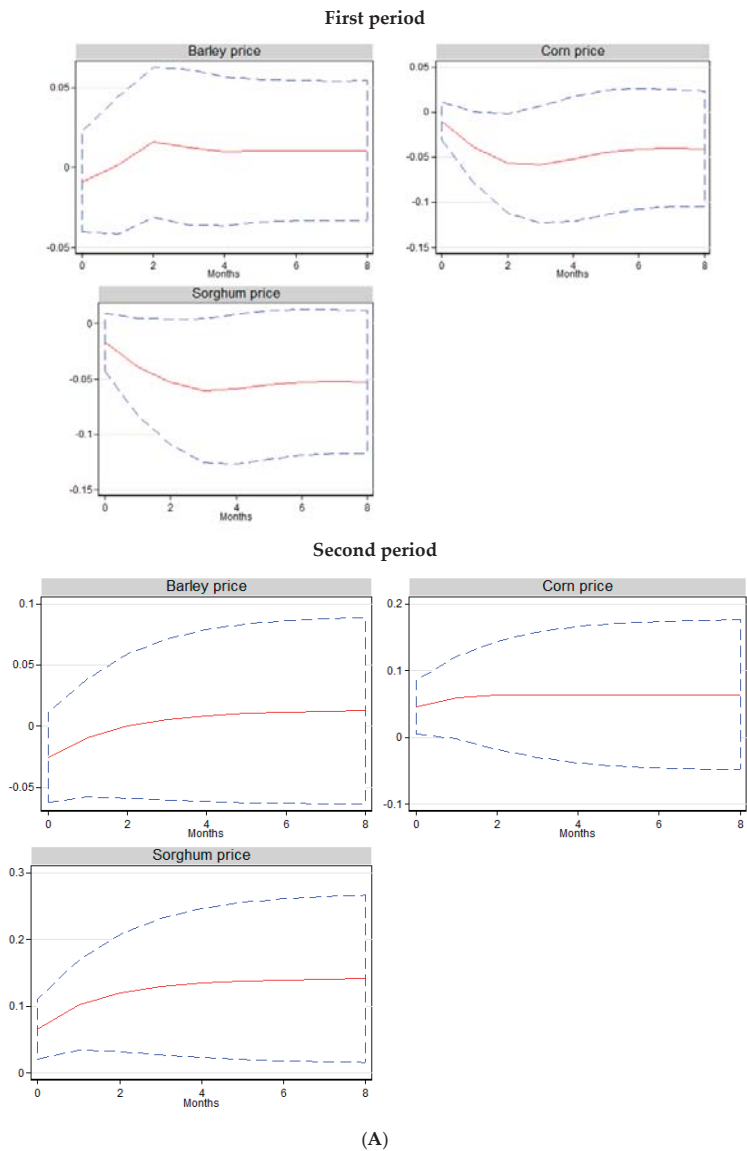


Figure 1. Cont.

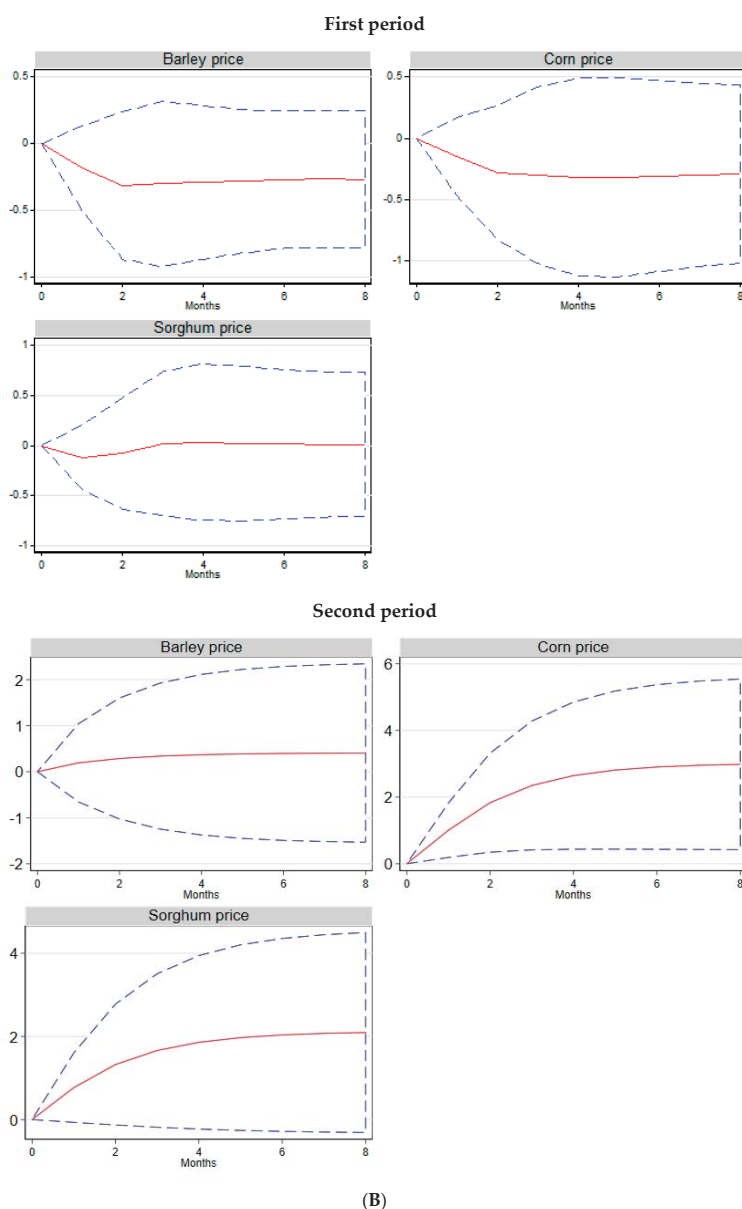


Figure 1. (A) Response of agricultural commodity prices to oil-specific demand shocks; (B) response of oil price to agricultural related-shocks. Notes: Red lines represent cumulative orthogonalized impulse-response functions while blue lines represent 95% confidence intervals.

The results suggest that the corn market can have an influence on crude oil price. According to the descriptive statistics, corn has far a larger supply than other agricultural commodities, which suggests that corn production may consume more energy than other agricultural sectors. In the US, corn is the main source of feedstock for ethanol production. Since 2006, the Energy Act 2005 by the US

Government has increased ethanol consumption exponentially. The expansion of corn production due to an increase in ethanol consumption might explain why corn price can have an influence on oil price.

5.2. The Responses of Agricultural Commodity Prices to Supply and Demand Shocks

In the second model, our main objective was to differentiate the effects of agricultural shocks on oil price changes. According to the previous section, it has been shown that shocks in the agricultural markets can have a significant impact on crude oil price. However, agricultural shocks can be divided into supply and demand-related shocks. Therefore, using only agricultural commodity prices does not allow us to identify which agricultural shocks are responsible for crude oil responses. Thus, it is helpful to include agricultural supplies in the model specification, along with agricultural commodity prices. Similar practices can be found in Qiu et al. (Qiu et al. 2012). We used the following model:

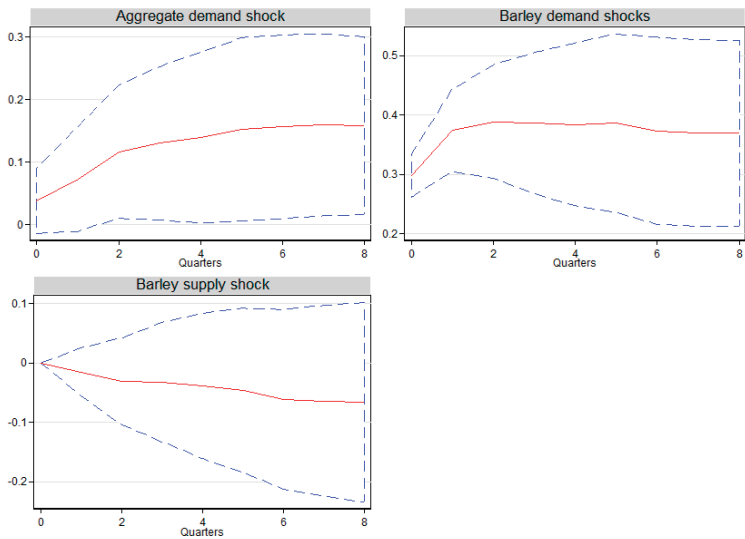
$$z = (\Delta oilpro_t, \Delta aggreg_t, \Delta oilpr_t, \Delta agripri_t, \Delta agripro_t).$$

In this model, we used the dummy variables as the exogenous variables of the SVAR system to control for the seasonality in agricultural supplies. The inclusion of the exogenous variables helped to increase the stability of the models, which tend to be unstable due to the inclusion of the agricultural supply data². In Qiu et al. (Qiu et al. 2012), the authors used the cubic spline interpolation to convert the quarterly agricultural supplies into monthly supplies. The disadvantage of this technique is that there should be a good theoretical reason for why the agricultural supply data should behave like a cubic function. In this paper, we decided to use the quarterly data of the agricultural supplies and the quarterly average of the other monthly variables. The consideration of the Akaike information criterion suggests four lags in both periods.

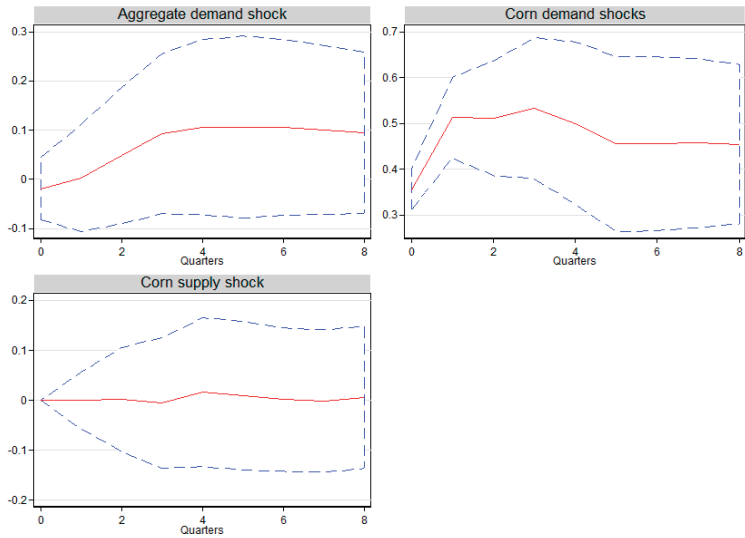
In prior to analyze the effects of agricultural shocks on oil price, we first plotted the response of agricultural commodity prices to the supply and demand shocks in Figure 2A–C. We can see that the responses of corn and sorghum price to real economic activity shocks are positive but not significant, while the impact of aggregate demand on barley price is marginally significant.

The shocks to barley, corn, and sorghum supplies did not have a significant impact on their own prices. In contrast, agricultural-specific demand shocks were the main factors contributing to the agricultural commodity price fluctuations. It can be seen that the responses of barley, sorghum, and corn price to their own specific demand shocks were positive and significant for eight quarters. The results confirm the hypothesis that the supply shock has a lesser impact on agricultural commodity prices than the demand shocks. The reason for this might be buffer stocking behaviors and trade liberalization. In times of crisis, the lack of supply from one region can be neutralized by the abundant supplies from other regions, thanks to free trade.

² The results of the stability tests are available upon request.



(A)



(B)

Figure 2. Cont.

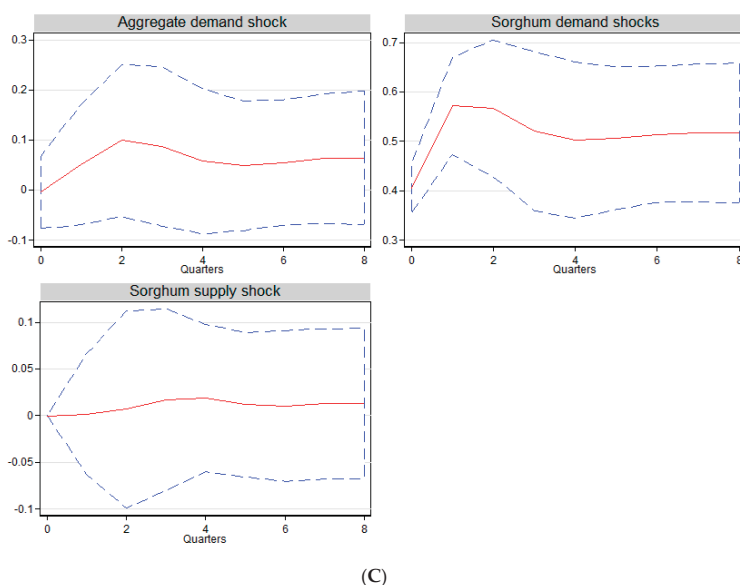


Figure 2. (A) Response of barley price to barley-related shocks. (B) Response of corn price to corn-related shocks. (C) Response of sorghum price to sorghum-related shocks. Notes: Red lines represent cumulative orthogonalized impulse–response functions while blue lines represent 95% confidence intervals.

5.3. The Responses of Oil Price to Agricultural Supply and Demand Shocks

In the previous section, we analyzed the impacts of agricultural shocks on agricultural commodity prices. In this section, we will investigate the impact of these shocks on crude oil price. Figure 3A–C shows the responses of crude oil price to different agricultural shocks. During the first period, we can see that the oil price did not respond significantly to agricultural shocks. The results are consistent with the unresponsiveness of oil price to agricultural commodity price shocks during the first period in Figure 1B.

During the second period, Figure 3A shows that the response of oil price to barley demand shocks was still insignificant. However, the response of oil price to barley supply shock was significantly negative. The reason for this might be that a positive productivity shock in the barley market reduced the demand for crude oil (Ciaian and Kancs 2011).

For the corn and sorghum case, Figure 3B,C shows that corn and sorghum supply shocks did not have a significant impact on crude oil price during the second period, even though we can see significant responses of oil price to corn and sorghum price shocks in Figure 1B. This can be explained by the insignificant impact of agricultural supply shocks on agricultural commodity prices observed in Figure 2A–C.

Figure 3B,C shows that the responses of crude oil price to corn and sorghum demand shocks were significantly positive during the second period. The effects of corn and sorghum demand shocks lasted for the first three quarters. After that, the impact of the sorghum demand disappeared, while the response of oil price to corn demand shocks became marginally significant from quarter five to eight.

In general, we observed that the significant response of oil price to corn and sorghum price shocks observed in Figure 1B was due to the impact of agricultural demand shocks on oil price, while the agricultural supply shocks played an insignificant role. The reason for this is the insignificant impact of agricultural supplies on their own prices observed in Figure 2B,C. Additionally, we observed that the responses of oil price to barley, corn, and sorghum supply and demand shocks were different.

For the barley case, the agricultural commodity is indirectly used in biofuel production. Therefore, the crop can only impact oil price through the indirect input cost channel, which is triggered by the productivity shocks. For the corn and sorghum cases, these two commodities are directly used in biofuel production. Thus, they are more likely to impact oil price through the direct biofuel channel, which is triggered by the increase in demand for biofuel feedstocks.

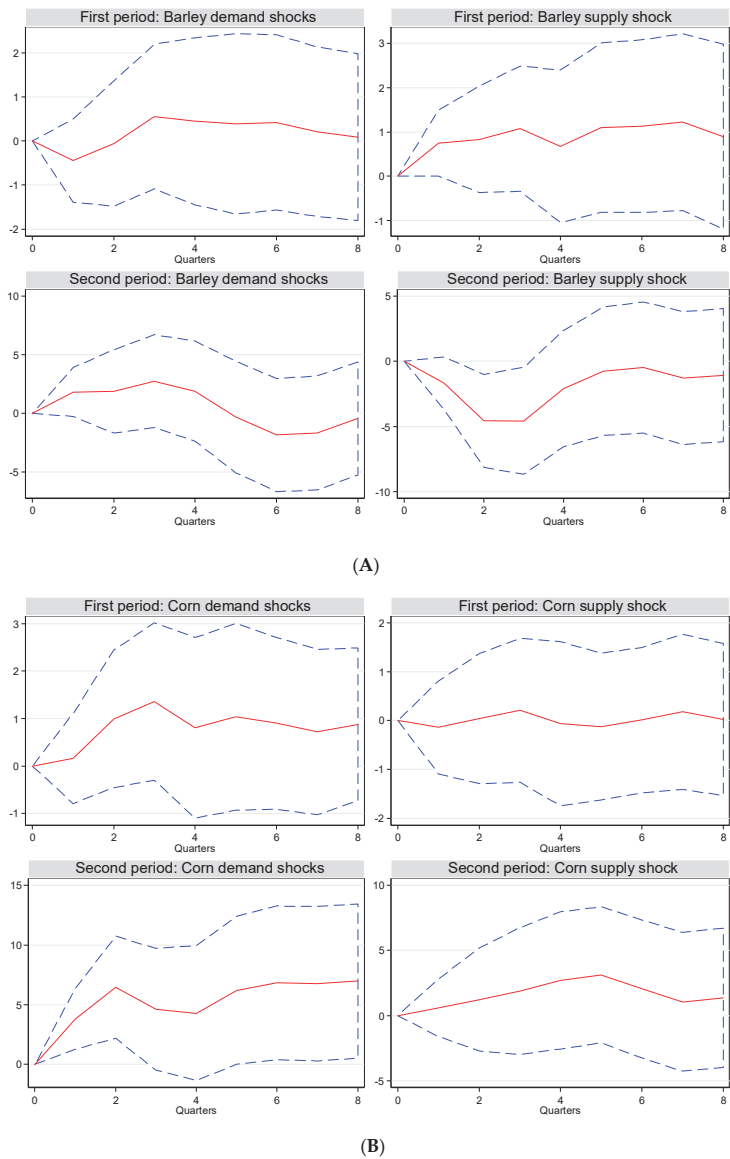


Figure 3. Cont.

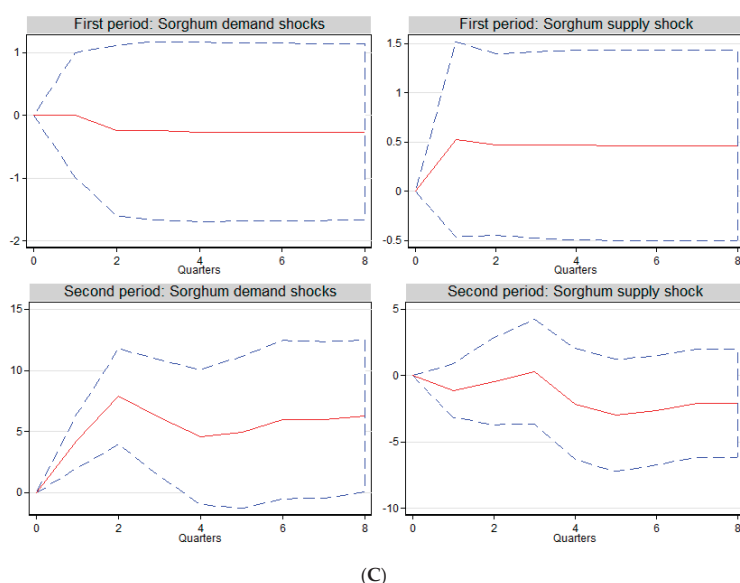


Figure 3. (A) Response of oil price to barley supply and demand shocks. (B) Response of oil price to corn supply and demand shocks. (C) Response of oil price to sorghum supply and demand shocks. Notes: Red lines represent cumulative orthogonalized impulse–response functions while blue lines represent 95% confidence intervals.

After the Energy Act 2005 by the US Government, the expansion in ethanol production has led to an increase in corn demand, besides the demand from the animal feed industry and human consumption. Therefore, we decided to further decompose corn demand shocks into corn use in ethanol and other corn demand shocks, using the following model, in the period 1986Q1 to 2005Q3 and period 2005Q4 to 2017Q3 (corn marketing year):

$$z = (\Delta oilpr_t, \Delta cornethanol_t, \Delta cornpr_t, \Delta cornpro_t).$$

The consideration of the Akaike information criterion suggests four lags for this model. Figure 4A,B shows the response of corn use in ethanol to oil price changes and the response of crude oil price to corn-related shocks after decomposing corn demand shocks into corn use in ethanol and other corn demand shocks. According to Figure 4A, oil price did not have a significant impact on corn use in ethanol during the first period. However, the response of corn use in ethanol to oil price variance became significant during the second period. The results suggest that the increase in oil price has created an incentive for more ethanol consumption, which ultimately transfers into the increase in the quantity of corn use in ethanol. On the other hand, such phenomena can only be observed during the second period, when the biofuel mandate became effectively implemented. The timing suggests that the biofuel mandate was successful in inducing consumers to increase biofuel consumption when oil prices increased.

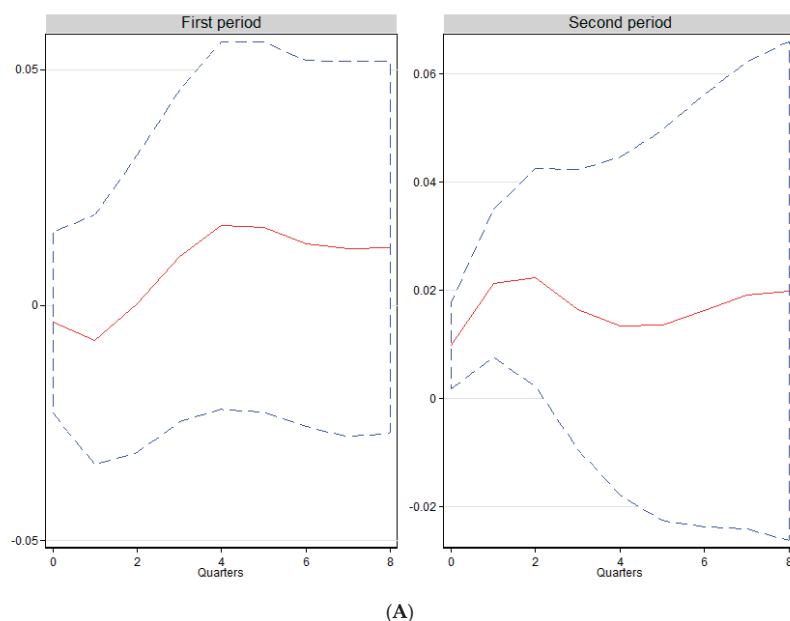
Table 3 shows that the null hypothesis that crude oil price does not Granger-causes corn use in ethanol cannot be rejected during the first period. However, the null is rejected at 5% during the second period. The results suggest that during this period, surges in oil price tended to make biofuel a more viable alternative to fossil fuel, which increased corn demand for ethanol production.

Table 3. Granger causality.

Direction of Causality	1986m1–2005m12	2006m1–2018m5
Oil price → Barley price	1.32	0.90
Barley price → Oil price	1.45	0.20
Oil price → Corn price	4.56	0.01
Corn price → Oil price	1.42	5.97 **
Oil price → Sorghum price	2.00	1.12
Sorghum price → Oil price	0.59	3.27 *
Corn demand → Oil price	3.22	11.8 **
Corn supply → Oil price	1.05	1.04
Oil price → Corn use in ethanol	1.23	11.29 **
Corn use in ethanol → Oil price	6.16	6.52

Notes: *, ** denote significance at the 10%, 5% level respectively.

Regarding the responses of crude oil price, Figure 4B shows that agricultural shocks did not have a significant impact on crude oil price during the first period. The situation changed during the second period, when corn use in ethanol shock could trigger a marginally significant response of oil price. The impacts of other corn demand shocks and corn supply shock were insignificant in the second quarter. In Table 3, corn use in ethanol, other corn demand, and corn supply do not Granger-cause crude oil price during the second period.

**Figure 4.** Cont.

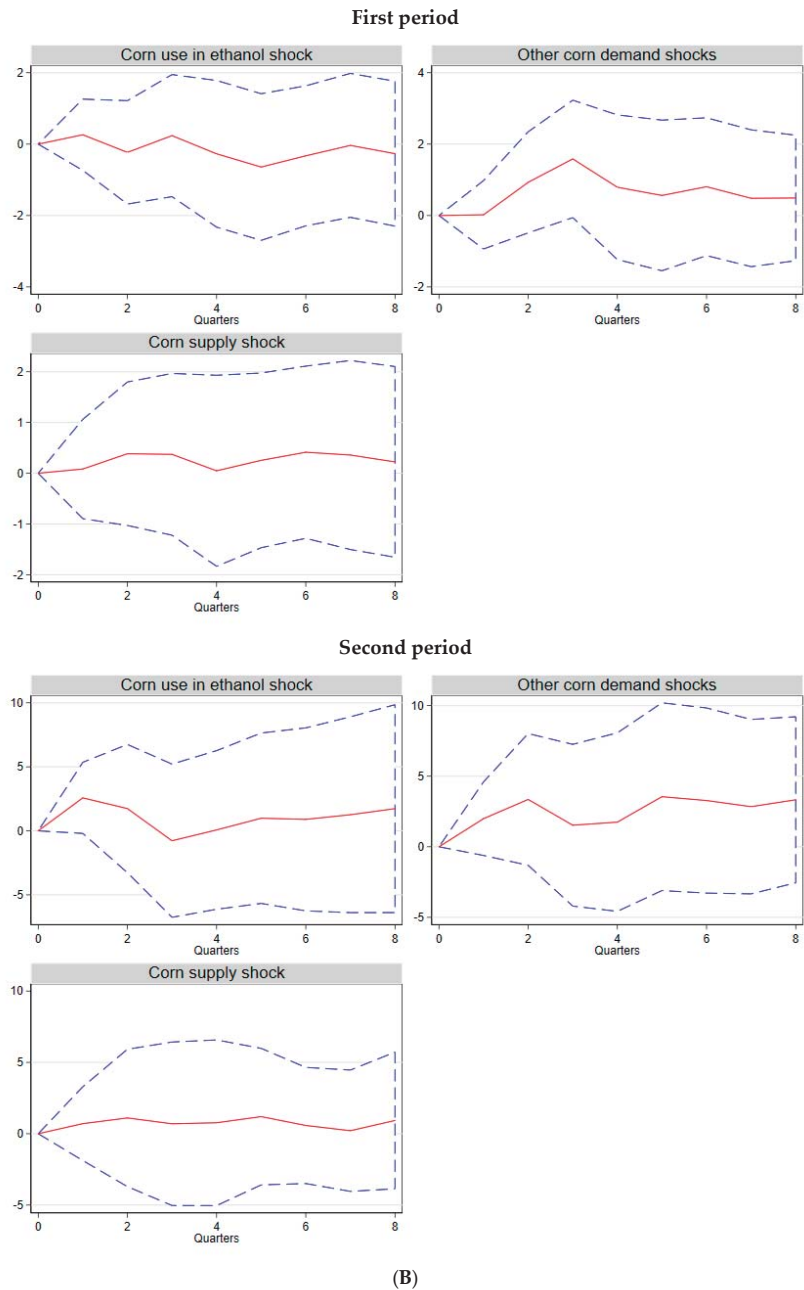


Figure 4. (A) Response of corn use in ethanol to oil price shocks. (B) Response of oil price to corn-related shocks. Notes: Red lines represent cumulative orthogonalized impulse–response functions while blue lines represent 95% confidence intervals.

5.4. The Contribution of Agricultural Shocks to Oil Price Changes

Table 4 quantifies the contribution of oil and corn-related shocks on crude oil price changes, using the method of forecasting error variance decomposition. We can see that other oil-specific demand shocks contributed the most, while the contribution of corn-related shocks was negligible during the first period. During the second period, even though other oil-specific demand shocks still contributed the most to oil price changes, its contribution reduced significantly. In contrast, the contribution of corn demand shocks increased almost fourfold, which contributed 18% to oil price variance and its contribution is comparable to the contribution of the aggregate demand during the second period. In general, the results suggest that corn demand shocks played a larger role in explaining oil price fluctuations, compared to the corn supply shock.

Table 5 shows the contribution of corn-related shocks after decomposing corn demand shocks into corn use in ethanol and other shocks. We can see that corn supply shock was the least important one among corn-related shocks during both periods. In the first period, we can see that other corn demand shocks contributed the most among corn-related shocks. However, during the second period, corn use in ethanol explained almost 10% of oil price changes and became the most important source of shocks among corn-related shocks. The results suggest that the transmission from the corn market to crude oil price is more likely to be explained by the direct biofuel channel than the indirect input cost channel during the second period.

5.5. The Impact of Corn Use in Ethanol on Corn Price and Corn Supply

Regarding the food versus fuel literature, various studies have found evidence that the expansion of biofuel may have a negative impact on food security and the welfare of the poor. In this study, Figure 5 shows the responses of corn price and corn supply to changes in corn use in ethanol.

During the first period, the response of corn supply to positive changes in corn use in ethanol was insignificant, while the response of corn price was significantly negative. The negative relationship between corn use in ethanol and corn price is more likely to reflect that corn use in ethanol might react to the future expectation of corn price fluctuation. In particular, the future expectation of a corn price increase may reduce the demand for corn use in ethanol.

During the second period, we can see that the response of corn price to positive shock on corn use in ethanol shock was insignificant. On the other hand, Figure 5 shows that increase in corn use in ethanol can trigger a positive response of corn supply. In general, the results show that corn use in ethanol had a limited impact on corn price during the second period. The reason for this might be that the increase in corn demand for ethanol triggered the expansion of corn production, which neutralized the pressure on corn price.

Table 4. Percentage contribution to oil price variation (before the decomposition of corn demand).

Quarters	First Period					Second Period				
	Oil Supply Shock	Aggregate Demand Shock	Other Oil-Demand Shocks	Corn Demand Shocks	Corn Supply Shock	Oil Supply Shock	Aggregate Demand Shock	Other Oil-Demand Shocks	Corn Demand Shocks	Corn Supply Shock
2	0.032	0.012	0.954	0.001	0.001	0.068	0.272	0.518	0.139	0.003
3	0.030	0.033	0.902	0.033	0.002	0.116	0.224	0.484	0.170	0.006
4	0.030	0.080	0.850	0.036	0.003	0.184	0.200	0.435	0.173	0.008
5	0.030	0.080	0.836	0.048	0.006	0.199	0.196	0.424	0.169	0.013
6	0.030	0.094	0.821	0.049	0.006	0.194	0.190	0.414	0.189	0.013
7	0.032	0.101	0.811	0.049	0.007	0.204	0.185	0.403	0.186	0.020
8	0.034	0.101	0.807	0.050	0.008	0.217	0.181	0.394	0.182	0.026

Table 5. Percentage contribution to oil price variation (after the decomposition of corn demand).

Quarters	First Period				Second Period			
	Oil-Related Shocks	Corn Use in Ethanol Shock	Other Corn Demand Shocks	Corn Supply Shock	Oil-Related Shocks	Corn Use in Ethanol Shock	Other Corn Demand Shocks	Corn Supply Shock
2	0.996	0.003	0.000	0.000	0.917	0.049	0.030	0.004
3	0.943	0.015	0.038	0.005	0.900	0.053	0.042	0.005
4	0.921	0.022	0.053	0.004	0.846	0.089	0.060	0.005
5	0.884	0.032	0.076	0.008	0.846	0.091	0.058	0.005
6	0.877	0.037	0.077	0.010	0.824	0.093	0.077	0.006
7	0.872	0.040	0.077	0.011	0.823	0.092	0.076	0.008
8	0.866	0.043	0.081	0.011	0.822	0.092	0.077	0.009

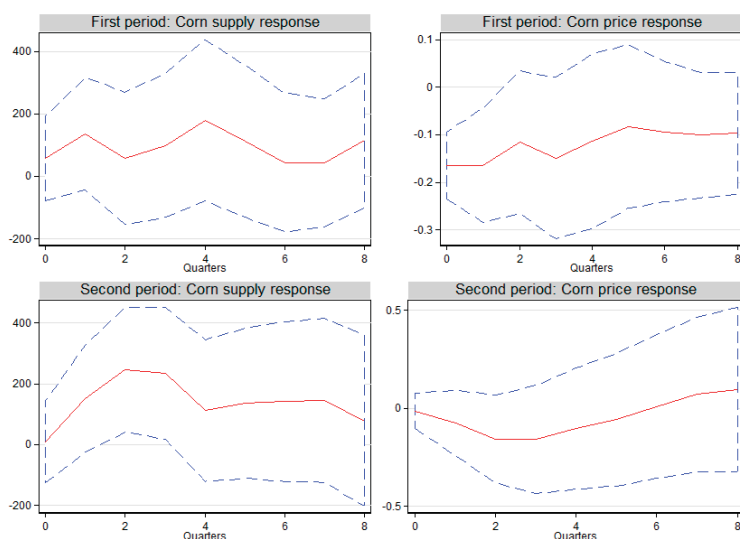


Figure 5. Response of corn supply and corn price to corn use in ethanol shocks. Notes: Red lines represent cumulative orthogonalized impulse–response functions while blue lines represent 95% confidence intervals.

5.6. Discussions

According to our results, there is a causality running from corn and sorghum prices to oil price and vice versa. The outcomes support the bidirectional relationship between agricultural commodities employed in biofuel production and crude oil price, as suggested by [Su et al. \(2019\)](#). On the other hand, our paper cannot find any correlation between barley and crude oil price, which supports the neutrality of agricultural commodity price to crude oil price changes ([Nazlioglu and Soytaş 2011, 2012](#); [Ma et al. 2016](#); [Fowowe 2016](#)).

This study found evidence of causality running from the agricultural market to oil prices, which cannot be observed in some previous studies. A possible explanation is that the expansion of biofuel and the agricultural market has not been sufficiently significant to be observable during the sample periods in previous literature. As oil is a major market that is the fundamental driver of almost every sector in the economy, the biofuel and agricultural markets need to develop to a certain size to exert a significant impact on oil prices. On the other hand, the neutral relationship between barley price and oil price could be because barley is not directly related to biofuel production.

However, the story turns out a little different when the agricultural commodity price shocks are separated into supply and demand shocks. For the corn and sorghum case, we observed that agricultural demand shocks are mainly responsible for the impacts of the agricultural markets on the oil market. The outcomes suggest that the increases in agricultural demand have a positive impact on fuel demand. The reason for this might be the indirect input channel, as suggested by [Ciaian and Kancs \(2011\)](#). The input channel suggests that the agricultural markets have become more dependent on the fuel market, because crude oil price can have an impact on fertilizer and transportation costs. Another reason might be the direct biofuel channel, where the increase in biofuel production may add to the agricultural demand, which in return strengthens the increase in fuel demand and oil price ([Ciaian 2011](#); [Su et al. 2019](#)).

For the barley case, even though the barley price was not a Granger cause for oil price, we observed that the response of oil price to barley supply shock was significant during the second period. The results support the hypothesis that when barley demand is inelastic, the productivity shock in the barley

market may create an oversupply situation, which reduces the agricultural demand and therefore fuel demand (Ciaian 2011).

In general, our results confirm that both supply and demand shocks in the agricultural markets can lead to fluctuation in the crude oil market. We also confirmed that crude oil price can have a great impact on corn use in ethanol. The results support the hypothesis that the ethanol market is dependent on crude oil price (Chen and Saghaian 2015). On the other hand, corn use in ethanol can also cause crude oil prices in the second period. This outcome is in accordance with the direct biofuel channel that ethanol production expansion can increase fuel demand in the corn sector. Regarding the biofuel channel, Ciaian and Kancs (2011) argued that bio-ethanol production can impact crude oil price in two opposite directions. Firstly, an increase in corn demand due to biofuel production may increase the supply for corn. The increase in agricultural production due to an increase in corn demand may lead to the increase in oil demand. As result, an increase in corn demand due to bioethanol expansion will eventually lead to an increase in oil price, because of the rise in fuel demand. Secondly, biofuel production increases the total energy supply and, therefore, reduces oil price. Our empirical results show that an increase in corn use in ethanol can have a positive impact on both corn supply and oil price. Therefore, our study supports the hypothesis that bioethanol expansion may increase the dependency of the economy on fossil fuels.

Regarding the food versus fuel literature, our results show that an increase in corn use in ethanol cannot impact corn price, which contrasts with previous literature (Hao et al. 2017; Apergis et al. 2017; Chiu et al. 2016). On the other hand, we observed that an increase in corn use in ethanol can increase corn supply. This outcome partly explains why corn use in ethanol cannot impact corn price. Our results support the hypothesis that the expansion of biofuel production has greatly attracted farming resources to corn production (Büyüktaşkın and Cobuloglu 2015; De Martino Jannuzzi 1991; Fradj and Jayet 2016; Herrmann et al. 2017).

It was shown in the preliminary analysis that corn supply has increased significantly, while the other agricultural commodity supplies decreased dramatically during the second period. The expansion of corn and the shrinking of other agricultural commodity supplies happened during the same period as the expansion of biofuel production. These outcomes suggest that the expansion of biofuel production in recent years has caused the land use management to be shifted against the production of food crops. The increase in biofuel demand led to the expansion of certain agricultural commodities which are feedstocks of biofuel production. As agricultural resources are limited, the expansion of these crops may lead to the reduction of farming areas and other agricultural resources invested in other agricultural commodity productions, which creates supply disruptions and, finally, increases of several agricultural commodity prices. However, there should be more research in this direction before we can reach any conclusion. Future research should focus on the impact of corn production expansion on the supplies of non-biofuel agricultural commodities and their prices to validate the hypothesis.

In general, we observed that the effects of agricultural shocks only happened during the second period. However, the energy act is unlikely to be fully responsible for causing the agricultural shocks, as other major economic events happened in the same period, such as the global financial crisis, the food crisis, or even climate change. Therefore, a future study should investigate other sub-periods to identify the timeline of those shocks.

On the other hand, as biofuel enhancement continues in the future, it is likely to attract many real economic resources, which may have many drawbacks. Firstly, even though the initial objective of biofuel is to increase the energy supply and replace fossil fuel, the current farming machinery is still dependent on oil. Thus, to make biofuel more sustainable, future machinery needs to be more compatible with the use of biofuel. Secondly, growing more energy crops means that more non-arable land will be turn into arable land, which is costly to the environment. Lastly, as the profits of biofuel production increase, farmers will have more incentive to substitute food crops with energy crops, which will have negative effects on food security. These sources of drawbacks need to be dealt with to improve the long-term effectiveness of biofuel enhancement.

6. Concluding Remarks

This study investigated the impact of agricultural shocks in the period from 1986m1 to 2018m5 using the SVAR model. Our sample data was divided into two subsamples: 1986m1–2005m12 and 2006m1–2018m5. The paper found that agricultural shocks had an effect on oil price during the second period. The findings are consistent with the theoretical model that agricultural shocks can influence crude oil price through the indirect cost-push effect and direct biofuel channel. Furthermore, we decomposed the agricultural commodity price shocks into agricultural supply and demand shocks. The demand shocks were later separated into corn use in ethanol and other corn demand shocks. The outcomes from the impulse response function suggest that different agricultural shocks can have different effects on oil price. Firstly, positive agricultural supply shocks can have a negative impact on oil price due to the reduction in fuel demand. Secondly, agricultural demand shocks can have a positive effect on oil price, especially corn use in ethanol.

In particular, we could not find any significant response of the crude oil price to the agricultural shocks during the first period. However, the situation changed sharply during the second period, when agricultural shocks triggered a significant response in oil price. On the other hand, not every agricultural shock can have a significant impact on oil price. While oil price does not respond significantly to the shocks to the corn and sorghum supplies, the response of crude oil price to barley supply shock was significant during the second period. On the other hand, corn and sorghum demand shocks triggered a significant response in oil price in the second period.

We used the variance decomposition to quantify the contribution of agricultural demand shocks on oil price variations. The outcomes suggest that corn use in ethanol played an important role in the impact of corn demand shocks on oil price during the second period. The results support the direct biofuel channel, which suggests that the expansion of bio-energy production has made oil price vulnerable to corn demand shocks.

Overall, the paper’s findings suggest that the links between agricultural market and oil prices have been strengthened since the issue of the Energy Policy Act of 2005. During this period, Table 6 shows that oil prices can influence agricultural prices, such as corn and sorghum prices, and increase the demand for corn use in ethanol. Oil prices also respond to shocks on agricultural supply, agricultural demand, and corn use in ethanol. In particular, the productivity shocks on barley supply can have a negative effect on oil prices. In corn and sorghum cases, agricultural demand shocks can have a positive impact on oil price. Moreover, corn use in ethanol plays an important role in the system, as the expansion of corn use in ethanol incentivizes growing more corn and increases the demand for oil in the agricultural sector. These findings are interesting because they show that biofuel expansion and an increase in size of the agricultural sector have become sufficiently significant to influence oil prices, which are the fundamental drivers for all sectors of the economy.

Table 6. Summary of findings.

Explanatory Variables	Dependent Variables				
	Oil Price	Agricultural Prices	Agricultural Supplies	Agricultural Demand	Corn Use in Ethanol
Oil price		+			+
Agricultural prices	+				
Agricultural supplies	–				
Agricultural demand	+				
Corn use in ethanol	+		+		

The policymakers in the agricultural and energy sectors can benefit from the findings of this paper. Firstly, the original purpose of the increase in bio-ethanol production is to reduce the dependency of the economy on fossil fuel. However, this strategy may have backfired because the increase in corn production due to the expansion of corn use in ethanol has led to a rise in fuel demand. Secondly,

our results indicate that farmers have reacted to the rise in corn demand and increased the corn supply. Their decisions can affect the investment in growing other agricultural commodities, because agricultural resources such as land and water are limited. It will be interesting to study whether the increasing corn supply due to the expansion of corn use in ethanol can have an impact on the supplies and prices of other important agricultural commodities.

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Article

The Impact of Urbanization on Income Inequality: A Study in Vietnam

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Abstract: This paper explores the impact of urbanization on income inequality in Vietnam, using the regression estimation method with panel data including Driscoll and Kraay, and Pooled Mean Group. The research data cover 63 provinces in Vietnam from 2006 to 2016. The results show that in the long term, urbanization has an impact on reducing income inequality. In the short term, urbanization has a negligible impact on income inequality. The hypothesis of an inverted-U-shaped relationship between urbanization and income inequality is confirmed. The high school enrollment rate and the proportion of agriculture have an effect on reducing income inequality.

Keywords: urbanization; income inequality; Driscoll and Kraay; PMG

1. Introduction

Many economists argue that increasing inequality is the root cause of economic crises (Stiglitz 2009). Meanwhile, the world faces serious income inequality. The gap between the rich and other groups has increased significantly. In 2015, the richest 1% of the population owned more assets than the other 99%. In Asia, the income of the poorest 70% has decreased, while that of the richest 10% has increased significantly (Hardoon et al. 2016).

The relationship between income inequality and development has long been a topic of particular interest to researchers in developed as well as developing countries. Many studies have tried to determine whether countries must make a trade-off between income inequality and growth. If so, what is the specific model of the relationship and why?

Kuznets (1955) was the first to introduce the idea of a link between inequality and development, pointing out that development involves a shift in population from traditional activities to modern activities. “An invariable accompaniment of growth in developed countries is the shift away from agriculture, a process usually referred to as industrialization and urbanization”, he wrote (Kuznets 1955, p. 7). Therefore, in a simple model, income distribution among the entire population can be viewed as a combination of income distribution among those in rural and urban areas. We observe that income per capita is often lower in rural areas than in urban areas, and inequality in income distribution is lower than in rural areas in urban areas. What conclusions can we draw from these observations? First, under the same conditions, increasing the share of the urban population does not necessarily reduce economic growth: in fact, some evidence indicates that growth may be higher because urban per capita productivity increased faster in agriculture. If this is true, inequality in income distribution increases. This ideal was highlighted and clarified by Bourguignon and Morrisson (1998), Piketty (2006).

Industrialization and urbanization are closely related to economic development. The process of industrialization and urbanization affects income distribution, causing income inequality. In the short term, urbanization can increase income inequality because wages are higher for urban jobs than rural work. However, in the long term, when urbanization is highly developed, the difference in income distribution in the two regions may decrease, and income inequality will decrease.

In Vietnam today, urbanization and industrialization have progressed considerably. Vietnam's urbanization level is still low compared to the global average but, in recent years, higher than the average in other developing countries as well as countries in Southeast Asia. In terms of Gini data, income inequality in Vietnam increased until 2008 and then decreased, and in 2014 began to increase again. So, does urbanization increase income inequality? This is the question that we address in this study.

2. Literature Review

Income inequality refers to an unequal distribution of income among individuals or households. To calculate the degree of income inequality, scholars often rely on the percentage of income held by different shares of the population. Income inequality is often associated with unfairness, such as when rich people hold a significantly larger share of national income relative to their proportion of the population (Todaro 1989).

Income inequality can be measured by various methods, such as using quintiles to measure income gaps between the poorest and the richest; using World Bank Standard 40, measured with the Lorenz curve (Lorenz 1905), the Gini coefficient (Gini 1913, 1921), and the Theil index (Akita et al. 1999). In this research, we use the Gini coefficient to represent income inequality.

Urbanization concerns the physical, human, and economic development of cities. This term also includes the concentration of people and social activities on the settlement model characterized by the development of land with high population density. The result of urbanization is partly due to the increase in population, natural and by migration, as well as economic, social, and technological changes that motivate people to migrate to urban areas, which have many jobs and opportunities. Market rules and government policies promote urbanization and create related changes in people's livelihoods, land use, health, and natural resource management. Job placement decisions, rural-urban transformation and production systems, and government development and distribution policies often create urban immigration and focus on economic activities in cities (Gotham 2012).

According to Bloom et al. (2010), a basic concept commonly used to determine the level of urbanization is the proportion of the population living in urban areas, represented by $Urban_t$ and defined using the following equation:

$$Urban_t = \frac{PU_t}{PU_t + PR_t}$$

in which PU_t and PR_t represent urban and rural population respectively.

2.1. How Does Urbanization Affect Income Inequality?

An economic model including urban and rural areas has four main elements of income inequality: (1) the level of urbanization; (2) the urban-rural income gap; (3) urban income inequality; and (4) rural income inequality. By keeping urban and rural disparities and rural and urban inequalities constant, Kuznets (1955) outlines an inverted-U-shaped relationship between inequality and urbanization. In this study, urbanization is viewed as an important factor affecting income inequality, and we examine Kuznets's inverted-U-shape hypothesis based on Vietnam's provinces.

A great deal of evidence supports the idea that urbanization promotes economic growth, at least in the early stages of development, implying that a balance exists between economic growth and equal income distribution, at least geographically. Brühlhart and Sbergami (2009) argue that poor countries face an awkward choice between inequality reduction and higher economic growth. In fact,

the relationship between development and income inequality described by Kuznets is highly relevant to urbanization.

The classic dual economic model examining structural change shows that inequality is an inevitable result of urbanization that is characteristic of economic development (Harris and Todaro 1970; Lewis 1954; Rauch 1993). Similarly, the New Economic Geography helps explain how economic development is associated with increased urbanization and inequality in its early stages (Krugman 1991). Both models show an increasing profit from industrial activities. In fact, many good workers are concentrated in urban areas with higher industrial wages. Economic growth is facilitated by structural changes in the economy, allowing it to enjoy the benefits of increasing profits and the economics of urbanization.

The process of urbanization brings about changes in economic structure, with people and resources being reallocated from agricultural activities to industrial activities. This process is associated with increased inequality, with higher incomes in urban areas than in rural areas. In this sense, both higher inequality and greater urbanization can enhance the concentration of production factors necessary for growth, at least in the early stages of development. And this focus further strengthens the reallocation of labor from rural to urban areas (Ross 2000). Therefore, both inequality and geographic concentration indicate, to some extent, capital accumulation (both physical and human). However, in the later stages of development, especially urban growth and the growth of a large concentration—urban accumulation—is linked to increasing inequality (Behrens and Robert-Nicoud 2014).

2.2. Previous Related Studies

Kanbur and Zhuang (2013) studied the impact of the change of two sectional economic structure and urbanization that affect inequality in Asia. Based on the Kuznets model and the inequality measurement method using the Theil index, this study analyzes four specific countries: China, India, Indonesia, and the Philippines. Their results show the following.

First, the effect of urbanization and the economic structure change on income inequality depends on the specific country. Urbanization contributes about 300% to the increase in inequality in the Philippines, more than 50% in Indonesia, and nearly 15% in India. However, it reduces inequality in China. Meanwhile, the change in the urban-rural income gap reduces inequality in Indonesia and the Philippines, but it increases inequality in India and China. Moreover, in China, the increase in income inequality is mainly due to the raise of 43% rural inequality. This is contrary to the popular point of view that increasing income inequality is the result of the expansion in the urban-rural income gap and the rising urban inequality.

Second, how urbanization will affect inequality in the future depends on the status urbanization of the country. If a country passes its “turning point”, urbanization will reduce inequality in, for example, China. In contrast, urbanization will increase inequality in countries such as India, Indonesia, and the Philippines.

Third, there are four factors driving inequality in the Asian country including the degree of urbanization, urban-rural income gap, and urban and rural inequality. Among them, the urban-rural income gap is expected to have the largest marginal impact on inequality.

Sagala et al. (2014) studied the relationship between inequality in expenditure and urbanization in Indonesia. A panel data regression analysis was carried out to test the Kuznets inverted-U-shaped hypothesis based on a dataset of 33 provinces in 2000–2009. The results of the study supported the inverted-U-shaped hypothesis, regardless whether the Gini coefficient or Theil index is used as a measure of inequality. Inequality in expenditure is expected to peak at an urbanization rate of about 46–50%. Because the urbanization rate in Indonesia in 2010 was 50%, this indicates that inequality in spending has reached its highest value. Therefore, further urbanization will reduce inequality in expenditure, with other factors constant.

Oyvatt (2016) studied the impact of agricultural structure and urbanization on income inequality. The author investigated the empirical relationship between inequality in land holding, urbanization,

and income inequality using cross-data sets. The estimated results indicated that the inequality of land holding has a significant impact on urbanization and urban income and inequality. Moreover, the analysis found that excessive urbanization increases income inequality. The results of the study showed that policy makers need to have a broader view of the importance of agricultural policies. An issue of progressive land reform and subsidies to protect small farmers rogressive land reform and subsidies to protect small farmers could also reduce urban income inequality and poverty in the long term.

Wu and Rao (2017) studied inequality in China, focusing on identifying the main causes of inequality. The main objective of the study was to examine the relationship between urbanization and income inequality using provincial data. Panel data in 20 provinces was collected from the China Statistical Yearbook for five years include 1998, 2000, 2002, 2005, and 2010. The empirical analysis was based on ordinary least squares estimator and fixed and random effects models, showing a strong inverted-U-shaped relationship between inequality and urbanization. An urbanization rate of 0.53 has been determined, with the implication that provinces with higher levels of urbanization can reduce income inequality.

However, Angeles (2010) used urban population density to represent the urbanization rate, and its square as an explanatory variable in the regression analysis of panel data on income inequality. With panel data on 226 countries and regions in 1960–2005, a U-shaped relationship was found, not an inverted-U-shaped relationship. Although it is not statistically significant, this result does not support Kuznets’s hypothesis.

3. Methodology and Data

3.1. Empirical Framework

Based on the theory related to urbanization and income inequality, the impact of urbanization on income equality, and the research model of Sagala et al. (2014), Wu and Rao (2017), and related studies, we present a quantitative model assessing the impact of urbanization on income inequality as follows:

$$INEQ_{it} = \alpha + \beta_1 URB_{it} + \beta_2 URB_sq_{it} + \beta_3 GRDPpc_{it} + \beta_4 GRDPpc_sq_{it} + \beta_5 initialINEQGRDPpc_{it} + \beta_6 rEXP_{it} + \beta_7 rGOV_{it} + \beta_8 rEDU_{it} + \beta_9 rAGR_{it} + \varepsilon_{it} \quad (1)$$

Definition of variables in research model are summarized in Table 1.

Table 1. Definition of variables in research model.

Variable Label	Definition	Expected Sign
<i>Dependent variable</i>		
INEQ	Gini index	
<i>Independent variable</i>		
URB	Urban population as a share of the average population in the province	+
URB_sq	Square of URB	–
GRDPpc	Gross regional domestic product per capita	+
GRDPpc_sq	Square of GRDPpc	–
initialINEQGRDPpc	Variable interaction between initial inequality and GRDPpc	
rEXP	Export value as a share of the province’s GRDP	–
rGOV	Public expenditure as a share of the province’s GRDP	–
rEDU	Students entering high school as a share of the average population in the province	–
rAGR	Agricultural value as a share of the province’s GRDP	–

3.2. Data

Due to limited access to Vietnam's statistical data and availability of the dataset Vietnam Household Living Standard Survey (VHLSS), this study uses panel data on 63 provinces in Vietnam for every two years from 2006 to 2016. The total number of observations is 378 (6 years \times 63 provinces).

The data used in our quantitative analysis include the Gini coefficient, representing income inequality, which was calculated by the author from VHLSS, and secondary data was collected from reports and surveys conducted by the General Statistics Office of Vietnam every two years.

The research uses urban population as a share of total population to proxy for urbanization. This variable is commonly used in previous studies (Nguyen and Nguyen 2018).

Data for independent and control variables used in quantitative models include urbanization, gross regional domestic product (GRDP) per capita, export volume as a share of the province's GRDP, public expenditure as a share of the province's GRDP, students entering high school as a share of the average population of the province, and agricultural value as a share of the province's GRDP, which were collected from the annual statistical yearbook of the General Statistics Office and the Provincial Statistics Office in Vietnam.

The study uses regression methods to estimate static panel data with OLS, FE, RE, and regression correction techniques proposed by Driscoll and Kraay (1998) and pooled mean group (PMG) estimation (Pesaran et al. 1999; Pesaran and Smith 1995).

4. Empirical Results

4.1. Descriptive Statistics of Variables in the Research Model

Table 2 summarizes the descriptive statistics of all the variables used in the model. The mean value of *INEQ* is 0.3794, its standard deviation is 0.0537, its minimum is 0.2498, and its maximum is 0.5883. Thus, our sample does not have much difference in the income inequality index. For *URB*, the mean is 0.2597, the standard deviation is 0.1640, the minimum is 0.0736, and the maximum is 0.8746—this shows a significant disparity in the level of urbanization among provinces during the study period. Like *URB*, *GRDPpc*, *rEXP*, *rGOV*, and *rAGR* also have large differences among provinces. For *rEDU*, the average is 0.0313, and the standard deviation is 0.0082, indicating a relatively small difference.

Table 2. Descriptive Statistics.

Variable	Obs.	Mean	S.D.	Min.	Max.
<i>INEQ</i>	378	0.3794	0.0537	0.2498	0.5883
<i>URB</i>	378	0.2597	0.1640	0.0736	0.8746
<i>GRDPpc</i>	378	0.3002	0.3693	0.0356	3.9169
<i>rEXP</i>	378	0.4413	0.6613	0.7863	6.2757
<i>rGOV</i>	378	0.3450	0.2512	0.1322	1.8091
<i>rEDU</i>	378	0.0313	0.0082	0.0123	0.0575
<i>rAGR</i>	378	0.2870	0.1444	0.0083	0.6241

4.2. Correlation Matrix and Multicollinearity

The correlation between variables in the regression model indicates the presence of multicollinearity that can affect the accuracy of the regression results. The results of the correlation analysis between variables in Table 3 show that the pairs of independent variables are not significantly correlated. However, to ensure accurate estimation results, we conduct a test on the multicollinearity phenomenon between variables in Table 4.

Table 3. Correlation matrix.

Variable	URB	GRDP _{pc}	rEXP	rGOV	rEDU	rAGR
URB	1.000					
GRDP _{pc}	0.4223 *	1.000				
rEXP	0.2164 *	0.2254 *	1.000			
rGOV	−0.2579 *	−0.2675 *	−0.3093 *	1.000		
rEDU	−0.100	−0.1489 *	−0.1449 *	−0.050	1.000	
rAGR	−0.5279 *	−0.4605 *	−0.3387 *	0.1350 *	−0.101	1.000

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

In Table 4, the results show that the coefficient VIF of the variables is quite small (<2), so the model has no multicollinearity.

Table 4. Checking multicollinearity.

Variable	VIF	SQRT VIF	Tolerance	R-Squared
URB	1.56	1.25	0.6417	0.3583
GRDP _{pc}	1.46	1.21	0.6855	0.3145
rEXP	1.29	1.14	0.7753	0.2247
rGOV	1.24	1.11	0.8074	0.1926
rEDU	1.15	1.07	0.8678	0.1322
rAGR	1.80	1.34	0.555	0.445
Mean VIF	1.42			

4.3. Assessing the Impact of Urbanization on Income Inequality

First, the implementation of static panel data regression estimation methods follows that in model (1). To assess the impact of urbanization (URB) on income inequality (INEQ), without considering the relevant factors, we revised this model by excluding *URB_sq*, *GRDP_{pc_sq}*, and *initialINEQGRDP_{pc}* in model (2):

$$INEQ_{it} = \alpha + \beta_1 URB_{it} + \beta_3 GRDP_{pc_{it}} + \beta_6 rEXP_{it} + \beta_7 rGOV_{it} + \beta_8 rEDU_{it} + \beta_9 rAGR_{it} + \varepsilon_{it} \quad (2)$$

To test the inverted-U-shaped hypothesis between income inequality and urbanization, we added *URB_sq* to model (2), revised as model (3):

$$INEQ_{it} = \alpha + \beta_1 URB_{it} + \beta_2 URB_sq_{it} + \beta_3 GRDP_{pc_{it}} + \beta_6 rEXP_{it} + \beta_7 rGOV_{it} + \beta_8 rEDU_{it} + \beta_9 rAGR_{it} + \varepsilon_{it} \quad (3)$$

To test the inverted-U-shaped hypothesis between income inequality and economic growth, we added *GRDP_{pc_sq}* to model (2), revised as model (4):

$$INEQ_{it} = \alpha + \beta_1 URB_{it} + \beta_3 GRDP_{pc_{it}} + \beta_4 GRDP_{pc_sq_{it}} + \beta_6 rEXP_{it} + \beta_7 rGOV_{it} + \beta_8 rEDU_{it} + \beta_9 rAGR_{it} + \varepsilon_{it} \quad (4)$$

To analyze the effects of initial inequality on the impact of economic growth on income inequality, we added *initialINEQGRDP_{pc}* to model (2), revised as model (5):

$$INEQ_{it} = \alpha + \beta_1 URB_{it} + \beta_3 GRDP_{pc_{it}} + \beta_5 initialINEQGRDP_{pc_{it}} + \beta_6 rEXP_{it} + \beta_7 rGOV_{it} + \beta_8 rEDU_{it} + \beta_9 rAGR_{it} + \varepsilon_{it} \quad (5)$$

Finally, to analyze the impact of URB on INEQ under the simultaneous influence of all factors, we constructed model (6):

$$INEQ_{it} = \alpha + \beta_1 URB_{it} + \beta_2 URB_sq_{it} + \beta_3 GRDP_{pc_{it}} + \beta_4 GRDP_{pc_sq_{it}} + \beta_5 initialINEQGRDP_{pc_{it}} + \beta_6 rEXP_{it} + \beta_7 rGOV_{it} + \beta_8 rEDU_{it} + \beta_9 rAGR_{it} + \varepsilon_{it} \quad (6)$$

To select an estimation method that is consistent with the dataset, we chose between pooled OLS and FE methods through F-testing with the hypothesis “ H_0 : Pooled OLS method is appropriate ($u_i = 0$)”. The regression result of the FE method in Table 5 shows that “F-test $u_i = 0$ ” has a p -value = $0.000 < 0.01$ in all models, which indicates that the FE method is more appropriate than pooled OLS. The results in Table 5 also show that the F-test has a p -value < 0.01 in all models, indicating that at the 1% significance level, the models are statistically significant. Then, to choose between FE and RE, the study uses the Hausman test with the hypothesis “ H_0 : RE model is appropriate”. The test results show $(\text{Prob} > \text{Chi}^2) = 0.0000 < 0.01$ in all models, which demonstrates sufficient statistical evidence to reject H_0 , indicating that the more efficient FE model should be selected.

However, the results of post-regression tests with the FE model have the following violations: a Wald test with the hypothesis “ H_0 : constant variance” gives the result $\text{Prob} > \text{Chi}^2 = 0.0000 < 0.01$ in all empirical models, rejecting H_0 at a significance level of 1%, which means that the existing models of variance change. The Wooldridge autocorrelation test with the hypothesis “ H_0 : no autocorrelation” gives the statistical result $\text{Prob} > F = 0.0000 < 0.05$ in all models, rejecting H_0 at a significance level of 5%, which means that the model has autocorrelation. The result from testing Pesaran cross-sectional dependence with the hypothesis “ H_0 : Cross-sectional independence” is $(\text{Prob} > z) < 0.01$ in all models, rejecting the H_0 hypothesis at a significance level of 1%, which means that cross-sectional dependence exists in models. The study also uses the Durbin-Wu-Hausman test for endogeneity of explanatory variables with the hypothesis “ H_0 : explanatory variables are exogenous,” i.e., not correlated with residuals. The results show that $rEXP$ and $rGOV$ are endogenous in the model.¹

Table 5. Results of fixed effects regression.

Variables	(2)	(3)	(4)	(5)	(6)
	INEQ	INEQ	INEQ	INEQ	INEQ
URB	−0.307 *** (0.0680)	−0.00200 (0.237)	−0.247 *** (0.0727)	−0.323 *** (0.0728)	0.0657 (0.238)
URB_sq		−0.319 (0.237)			−0.353 (0.234)
GRDPpc	−0.0233 (0.0151)	−0.0229 (0.0150)	−0.0891 *** (0.0327)	0.0631 (0.144)	0.289 * (0.158)
GRDPpc_sq			0.0150 ** (0.00662)		0.0281 *** (0.00824)
initialINEQGRDPpc				−0.215 (0.356)	−1.083 ** (0.439)
$rEXP$	−0.00584 (0.00504)	−0.00753 (0.00518)	−0.00527 (0.00501)	−0.00619 (0.00507)	−0.00843 (0.00513)
$rGOV$	0.00847 (0.0202)	0.00820 (0.0202)	0.00416 (0.0202)	0.00934 (0.0203)	0.00440 (0.0200)
$rEDU$	−1.302 ** (0.658)	−1.006 (0.692)	−2.133 *** (0.750)	−1.182 * (0.687)	−1.932 ** (0.766)
$rAGR$	−0.0839 * (0.0468)	−0.0746 (0.0472)	−0.124 ** (0.0497)	−0.0821 * (0.0469)	−0.140 *** (0.0505)
Constant	0.531 *** (0.0339)	0.470 *** (0.0563)	0.570 *** (0.0380)	0.528 *** (0.0342)	0.527 *** (0.0578)
Observations	378	378	378	378	378
F-test (p -value)	0.0000	0.0000	0.0000	0.0001	0.0000
R-squared	0.093	0.098	0.108	0.094	0.132
F-test $u_i = 0$ (p -value)	0.0000	0.0000	0.0000	0.0000	0.0000
Number of id	63	63	63	63	63

Standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

¹ The results of estimating OLS and RE regression, Hausman test, and post-regression tests are detailed in the Appendix A.

The models have an endogenous element caused by $rEXP$ and $rGOV$, but this is not the main research focus, so we ignore this problem.

A regression model can be used for analysis of the estimation results, and statistical inference techniques should be used for appropriate revisions. Technical studies revise regressions following Driscoll and Kraay (1998), whose method resolves violations in the FE model, such as changes in the variance, autocorrelation, and cross-dependence. The results are in Table 6.

Finally, the impact of urbanization on income inequality in the short and long term is assessed. The technical econometric dynamic panel regression estimation method used in this study is PMG (Pesaran et al. 1999; Pesaran and Smith 1995). Because the number of years of observation is not long enough, the study assesses only the impact of urbanization on income inequality unaffected by other factors. The results in Table 7 show that urbanization affects income inequality in the long term but not in the short term.

Table 6. Results of Driscoll and Kraay regression.

Variables	(2)	(3)	(4)	(5)	(6)
	INEQ	INEQ	INEQ	INEQ	INEQ
<i>URB</i>	−0.307 *** (0.0729)	−0.00200 (0.0489)	−0.247 ** (0.0907)	−0.323 *** (0.0708)	0.0657 (0.0419)
<i>URB_sq</i>		−0.319 ** (0.0920)			−0.353 ** (0.103)
<i>GRDPpc</i>	−0.0233 ** (0.00884)	−0.0229 ** (0.00882)	−0.0891 * (0.0370)	0.0631 (0.194)	0.289 (0.194)
<i>GRDPpc_sq</i>			0.0150 (0.00771)		0.0281 *** (0.00675)
<i>initialINEQGRDPpc</i>				−0.215 (0.484)	−1.083 * (0.484)
<i>rEXP</i>	−0.00584 (0.00579)	−0.00753 (0.00615)	−0.00527 (0.00619)	−0.00619 (0.00638)	−0.00843 (0.00693)
<i>rGOV</i>	0.00847 (0.0121)	0.00820 (0.0127)	0.00416 (0.00794)	0.00934 (0.0107)	0.00440 (0.00804)
<i>rEDU</i>	−1.302 (0.722)	−1.006 (0.696)	−2.133 *** (0.302)	−1.182 * (0.469)	−1.932 *** (0.338)
<i>rAGR</i>	−0.0839 *** (0.0197)	−0.0746 *** (0.0166)	−0.124 ** (0.0459)	−0.0821 ** (0.0218)	−0.140 ** (0.0437)
Constant	0.531 *** (0.0297)	0.470 *** (0.0219)	0.570 *** (0.0111)	0.528 *** (0.0266)	0.527 *** (0.0160)
Observations	378	378	378	378	378
Number of groups	63	63	63	63	63

Standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table 7. Results of PMG regression.

Variables	Long Run	Short Run
$_ec$		−0.889 *** (0.0959)
$D.URB$		−1.199 (1.940)
URB	−0.500 *** (0.0129)	
Constant		0.457 *** (0.0466)
Observations	315	315

Standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

5. Discussion of Results

The results of the econometric models lead to the following findings.

URB has a negative regression coefficient with a statistical significance of 1% in model (2), indicating the negative impact of urbanization on income inequality in Vietnamese provinces. This means that higher urbanization contributes to reducing income inequality, which is consistent with the impact of urbanization on income inequality in models (3), (4), and (5). This result is consistent with [Johansson and Wang \(2014\)](#) and contrary to [Beladi et al. \(2017\)](#). In fact, in Vietnam, urbanization is associated with the formation of industrial zones and clusters. People who have little or no land in rural areas migrate to cities to work in factories with higher wages than previous jobs in rural areas, which raises their income. Therefore, urbanization contributes to reducing income inequality in Vietnam. This impact is consistent with the PMG method in the long term.

URB_sq , the impact of urbanization on income inequality, may be nonlinear, in other words, this effect may be in accordance with the inverted-U-shaped hypothesis. URB_sq is included in models (3) and (6) to test this hypothesis, and the estimation results show that its impact on $INEQ$ is negatively significant at the 5% level. Model (6), which includes with regression coefficients for URB and URB_sq , shows the nonlinear relationship between urbanization and income inequality. Urbanization increases income inequality in the early stages until it reaches a certain threshold, after which it reduces income inequality. This result is consistent with [Sagala et al. \(2014\)](#) in Indonesia and [Wu and Rao \(2017\)](#) in China.

$GRDPpc$, which has a negative regression coefficient with a statistical significance of 5% in model (2), shows the negative impact of per capita income on income inequality in Vietnam provinces, which means that higher per capita income contributes to reducing income inequality. This result is consistent with the impact of per capita income on income inequality in models (3) and (4), consistent with [Jin \(2009\)](#) who studies China in 1990–2006. In addition, the interaction variable between initial economic growth and inequality ($initialINEQGRDPpc$) has no significant regression coefficients. The results of model (5) show that the effect of economic growth on income inequality in Vietnam in 2006–2016 is not affected by the level of initial inequality. The results are contrary to those of [Johansson and Wang \(2014\)](#).

The regression coefficients of $GRDPpc_sq$, which are not statistically significant in model (4), shows that the inverted-U-shape hypothesis between economic growth and income inequality in Vietnam is not confirmed from 2006 to 2016. The results are contrary to those of [Sagala et al. \(2014\)](#), who found evidence supporting the inverted-U-shape hypothesis in Indonesia between 2000 and 2009.

$rEXP$, which is not statistically significant, shows that trade, which represents the share of exports in GDP, has a negligible effect on income inequality in Vietnam. This result is similar to that of [Johansson and Wang \(2014\)](#).

$rGOV$, which is not statistically significant, shows that the government spending in the provinces has a negligible effect on income inequality in Vietnam. This result is similar to that of [Johansson and Wang \(2014\)](#) and [Beladi et al. \(2017\)](#).

$rEDU$, which represents human capital, has a negative regression coefficient, showing the negative impact of education on income inequality. Although the level of statistical significance is not consistent in all empirical models, the results show that education plays a role in decrease income inequality in Vietnam. This result contrasts with [Jin \(2009\)](#), showing the education increased income inequality in China between 1990 and 2006, with [Johansson and Wang \(2014\)](#), which found no impact of education on income inequality in 90 countries in 1981–2005.

$rAGR$, which has a negative regression coefficient and is statistically significant at the 1% significance level in models (2) and (3) and 5% in models (4) and (5) shows the negative effect of the proportion of agricultural value to income inequality. This result is consistent with that of [Wu and Rao \(2017\)](#).

6. Conclusions and Policy Implications

This study analyzed and evaluated the impact of urbanization on income inequality in Vietnam in the period 2006–2016. We used the following econometric techniques and methods: the estimation methods with static panel data regression used are OLS, FE, RE, and Driscoll and Kraay. The method used for estimating dynamic panel data regression is PMG, enabling us to consider the impact of urbanization on income inequality in the short and long term.

Our research results lead us to draw the following conclusions. Urbanization helps reduce income inequality in Vietnam, including in the long term. We confirm the inverted-U-shaped relationship between urbanization and income inequality in Vietnam, where economic growth reduces income inequality. The impact of economic growth on income inequality is not affected by the initial level of inequality. The hypothesis on an inverted-U-shaped relationship between economic growth and income inequality is not confirmed during the study period. The share of exports has a negligible effect on income inequality in Vietnam. Public spending does not significantly affect income inequality in Vietnam. The high school enrollment rate and the proportion of agriculture influence reductions in income inequality.

Because urbanization has the effect of reducing income inequality, even in the long term, Vietnam needs to continue to promote urbanization. Economic growth has the effect of reducing income inequality, therefore policies to increase economic growth and social welfare should be maintained to reduce the gap between rich and poor. As improving intellectual standards will help reduce inequality, more supportive policies are needed to improve education. Because high value agricultural development will contribute to reducing inequality, appropriate policies are needed to support and develop agriculture, farmers, and rural areas.

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Results of pooled OLS regression.

Variables	(2)	(3)	(4)	(5)	(6)
	INEQ	INEQ	INEQ	INEQ	INEQ
<i>URB</i>	−0.00142 (0.0191)	0.0299 (0.0585)	0.00526 (0.0194)	0.00115 (0.0184)	−0.00203 (0.0573)
<i>URB_sq</i>		−0.0371 (0.0654)			0.00174 (0.0637)
<i>GRDPpc</i>	0.0146* (0.00822)	0.0140 * (0.00830)	−0.0219 (0.0222)	−0.415 *** (0.0787)	−0.421 *** (0.0804)
<i>GRDPpc_sq</i>			0.0106 * (0.00598)		−0.00286 (0.00636)
<i>initialINEQGRDPpc</i>				1.036 *** (0.189)	1.074 *** (0.209)
<i>rEXP</i>	−0.00500 (0.00431)	−0.00521 (0.00433)	−0.00406 (0.00434)	0.00191 (0.00434)	0.00193 (0.00438)
<i>rGOV</i>	0.0799 *** (0.0111)	0.0803 *** (0.0112)	0.0763 *** (0.0113)	0.0699 *** (0.0109)	0.0705 *** (0.0110)
<i>rEDU</i>	−0.642 * (0.328)	−0.647 ** (0.328)	−0.854 ** (0.348)	−1.021 *** (0.323)	−0.977 *** (0.338)
<i>rAGR</i>	0.0507 ** (0.0234)	0.0493 ** (0.0235)	0.0351 (0.0249)	0.0246 (0.0230)	0.0279 (0.0243)
Constant	0.356 *** (0.0191)	0.352 *** (0.0204)	0.374 *** (0.0218)	0.388 *** (0.0193)	0.384 *** (0.0222)
Observations	378	378	378	378	378
R-squared	0.189	0.189	0.195	0.250	0.250

Standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A2. Results of RE regression.

Variables	(2)	(3)	(4)	(5)	(6)
	INEQ	INEQ	INEQ	INEQ	INEQ
<i>URB</i>	−0.0314 (0.0258)	0.0527 (0.0812)	−0.0217 (0.0262)	−0.0193 (0.0239)	0.0273 (0.0745)
<i>URB_sq</i>		−0.0990 (0.0896)			−0.0514 (0.0822)
<i>GRDPpc</i>	−0.00198 (0.0100)	−0.00349 (0.0101)	−0.0510 ** (0.0230)	−0.388 *** (0.0903)	−0.376 *** (0.0931)
<i>GRDPpc_sq</i>			0.0135 ** (0.00574)		0.00272 (0.00637)
<i>initialINEQGRDPpc</i>				0.949 *** (0.219)	0.895 *** (0.245)
<i>rEXP</i>	−0.00627 (0.00456)	−0.00682 (0.00459)	−0.00557 (0.00454)	−0.00156 (0.00455)	−0.00185 (0.00459)
<i>rGOV</i>	0.0564 *** (0.0136)	0.0568 *** (0.0136)	0.0520 *** (0.0136)	0.0535 *** (0.0129)	0.0544 *** (0.0129)
<i>rEDU</i>	−0.682 * (0.395)	−0.668 * (0.397)	−1.110 ** (0.434)	−1.125 *** (0.388)	−1.166 *** (0.408)
<i>rAGR</i>	0.0153 (0.0286)	0.0130 (0.0288)	−0.0126 (0.0308)	−0.00103 (0.0276)	−0.00458 (0.0290)
Constant	0.388 *** (0.0226)	0.377 *** (0.0253)	0.420 *** (0.0261)	0.413 *** (0.0226)	0.409 *** (0.0266)
Observations	378	378	378	378	378
Number of id	63	63	63	63	63

Standard errors in parentheses: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Table A3. Hausman test results.

Statistical Parameters	(2)	(3)	(4)	(5)	(6)
Chi2	58.27	58.63	55.59	49.78	68.39
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000

Table A4. Wald test of constant variance.

Statistical Parameters	(2)	(3)	(4)	(5)	(6)
Chi2	8920.95	12,922.50	6332.03	9820.80	16,898.79
Prob > chi2	0.0000	0.0000	0.0000	0.0000	0.0000

Table A5. Wooldridge test inspection of autocorrelation.

Statistical Parameters	(2)	(3)	(4)	(5)	(6)
F(1,62)	6.297	5.556	6.457	5.997	5.207
Prob>F	0.0147	0.0216	0.0136	0.0172	0.0259

Table A6. Pesaran test inspection dependence between units.

Statistical Parameters	(2)	(3)	(4)	(5)	(6)
Pesaran's test	3.915	3.520	3.945	3.979	3.675
Prob > z	0.0001	0.0004	0.0001	0.0001	0.0002
abs	0.401	0.403	0.395	0.403	0.397

Table A7. Durbin-Wu-Hausman test on the endogenousness of explanatory variables.

Variables	(2)	(3)	(4)	(5)	(6)
URB					
Chi-sq	0.36863	0.41196	0.37807	0.21610	0.19385
p-value	0.54375	0.52098	0.53864	0.64203	0.65973
URB_sq					
Chi-sq		0.61870			0.30912
p-value		0.43153			0.57822
GRDPpc					
Chi-sq	0.37675	0.38193	0.02666	0.88462	0.67078
p-value	0.53935	0.53657	0.87030	0.34694	0.41278
GRDPpc_sq					
Chi-sq			0.75805		0.05507
p-value			0.38394		0.81446
initial					
INEQGRDPpc					
Chi-sq				0.64876	0.46360
p-value				0.42056	0.49595
rEXP					
Chi-sq	3.67900	3.65990	4.37889	7.78901	7.89755
p-value	0.05510	0.05574	0.03639	0.00526	0.00495
rGOV					
Chi-sq	3.91847	3.93987	3.64679	3.52257	3.44806
p-value	0.04776	0.04715	0.05618	0.06054	0.06333
rEDU					
Chi-sq	0.02895	0.02656	0.12883	0.09891	0.13693
p-value	0.86490	0.87053	0.71965	0.75314	0.71135
rAGR					
Chi-sq	0.07408	0.07707	0.00048	0.03788	0.06896
p-value	0.78548	0.78131	0.98260	0.84569	0.79286

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Article

CO₂ Emissions, Energy Consumption, and Economic Growth: New Evidence in the ASEAN Countries

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Abstract: The members of the Association of Southeast Asian Nations (ASEAN) have made several attempts to adopt renewable energy targets given the economic, energy-related, environmental challenges faced by the governments, policy makers, and stakeholders. However, previous studies have focused limited attention on the role of renewable energy when testing the dynamic link between CO₂ emissions, energy consumption and renewable energy consumption. As such, this study is conducted to test a common hypothesis regarding a long-run environmental Kuznets curve (EKC). The paper also investigates the causal link between carbon dioxide (CO₂) emissions, energy consumption, renewable energy, population growth, and economic growth for countries in the region. Using various time-series econometrics approaches, our analysis covers five ASEAN members (including Indonesia, Myanmar, Malaysia, the Philippines, and Thailand) for the 1971–2014 period where required data are available. Our results reveal no long-run relationship among the variables of interest in the Philippines and Thailand, but a relationship does exist in Indonesia, Myanmar, and Malaysia. The EKC hypothesis is observed in Myanmar but not in Indonesia and Malaysia. Also, Granger causality among these important variables varies considerably across the selected countries. No Granger causality among carbon emissions, energy consumption, and renewable energy consumption is reported in Malaysia, the Philippines, and Thailand. Indonesia experiences a unidirectional causal effect from economic growth to renewable energy consumption in both short and long run and from economic growth to CO₂ emissions and energy consumption. Interestingly, only Myanmar has a unidirectional effect from GDP growth, energy consumption, and population to the adoption of renewable energy. Policy implications have emerged based on the findings achieved from this study for each country in the ASEAN region.

Keywords: ASEAN; CO₂ emissions; economic growth; EKC; energy consumption; Granger causality; VECM

JEL Classification: C22; C32; Q43; Q56

1. Introduction

The Association of Southeast Asian Nations (ASEAN) has experienced a profound economic transformation, attained high economic growth, and become the most dynamic economic area in the world in recent years (De Grauwe and Zhang 2016). The region, which is home to around 630 million people and has gross domestic production (GDP) of approximately US\$2.4 trillion, plays a large role in boosting regional integration and cooperation in East Asia and is becoming a driving force behind global growth, according to the fifth ASEAN energy outlook, in 2017. This economic development

requires an enormous supply of energy, which heavily depends on fossil fuel with the consequence of environmental degradation.

In its 2017 report on the Southeast Asia energy outlook, the International Energy Agency (IEA) highlighted that achieving stable economic growth, meeting energy demand in a secure, affordable, and sustainable manner, as well as maintaining an acceptably low level of environment degradation, are multiple challenges that the governments in the Southeast Asia nations encounter. Many ASEAN countries have made tremendous efforts to tackle those challenges. A wide range of policies aimed at the adoption and use of renewable energy have been implemented as a result of not only the influence of the Paris Agreement but also the national plans for energy consumption. The fifth ASEAN energy outlook indicated that the members of the ASEAN countries have made several attempts to adopt targets for renewable energy. For example, Indonesia has developed and implemented a plan to increase new and renewable energy as a share of total primary energy supply (TPES) to 23 percent in 2025 and approximately 30 percent in 2050, and the country expects to reduce greenhouse gas (GHG) emissions to under 30 percent by 2020 below the business-as-usual level. Malaysia has set a target for increasing the capacity of renewable electricity supply to around 8 percent of total installed capacity by 2020 and decreased the ratio of GHG emissions to GDP by 35 percent by 2030, compared to the level in 2005. In its national renewable energy program roadmap to 2030, the Philippine government set a goal for every source of renewable energy that will triple the installed capacity of renewables-based supply by 2030 compared to its 2010 level, together with controlling GHG and stabilizing it at less than 16 percent of the business-as-usual level. Thailand has the more profound objective of increasing renewable energy to 30 percent of total energy usage by 2036 in power generation, heating, and transport fuel consumption. These efforts in the expansion of renewable energy use to rebalance the energy mix could depend significantly on a country's resource availability, energy security, and environmental targets. On these grounds of these strong, committed and ambitious policies formulated and implemented by various ASEAN nations, it is the claim of this paper that it is vitally important to understand the relationship among economic growth, energy demand, renewable energy use, and environmental degradation in the context of gradual population growth. Findings from this paper will enhance greatly understanding and rationales for policies from these ASEAN nations and other emerging markets.

The context of economic growth in the region raises the question of the environment in the EKC hypothesis. This hypothesis stipulates that an increase in a country's income leads to a corresponding increase in the level of CO₂ emissions at the early stage of economic development, but in the later stage, the impact is reversed at a certain income threshold. The adoption of environmentally harmful technology in economic activities, lack of awareness of environmental problems, and the goal of higher profit in premature economic development can explain the parallel pattern in the level of per capita income and environmental degradation at this stage. However, higher per capita income, improved social indicators, and safer technology in the mature stage create a turning point in the growth-environment nexus (Zoundi 2017).

Many scholars have tested the EKC in the context of the ASEAN region focused only on economic growth, energy consumption, and CO₂ emissions. For instance, Tang and Tan (2015) confirmed the validity of the EKC hypothesis in Vietnam over the 1976–2009 period. Yet Al-Mulali et al. (2015) found no evidence to support the existence of the EKC over the 1981–2011 period, and Shahbaz et al. (2019) arrived at the same conclusion for the period 1976 to 2016. Ozturk and Al-Mulali (2015) failed to confirm the validity of the EKC but found a U-shaped relationship between economic growth and CO₂ emissions in Cambodia in 1996–2012 period. Begum et al. (2015) reached the same conclusions as those from Ozturk and Al-Mulali (2015) in a study for Malaysia over the 1980–2009 period. In contrast, Saboori et al. (2016) found the opposite result, supporting the existence of the EKC in Malaysia. Saboori and Sulaiman (2013) used a recently developed cointegration approach based on the autoregressive distributed lag (ARDL) model to examine the cointegration among economic growth, CO₂ emissions, and energy consumption in five ASEAN countries over the 1971–2008 period. They supported the EKC

hypothesis in Singapore and Thailand, found a U-shaped relationship (the inverted EKC hypothesis) in Indonesia and the Philippines. The different levels of economic development may reflect their mixed results although these countries are housed in the same region.

The paper makes significant contributions to the contemporary literature on this important issue. Our attempt is to supplement empirical evidence in relation to an EKC hypothesis in the ASEAN region. Although numerous scholars have investigated the link between economic growth, energy consumption, and environmental degradation, little attention has been paid to renewable energy, which has emerged as an alternative source of fossil fuel energy. The only exception is a study from [Liu et al. \(2017\)](#), who analyzed Granger causality among per capita CO₂, economic growth, renewable and nonrenewable energy consumption, and agricultural value added in four ASEAN members—Indonesia, Malaysia, the Philippines, and Thailand—over the 1970–2013 period. Their findings show a long-run relationship among those variables but a turning point in the EKC hypothesis is not observed. As such, our empirical study will bridge the gap on this important link. We critically examine the relationship among economic development, energy consumption, environmental degradation, and population growth in the ASEAN region. A special focus on renewable energy usage is the most significant contribution of the paper.

Useful insights on renewable energy also benefit the governments, policy makers, and stakeholders in the ASEAN region in dealing with economic, energy-related and environmental challenges. The EKC hypothesis and the causality between economic growth, energy consumption and CO₂ emissions were tested using a panel of ASEAN countries in previous studies (e.g., [Heidari et al. 2015](#); [Le and Quah 2018](#); [Lean and Smyth 2010](#); [Nasreen and Anwar 2014](#)). These studies ignored the usage of renewable energy in the context that ASEAN countries have a strong desire for such kind of energy in coming years. Also, pooling a panel of countries in a whole sample can potentially suffer a difficulty in relation to policy implementations on this important link. The ASEAN countries vary considerably in terms of economic development and size as well as their targets for renewable energy. Thus, it is essential to analyze the interrelationship among economics, energy consumption, environmental degradation, the use of renewable energy for a case-by-case country. A thorough understanding of this interrelationship at a country level enables the governments not only to design proper strategies for sustainable economic development, energy security, and environmental protection but also to achieve an optimal, effective, and efficient level of consumption and supply of renewable energy.

To achieve our objectives, a common validity of the EKC hypothesis is tested in the long run and investigate the causal link between CO₂ emissions, energy consumption, renewable energy, population growth, and economic growth for five ASEAN members, including Indonesia, Myanmar, Malaysia, the Philippines, and Thailand over the 1971–2014 period. The selection of countries is based on data availability. We use several econometrics techniques on time series, including advanced cointegration tests, two long-run estimators—the fully modified ordinary least squares (FMOLS) and the dynamic ordinary least squares (DOLS)—and a causality test based on the vector error correction model (VECM) framework. Using these techniques will strengthen the validity of our conclusions.

The paper is organized as follows. Following this Introduction, Section 2 discusses relevant theories and empirical studies related to the EKC hypothesis as well as the causal relationship among the variables of interests. The methodology is presented in Section 3, while Section 4 describes the data and empirical results. Our conclusions are discussed in Section 5.

2. Literature Review

2.1. The Environmental Kuznets Curve (EKC) Hypothesis

To date, many studies on the EKC hypothesis have failed to reach a consensus; some failed to reject the null hypothesis of the validity of the EKC while others found supporting evidence. One major factor causing such an unclear conclusion is the econometrics testing method, the countries in the sample, and the period studied in the analysis.

Several studies have reported mixed evidence on the EKC hypothesis using a country panel over a particular time period with the use of CO₂ emissions as pollutants. The EKC appears to be present in the member countries of the Organization for Economic Cooperation and Development (OECD) (Bilgili et al. 2016; Jebli et al. 2016), in G-7 countries (Raza and Shah 2018), in the European Union region (Dogan and Seker 2016), in Central America (Apergis and Payne 2014), among a wide group of developed and developing countries globally (Ibrahim and Law 2014), as well as in Asia (Heidari et al. 2015). Other scholars failed to confirm the validity of the EKC hypothesis based on empirical evidence in both developed and developing countries (Apergis et al. 2010).

The same pattern of inconclusive findings in relation to the EKC hypothesis with the use of CO₂ emissions is observed in various studies on a particular country using time-series data. Supporting evidence is observed in France (Iwata et al. 2010), Indonesia (Sugiawan and Managi 2016), China (Jalil and Mahmud 2009; Jayanthakumaran and Liu 2012), and Pakistan (Shahbaz et al. 2015; Shahzad et al. 2017). Other papers failed to confirm the validity of EKC—for instance, Soytaş et al. (2007) found no presence of the EKC in the US, which is further supported by Dogan and Ozturk (2017), even when taking a structural break into consideration.

The most striking characteristic in earlier empirical studies is that they used the same sample of a country with different timespans and econometrics techniques but come to a completely different conclusion regarding the EKC hypothesis. One example is a study for Malaysia, where Saboori et al. (2016) confirmed the presence of the EKC over the 1980–2008 period, while Ali et al. (2017), Begum et al. (2015), and Gill et al. (2018) presented the opposite outcome. A contradictory finding is observed in Vietnam (Tang and Tan 2015; Al-Mulali et al. 2015) and in Turkey (Pata 2018; Soytaş et al. 2007).

Another potential factor contributing to the mixed findings arising from previous empirical studies on the validity of the EKC hypothesis is the proposed model tested with diverse additionally controlled variables. Various factors have been added to a traditional EKC model. These variables include energy consumption (Le and Quah 2018; To et al. 2019), trade openness (Halicioglu 2009; Halicioglu and Ketenci 2018; Jayanthakumaran and Liu 2012; Ozturk and Acaravci 2013), financial development (Dogan and Seker 2016; Dogan and Turkekul 2016; Shahbaz et al. 2013), population (Dong et al. 2018; Zoundi 2017), and urbanization (Ozturk and Al-Mulali 2015; Dogan and Turkekul 2016; Saidi and Mbarek 2016). Other studies integrated all sorts of variables and used them to test the EKC hypothesis (Ozatac et al. 2017; Pata 2018). For example, Ozatac et al. (2017) confirmed the EKC hypothesis in Turkey over the 1971–2013 period, integrating energy consumption, trade openness, financial development, and urbanization into the proposed model. So, the role of these variables should not be ignored in testing the EKC hypothesis.

Many studies investigated the relationship between energy use and the amount of CO₂ emissions produced by economic development. Some scholars have tested the link between economic growth and carbon emissions (Nguyen and Kakinaka 2019). The role of renewable energy in the EKC hypothesis has gained attention among scholars as part of efforts to reverse the effects of environment degradation. It is well recognized renewable energy sources have many benefits in terms of increased energy security, sustainable economic growth, and pollution reduction (Şener et al. 2018).

Contemporary studies have also employed the variable of renewable energy in models testing the EKC hypothesis. Raza and Shah (2018) confirmed the EKC hypothesis in the G7 countries due to the trade openness and renewable energy consumption based on panel data over the 1991–2016 period. Pata (2018) confirmed the EKC hypothesis using a model including renewable energy, urbanization, and financial development in Turkey over the 1974–2014 period after controlling for structural breaks over the selected period.

The adoption of parametric approach in testing the EKC hypothesis may face the problem of misspecification. As such, the nonparametric strand of the EKC literature has emerged to further explain the mixed results as it does not require the specification of a functional form (Shahbaz et al. 2017). Using a novel nonparametric econometrics approach is expected to yield a more insightful understanding of the EKC literature. For example, Azomahou et al. (2006) revealed a contradict result in relation to

the EKC hypothesis using both parametric and non-parametric method. While the estimation of a parametric specification supported the EKC, the non-parametric approach opposed to the parametric finding. Similarly, when employing a non-parametric approach in the MENA region, [Fakih and Marrouch \(2019\)](#) found the none-existence of an EKC in contrast to the findings from [Arouri et al. \(2012\)](#), who presented evidence of EKC relationship between CO₂ emissions and GDP. Recently, based on a nonparametric approach with the data over nearly two centuries, [Shahbaz et al. \(2017\)](#) argued for an existence of the EKC in six out of the G-7 countries—Canada, France, Germany, Italy, UK and the US with an exception for the case of Japan. Recently, [Kalaitzidakis et al. \(2018\)](#) used a semiparametric smooth coefficient model to investigate the impact of CO₂ emissions on economic growth, as measured by total factor productivity, among a set of the Organization for Economic Co-operation and Development (OECD) countries during the 1981–1998 period. Their results reported a robust non-linear relationship between these variables and showed that CO₂ emissions contributes marginally to productivity growth, approximately 0.07 percent on average. These findings highlighted the nature of nonlinearity in the relationship between income and environment degradation.

2.2. The Causal Link between Renewable Energy Use, Economic Growth, and Environmental Degradation

From a theoretical perspective, a causal link is observed between the use of renewable energy, economic growth, and environmental degradation. Higher income raises demand for energy consumption and consequently exacerbates degradation of the environment. Increasing concerns about energy security and global warming, in turn, create greater pressure for the use of renewable energy. Renewable energy is an ideal substitute for fossil fuels and results in fewer CO₂ emissions ([Bilgili et al. 2016](#)). As such, sustainable economic growth is compatible with the use of renewable energy.

On the empirical aspect, the directional effect among renewable energy consumption, economic growth, and environmental degradation varies considerably across studies. Some scholars recognized a unidirectional causal effect. The short-run unidirectional casual effect from renewable energy consumption to CO₂ emissions was found in 25 African countries by [Zoundi \(2017\)](#), in BRICS (Brazil, Russia, India, China, and South Africa) countries by [Sebri and Ben-Salha \(2014\)](#). [Shafiei and Salim \(2014\)](#) showed unidirectional causality from renewable energy consumption to CO₂ emissions in the long run in 29 OECD member countries between 1980 and 2011. The same pattern was observed in [Bilgili et al. \(2016\)](#) in a smaller sample of 17 OECD countries in the 1977–2010 period. Additionally, [Sadorsky \(2009\)](#) demonstrated that increases in real per capita income and per capita CO₂ emissions led to an increase in the use of renewable energy in the long run in the G7 countries. Based on a sample of nine developed countries, [Saidi and Mbarek \(2016\)](#) revealed a unidirectional effect from renewable energy consumption to economic growth, but in the long run, they Granger-cause each other. In contrast, [Jebli et al. \(2016\)](#) observed short-run Granger causality from economic growth to renewable energy.

Several studies revealed reverse causality among economic growth, renewable energy, and CO₂ emissions. [Apergis et al. \(2010\)](#) reported a bidirectional causal relationship between each pair of three variables of interest in seven Central American countries both in the short and long run. [Raza and Shah \(2018\)](#) found that economic growth is positively associated with CO₂ emissions in the long run, as well as the reverse causality from CO₂ emissions to renewable energy consumption in G7 countries. The bidirectional Granger causality between renewable energy and CO₂ emissions is observed by [Dogan and Seker \(2016\)](#) in 15 EU member countries in the short run and by [Dong et al. \(2017\)](#) in BRICS countries in the long run.

In consistency with studies that use panel data on several countries over a long period, an investigation on Granger causality in particular countries presents mixed directions, either unidirectional or bidirectional. A unidirectional effect from renewable energy to CO₂ emissions is observed in the US ([Jaforullah and King 2015](#)), Denmark and Finland ([Irandoust 2016](#)), Indonesia ([Sugriawan and Managi 2016](#)), and Algeria ([Belaid and Youssef 2017](#)). Recently, using a VECM-based

Granger-causality test, Bekhet and Othman (2018) found unidirectional causality from CO₂ emissions to renewable energy in Malaysia. Reverse causality is observed in Sweden and Norway by Irandoust (2016). The varying patterns in the directional effect among economic growth, renewable energy, and CO₂ emissions demonstrate the need for more investigation on the complicated relationship among those variables.

3. Methodology

3.1. Model Specification and Data Source

Stern (2004) proposed three causes of the EKC relationship via the scale, technique, and composition effects. The scales effect implies the expansion of production which will lead to a corresponding increase in the amount of polluted emissions. The component effect postulates the heterogeneity of pollution intensities across industries. The technique effect indicates the improvement of the state of technology which will lead to a lower pollutant generated. This can be achieved through either a higher productivity, meaning a reduction of inputs for a given output, or lowering emissions per unit of input with innovations. On the ground of those effects, in this paper, we shed a light on the importance of using renewable energy for the growth-environment nexus using the following model specification.

$$\text{LnCO}_{2t} = \alpha_0 + \alpha_1 \text{Ln}Y_t + \alpha_2 \text{Ln}Y_t^2 + \alpha_3 \text{Ln}EC_t + \alpha_4 \text{Ln}RE_t + \alpha_5 \text{Ln}POP_t + \varepsilon_t \quad (1)$$

in which CO₂ represents per capita CO₂ emissions at year t . EC_t is per capita energy consumption; RE_t is per capita consumption of renewable energy; Y_t and Y_t^2 denote real per capita GDP and the square of real per capita GDP at year t , respectively; and POP_t is the population of the country at year t . The residuals ε_t are assumed to be normally distributed and white noise.

We focus on long-run coefficients ($\alpha_i, i = 1, \dots, 4$), which indicate the effect of the independent variables—economic growth, use of renewable energy, and population size—on the dependent variable, CO₂ emissions. α_1 and α_2 are expected to be positive and negative, respectively, so that the EKC hypothesis holds. An increase in the consumption of renewable energy is expected to mitigate CO₂ emissions, thus α_3 is expected to be negative while the impact of population growth on CO₂ emissions is expected to be positive, as higher population growth is more likely to raise CO₂ emissions.

All the data on the five ASEAN countries including Indonesia, Myanmar, Malaysia, the Philippines, and Thailand are collected from the World Bank's World Development Indicators, over the 1971–2014 period. Renewable energy is proxied by combustible renewables and waste. Income is measured by real per capita GDP in constant 2010 US dollars. Population is total population, and CO₂ emissions is total CO₂ emissions from energy consumption in millions of metric tons, which is converted into kilograms per capita. Table 1 describes the data, with all variables transformed into their natural logarithmic form.¹

¹ We have rescaled all the variables so that a number of values falls between zero and one. As such, these values are negative when taking the logarithm.

Table 1. Data description.

Variable	Observations	Mean	Std. Dev.	Minimum	Maximum
Indonesia					
<i>LnCO₂</i>	44	−0.04	0.53	−1.11	0.94
<i>LnY</i>	44	0.58	0.43	−0.22	1.31
<i>LnY²</i>	44	0.51	0.50	0.00	1.71
<i>LnEC</i>	44	−0.61	0.37	−1.21	−0.12
<i>LnREC</i>	44	−0.02	1.78	−3.06	1.98
<i>LnPOP</i>	44	5.21	0.23	4.77	5.54
Myanmar					
<i>LnCO₂</i>	44	−1.73	0.29	−2.29	−0.88
<i>LnY</i>	44	−1.14	0.64	−1.79	0.24
<i>LnY²</i>	44	1.70	1.11	0.00	3.21
<i>LnEC</i>	44	−1.26	0.07	−1.37	−0.99
<i>LnREC</i>	44	−1.11	0.64	−1.89	0.39
<i>LnPOP</i>	44	3.69	0.20	3.30	3.95
Malaysia					
<i>LnCO₂</i>	44	1.31	0.58	0.41	2.08
<i>LnY</i>	44	1.62	0.47	0.72	2.34
<i>LnY²</i>	44	2.85	1.51	0.52	5.48
<i>LnEC</i>	44	0.34	0.56	−0.65	1.09
<i>LnREC</i>	44	0.49	0.54	−0.66	1.35
<i>LnPOP</i>	44	2.94	0.31	2.40	3.41
Philippines					
<i>LnCO₂</i>	44	−0.24	0.16	−0.66	0.05
<i>LnY</i>	44	0.50	0.16	0.25	0.92
<i>LnY²</i>	44	0.27	0.19	0.06	0.84
<i>LnEC</i>	44	−0.79	0.06	−0.90	−0.67
<i>LnREC</i>	42	1.75	1.08	−0.88	2.62
<i>LnPOP</i>	44	4.16	0.30	3.61	4.61
Thailand					
<i>LnCO₂</i>	44	0.54	0.75	−0.68	1.53
<i>LnY</i>	44	0.92	0.57	−0.05	1.72
<i>LnY²</i>	44	1.16	1.00	0.00	2.96
<i>LnEC</i>	44	−0.20	0.57	−1.02	0.69
<i>LnREC</i>	44	−0.35	0.33	−1.47	0.18
<i>LnPOP</i>	44	4.02	0.17	3.64	4.23

Notes: Std. Dev. is standard deviation. All variables are in logarithm.

3.2. Cointegration Tests

We examine the long-run relationship among the variables of interest employing the traditional Johansen cointegration approach and the bounds-testing approach to cointegration. The first test is proposed by [Johansen \(1988\)](#) and further developed by [Johansen and Juselius \(1990\)](#) while the second approach, a relatively new technique based on the ARDL model, is constructed by [Pesaran et al. \(2001\)](#). Using two well-known cointegration tests yields a more robust conclusion, and between the two, the ARDL bounds-testing approach has greater advantages ([Sebri and Ben-Salha 2014](#)). First, the ARDL technique works well with a small sample such as ours, and it can test a cointegrating relationship among underlying regressors and a regressand with uncertainty as to whether they are $I(0)$ or $I(1)$ ([Narayan 2005](#); [Pesaran et al. 2001](#)). Second, the ARDL bounds-testing approach can address potential endogeneity problems, thus yielding an unbiased long-run estimation and interpreting the short-

and long-run effects with a single regression (Sebri and Ben-Salha 2014). Based on Equation (1), the ARDL-based approach to cointegration can be represented as follows:

$$\begin{aligned} \Delta \text{LnCO}_{2t} = & \gamma_0 + \sum_{i=1}^{k1} \gamma_{1i} \Delta \text{LnCO}_{2t-i} + \sum_{i=0}^{k2} \gamma_{2i} \Delta \text{LnY}_{t-i} + \sum_{i=0}^{k3} \gamma_{3i} \text{LnY}_{t-i}^2 \\ & + \sum_{i=0}^{k4} \gamma_{4i} \Delta \text{LnRE}_{t-i} + \sum_{i=0}^{k5} \gamma_{5i} \Delta \text{LnPOP}_{t-i} + \varnothing_{11} \text{LnCO}_{2t-1} \\ & + \varnothing_{12} \text{LnY}_{t-1} + \varnothing_{13} \text{LnY}_{t-1}^2 + \varnothing_{14} \text{LnRE}_{t-1} + \varnothing_{15} \text{LnPOP}_{t-1} + \epsilon_t \end{aligned} \quad (2)$$

where Δ denotes the first difference of the selected variables while γ_{1i} and \varnothing_{1i} ($i = 1, \dots, 4$) are the estimated parameters. k_i ($i = 1, \dots, 4$) are the optimal lag length determined by Akaike's information criterion (AIC), and ϵ_t is an error term of white noise.

Under the ARDL model as expressed in Equation (2), Pesaran et al. (2001) proposed two standard cointegrating tests, namely, the F - and t -statistics, for the purpose of testing a null hypothesis of no cointegration. These tests examine the significance of the lagged level of the regressors on the regressand using a univariate equilibrium correction mechanism. The confirmation of cointegration checks whether all the estimated coefficients of the lag level equal zero. That is, the t -statistics test the null hypothesis $\varnothing_1 = 0$ against the alternative of $\varnothing_1 \neq 0$, whereas the F -statistics test the null hypothesis $\varnothing_i = 0$ ($i = 1, 4$) against the alternative of at least $\varnothing_i \neq 0$ ($i = 1, \dots, 4$). If the estimated F -statistic is smaller than the lower-bound critical value (larger than an upper one), then the null hypothesis is rejected (accepted); otherwise, there knows no conclusion.

Pesaran et al. (2001) supplemented the critical value bounds for the F - and t -test in their analysis, but Narayan (2005) used a simulation method to reproduce critical values for the ARDL bounds test with a small sample size (between 30 and 80 observations). As the time span of our study is quite short, we refer to Narayan (2005)'s critical values for confirmation of a cointegrating relationship among the variables in the proposed model. Before calculating these two statistics, we ensure that the error terms are serially uncorrelated and homoskedastic and select optimal lags using AIC.²

3.3. Granger-Causality Test

To test whether a cointegrating relationship exists among CO₂ emissions, energy consumption, the use of renewable energy, income, and the square of income, and population size, we perform a long-run Granger-causality test in the framework of the VECM. The VECM specification provides both short- and long-run Granger-caused relationships among all the variables. Equation (1) is revised with a VECM framework as follows:

$$\begin{aligned} \Delta \text{LnCO}_{2t} = & \pi_0 + \sum_{j=1}^n \pi_{1j} \Delta \text{LnCO}_{2t-j} + \sum_{j=0}^n \pi_{2j} \Delta \text{LnY}_{t-j} + \sum_{j=0}^n \pi_{3j} \text{LnY}_{t-j}^2 \\ & + \sum_{j=0}^n \pi_{4j} \Delta \text{LnRE}_{t-j} + \sum_{j=0}^n \pi_{5j} \Delta \text{LnPOP}_{t-j} + \varphi_1 \text{ECT}_{t-1} + \epsilon_{1t} \end{aligned} \quad (3)$$

$$\begin{aligned} \Delta \text{LnY}_t = & \delta_0 + \sum_{j=0}^n \delta_{1j} \Delta \text{LnCO}_{2t-j} + \sum_{j=1}^n \delta_{2j} \Delta \text{LnY}_{t-j} + \sum_{j=0}^n \delta_{3j} \Delta \text{LnY}_{t-j}^2 \\ & + \sum_{j=0}^n \delta_{4j} \Delta \text{LnRE}_{t-j} + \sum_{j=0}^n \delta_{5j} \Delta \text{LnPOP}_{t-j} + \varphi_2 \text{ECT}_{t-1} + \epsilon_{2t} \end{aligned} \quad (4)$$

$$\begin{aligned} \Delta \text{LnY}_t^2 = & \theta_0 + \sum_{j=0}^n \theta_{1j} \Delta \text{LnCO}_{2t-j} + \sum_{j=0}^n \theta_{2j} \Delta \text{LnY}_{t-j} + \sum_{j=1}^n \theta_{3j} \Delta \text{LnY}_{t-j}^2 \\ & + \sum_{j=0}^n \theta_{4j} \Delta \text{LnRE}_{t-j} + \sum_{j=0}^n \theta_{5j} \Delta \text{LnPOP}_{t-j} + \varphi_3 \text{ECT}_{t-1} + \epsilon_{3t} \end{aligned} \quad (5)$$

² For details of the procedures in the bounds test, see earlier studies, such as Pesaran et al. (2001) and Vo et al. (2019).

$$\Delta \text{LnRE}_t = \beta_0 + \sum_{j=0}^n \beta_{1j} \Delta \text{LnCO}_{2t-j} + \sum_{j=0}^n \beta_{2j} \Delta \text{LnY}_{t-j} + \sum_{j=0}^n \beta_{3j} \Delta \text{LnY}_{t-j}^2 + \sum_{j=1}^n \beta_{4j} \Delta \text{LnRE}_{t-j} + \sum_{j=0}^n \beta_{5j} \Delta \text{LnPOP}_{t-j} + \varphi_4 \text{ECT}_{t-1} + \epsilon_{4t} \quad (6)$$

$$\Delta \text{LnPOP}_t = \rho_0 + \sum_{j=0}^n \rho_{1j} \Delta \text{LnCO}_{2t-j} + \sum_{j=0}^n \rho_{2j} \Delta \text{LnY}_{t-j} + \sum_{j=0}^n \rho_{3j} \Delta \text{LnY}_{t-j}^2 + \sum_{j=0}^n \rho_{4j} \Delta \text{LnRE}_{t-j} + \sum_{j=1}^n \rho_{5j} \Delta \text{LnPOP}_{t-j} + \varphi_5 \text{ECT}_{t-1} + \epsilon_{5t} \quad (7)$$

where Δ denotes the first difference of the selected variables, and n is the number of optimal lags. The residuals ($\epsilon_{it}, i = 1, \dots, 5$) are assumed to be serially independent with a zero mean and a finite covariance matrix. ECT_{t-1} , the error correction term (ECT), is its one-period lagged estimation derived from the long-run regression in Equation (1).

Within the VECM framework, short-run Granger causality from income to CO_2 emissions is tested via the null hypothesis that all the coefficients of income and the square of income in Equation (3) are zero, simultaneously. So, we test $\pi_{2j} = \pi_{3j} = 0 \forall n$, using the Wald test. Rejection of the null hypothesis means that a unidirectional causal effect exists from income to CO_2 emissions. To confirm whether CO_2 emissions Granger-cause income, after estimating Equations (3) and (4), we test the significance of $\delta_{1j} = \theta_{1j} = 0 \forall n$ using the Wald test. If we find at least $\delta_{1j} \neq \theta_{1j} \neq 0$, we can conclude that a unidirectional causal effect exists from CO_2 emissions to income. Furthermore, a rejection of both $\pi_{2j} = \pi_{3j} = 0 \forall n$ and $\delta_{1j} = \theta_{1j} = 0 \forall n$ implies a bidirectional Granger-causal relationship between income and CO_2 emissions. Meanwhile, acceptance of these conditions illustrates that the two variables of interest have no causal relationship. A similar procedure can be performed for each pair of variables in Equations (3)–(7) to examine the Granger causality.

The long-run Granger-causality test is based not only on the conditions in short-run Granger causality but also a coefficient of the ECT. Specifically, we test the significance of $\varphi_1 = \pi_{2j} = \pi_{3j} = 0$, and rejecting this test indicates that income Granger-causes CO_2 emissions in the long run. Similarly, a rejection of the test $\varphi_2 = \varphi_2 = \delta_{2j} = \theta_{3j} = 0$ means a reverse Granger-caused relationship from CO_2 emissions to income in the long run. Using the same procedure, we examine the long-run Granger-caused relationship between other pairs of variables in the equations.

If Equation (1) shows no cointegration, we do not examine long-run causality. Instead, we conduct a short-run Granger-causality test using the vector autoregression (VAR) framework, in which we take the first difference of the variables to ensure that the data are stationary for our analysis.

4. Empirical Results and Discussions

4.1. Results of Unit-Root and Cointegration Tests

We begin our analysis by checking whether the time series of the given variables is stationary because regressing non-stationary variables leads to spurious estimation. We employ the Dickey–Fuller generalized least squares (DF-GLS) unit-root test by Elliott et al. (1996). The DF-GLS test is a modified version of traditional augmented Dickey–Fuller (ADF) test (Dickey and Fuller 1979), in which the time series is transformed via a GLS regression before the test is performed. Thus, it is perceived to be more robust and significantly powerful than the ADF test.

Table 2 illustrates the DF-GLS tests for all the variables of interest, namely CO_2 emissions, energy consumption, the use of renewable energy, income and the square of income, and population size. We find that the five ASEAN countries including Indonesia, Myanmar, Malaysia, the Philippines, and Thailand reject the null hypothesis of containing a unit root in population size at level. In other words, this variable is stationary or integrated $I(0)$ although relatively weak evidence is observed in Thailand at a level of 10 percent significance. Meanwhile, the test for the remaining variables— CO_2 emissions, energy consumption, renewable energy consumption, real income, and the square of real income—rejects the null hypothesis at the first difference, meaning they are integrated at $I(1)$.

Table 2. The results of unit-root tests.

Country	Variable	Level		1st Difference			Order of Integration
		DF-GLS	DF	PP	DF-GLS	DF	PP
Indonesia	<i>LnCO₂</i>	−2.13	−3.08	−2.96	−3.97 ***	−6.00 ***	−6.02 ***
	<i>lnY</i>	−2.03	−1.98	−2.24	−3.26 **	−4.80 ***	−4.74 ***
	<i>LnY²</i>	−0.78	−0.33	−0.60	−3.38 **	−4.83 ***	−4.77 ***
	<i>LnEC</i>	−1.29	−1.24	−1.22	−3.81 ***	−3.63 **	−6.68 ***
	<i>LnREC</i>	−1.18	−0.65	−0.86	−3.09 *	−5.30 ***	−5.26 ***
	<i>LnPOP</i>	−5.81 ***	−7.57 ***	−4.16 **	−3.86 ***	0.55	−0.35
Myanmar	<i>LnCO₂</i>	−1.01	−1.57	−1.50	−2.99 *	−5.01 ***	−4.71 ***
	<i>lnY</i>	−1.50	−0.15	−0.59	−1.86	−3.06	−3.12
	<i>LnY²</i>	−2.33	−1.22	−1.71	−1.84	−3.32 *	−3.78 **
	<i>LnEC</i>	−1.50	−0.21	−0.95	−2.36	−3.51 *	−3.53 *
	<i>LnREC</i>	−0.93	−1.32	−1.11	−3.86 ***	−7.13 ***	−7.37 ***
	<i>LnPOP</i>	−6.07 ***	−2.38	−1.52	−5.54 ***	0.24	−1.28
Malaysia	<i>LnCO₂</i>	−1.91	−2.02	−2.11	−3.31 **	−7.86 ***	−7.79 ***
	<i>lnY</i>	−1.68	−2.20	−2.35	−3.01 *	−5.75 ***	−5.72 ***
	<i>LnY²</i>	−2.01	−2.24	−2.38	−3.22 **	−5.98 ***	−5.96 ***
	<i>LnEC</i>	−1.69	−1.84	−1.72	−3.89 ***	−7.03 ***	−7.39 ***
	<i>LnREC</i>	−1.92	−1.81	−1.97	−3.96 ***	−5.17 ***	−5.08 ***
	<i>LnPOP</i>	−3.59 **	−3.71 **	1.53	−2.96 *	−1.49	−1.78
Philippines	<i>LnCO₂</i>	−1.89	−1.44	−1.74	−2.81	−5.70 ***	−5.79 ***
	<i>lnY</i>	−1.22	0.04	−0.69	−3.07 *	−3.56 **	−3.52 *
	<i>LnY²</i>	−0.81	1.78	0.84	−2.63	−3.53 *	−3.52 *
	<i>LnEC</i>	−2.04	−2.49	−2.53	−2.51	−8.62 ***	−8.33 ***
	<i>LnREC</i>	−1.93	−1.57	−1.69	−2.60	−3.67 **	−3.58 **
	<i>LnPOP</i>	−6.67 ***	6.10 ***	3.42 ***	−3.99 ***	−1.67	−1.92
Thailand	<i>LnCO₂</i>	−1.54	−0.74	−1.17	−3.14 *	−4.48 ***	−4.44 ***
	<i>lnY</i>	−1.81	−0.71	−1.29	−2.85	−4.04 **	−4.04 **
	<i>LnY²</i>	−1.81	−2.35	−2.41	−3.02 *	−4.33 ***	−4.34 ***
	<i>LnEC</i>	−2.01	−1.60	−1.97	−2.39	−4.8 ***	−4.91 ***
	<i>LnREC</i>	−4.79 ***	−5.36 ***	−5.27 ***	−5.17 ***	−8.97 ***	−10.1 ***
	<i>LnPOP</i>	−2.94 *	−6.60 ***	4.04 ***	−5.05 ***	−1.36	−2.02

Notes: For comparison purposes, we use the Dickey–Fuller Generalized Least Square (DF-GLS), augmented Dickey–Fuller (ADF) and Phillips Pearson (PP) tests with a constant and trend. The DF-GLS test is based on two lags and the remaining tests have three lags. ***, **, and * denote significance level of 1%, 5%, and 10%, respectively. In corresponding to these significant levels, the DFGLS test critical values are −3.77, −3.19, and −2.89 while the ADF and PP tests have interpolated critical values of −4.24, −3.52, and −3.20.

Our study uses two advanced cointegration tests, namely, the Johansen cointegration test developed by Johansen and Juselius (1990) and the bounded approach to cointegration by Pesaran et al. (2001). We then conduct a Granger-causality test with a multi-equation framework to examine whether a causal relationship exists among the variables of interest. In other words, when a long-run relationship exists among the selected variables, we use a VECM; otherwise, we use a vector autoregressive model (VAR).

Table 3 presents the results of the two cointegration tests, in which Panel A presents the Johansen method and Panel B depicts the bounds-testing approach. First, the Johansen test results show that both the maximum lambda and trace statistics are statistically significant at least at the 5 percent level of significance, indicating that the null hypothesis of no cointegration is rejected and that a long-run relationship among the variables exists in all of the selected countries. Interestingly, Indonesia, Myanmar, and Malaysia have as many as three cointegrating vectors in the test. Second, both the *F*- and *t*-statistics fail to confirm a cointegrating relationship among CO₂ emissions, energy consumption, renewable energy consumption, income and the square of income, and population size in the Philippines and Thailand, but not in Indonesia, Myanmar, and Malaysia. Because all the variables in the model are integrated at different levels, the bounds cointegration approach appears to be more appropriate for testing a long-run relationship and yields more consistent results. As such, we rely on the bounds approach rather than the Johansen cointegration test to reach our final conclusions about the long-run relationship.

Table 3. Results of the cointegration tests.

ASEAN Countries		Indonesia		Myanmar		Malaysia		Philippines		Thailand	
Panel A: Johansen cointegration test											
Ho	H1	λ	trace	λ	trace	λ	trace	λ	trace	λ	trace
$r = 0$	$r \geq 1$	84.42 **	186.27 **	91.29 **	201.37 **	54.22 **	152.94 **	67.90 **	167.58 **	49.73 **	117.12 **
$r \leq 1$	$r \geq 2$	46.51 **	101.85 **	54.58 **	110.08 **	43.64 **	98.72 **	41.53 **	99.68 **	34.12 **	67.40
$r \leq 2$	$r \geq 3$	31.71 **	55.33 **	24.37	55.50 **	25.19	55.08 **	33.00 **	58.15 **	15.06	33.27
$r \leq 3$	$r \geq 4$	14.59	23.62	22.23 **	31.14 **	17.3	29.89 **	15.61	25.14	9.43	18.21
$r \leq 4$	$r \geq 5$	8.22	9.03	8.36	8.90	11.76	12.59	9.38	9.53	6.05	8.77
$r \leq 5$	$r \geq 6$	0.81	0.81	0.54	0.54	0.83	0.83	0.16	0.16	2.72	2.72
Panel B: Bound cointegration test											
		F -stat	t -stat	F -stat	t -stat	F -stat	t -stat	F -stat	t -stat	F -stat	t -stat
Ho: No cointegration		8.24 ***	-6.37 ***	8.09 ***	-3.81 *	5.04 **	-3.98 *	3.25	-3.07	3.03	-1.14
Model		ARDL (1, 1, 2, 1, 1, 1)		ARDL (1, 2, 2, 1, 1, 2)		ARDL (1, 1, 1, 1, 2, 1)		ARDL (1, 1, 1, 1, 2, 1)		ARDL (1, 1, 1, 1, 1, 1)	

Notes: λ is max lambda value. Panel A shows the Johansen cointegration test by Johansen and Juselius (1990) and Panel B indicates the Bound cointegration test by Pesaran et al. (2001). Due to the small sample size, the critical values for the bounds test in Panel B refer to Narayan (2005) rather than Pesaran et al. (2001). The values are in the third case of the bounds test, which includes unrestricted intercept and no trend. ***, **, and * denote a significance level of 1%, 5%, and 10%, respectively. ASEAN: Association of Southeast Asian Nations.

4.2. Results of Long-Run Relationship

Because of the confirmation of the cointegration test in Indonesia, Myanmar, and Malaysia, we use the FMOLS and DOLS to estimate the long-run relationship with a particular stress on testing the EKC hypothesis as well as on investigating the impact of energy consumption, renewable energy consumption, and population growth on CO₂ emissions. Table 4 shows the estimation results for the long run relationship. Our findings support the presence of an EKC only in Myanmar, as both the FMOLS and DOLS have provided consistent results in which estimated coefficients are statistically positive for income per capita and negative for its square transformation. Because of conflicting results between the FMOLS and DOLS estimators, we did not come to a conclusive result about the EKC hypothesis in Indonesia and Malaysia.³

Table 4. The results from long-run estimations.

Variable	Indonesia	Myanmar	Malaysia
FMOLS			
<i>LnY</i>	0.66 ***	−0.12	0.87 ***
<i>LnY</i> ²	−0.09 **	−0.35 ***	0.08
<i>LnEC</i>	0.47 ***	1.72 ***	0.43 **
<i>LnREC</i>	−0.15 ***	−0.0003	−0.0004
<i>LnPOP</i>	1.58 ***	−0.89 ***	−0.62 *
Const	−8.32 ***	4.15 ***	1.35
DOLS			
<i>LnY</i>	−0.68 ***	0.43 ***	−0.78
<i>LnY</i> ²	0.15 ***	−0.41 ***	0.64 ***
<i>LnEC</i>	1.76 ***	2.8 ***	0.8 ***
<i>LnREC</i>	−0.27 ***	−0.49 ***	−0.14 **
<i>LnPOP</i>	3.6 ***	−1.84 ***	−0.86 **
Const	−18.19 ***	10.33 ***	1.87 *

Notes: ***, **, and * indicate significance levels of 1%, 5% and 10%, respectively.

Our mixed results on the EKC hypothesis in the selected ASEAN countries are in line with previous studies on the region. Some scholars are in favor of the EKC hypothesis. For example, [Saboori and Sulaiman \(2013\)](#) did confirm it in Singapore and Thailand and [Saboori et al. \(2016\)](#) revealed the same conclusion for the case of Malaysia. Our findings in Myanmar support this strand of an EKC literature. In contrast, [Saboori and Sulaiman \(2013\)](#) failed to confirm the EKC hypothesis in Indonesia, Malaysia, and the Philippines while [Al-Mulali et al. \(2015\)](#) reached the same outcome using the Vietnamese data over the 1981–2011 period. Our results are in line with this trend of empirical evidence as we found no conclusion of the EKC hypothesis in the long run in Indonesia, Malaysia, Thailand and the Philippines.

In the long run, the driving forces behind carbon emissions vary considerably from one surveyed country to another. In Indonesia, energy consumption is a contributing factor to CO₂ emissions, and the use of renewable energy mitigates their impact. The population growth also leads to higher carbon emissions. Similar patterns are observed in the driving determinants of CO₂ emissions in Myanmar and Malaysia, whose level of CO₂ emissions is positively associated with energy consumption and negatively related to population growth. The adoption of renewable energy in these two countries would help

³ It should be noted that although the coefficients of the income per capita and its square form are appropriate in terms of signs and significance levels, the estimation results could be spurious if there is a failure of cointegration of the conventional EKC estimation. The spurious regression is caused not by the quadratic function form, but by the fundamental trend relationship between income per capita and pollutants ([Wang 2013](#)). Thanks to the confirmation of the two advanced cointegration tests, our regressions do not suffer spurious estimations.

mitigate the negative environmental impact by reducing the quantity of CO₂ emissions, though the findings are less supported by the FMOLS estimator because of the statistically insignificant coefficients.

4.3. Results of Granger-Causality Tests

Table 5 reveals the causality effect of the variables of interests adopted in this paper. In Indonesia, Myanmar, and Malaysia, we see both long- and short-run causality but only a short-run causal relationship in the Philippines and Thailand. In general, the five countries included in our sample have considerable differences in the causality effect, as shown in Figure 1. In Malaysia, the neutrality effect on one another is observed among energy consumption, renewable energy, and CO₂ emissions in the short and long run, and a causal effect is reported from economic growth to CO₂ emissions and energy consumption. GDP growth unidirectionally Granger causes not only energy consumption but also carbon emissions, and a feedback effect is found between GDP growth and population growth. These findings imply that GDP growth is a key determinant of the amount of energy consumption and environmental degradation. Consistent with our results, Ang (2008) posited that there was an impact of economic growth on energy consumption for Malaysia over the 1971–1999 period.

In Indonesia, GDP growth also plays a key role in causing energy consumption, carbon emissions, and renewable energy use. Economic growth and population growth cause each other. Unidirectional causality is found from energy consumption to population growth and from carbon emissions to energy consumption in both the short and long run. Our results are consistent with those of Sugiawan and Managi (2016) in supporting a unidirectional effect from GDP growth to carbon emissions in the long run in Indonesia. However, unlike Sugiawan and Managi (2016), we detect unidirectional causality from GDP growth to the use of renewable energy, which further supports the EKC hypothesis, as found in earlier studies (Bento and Moutinho 2016).

Several interesting findings are found for Myanmar. It has a complicated causality relationship among five selected variables, and renewable energy usage seems to be an issue of concern as it is significantly affected by different determinants. Specifically, a statistically strong inter-relationship is seen among carbon emissions, GDP growth, population growth, and energy consumption as a bidirectional causal relationship exists between each pair of those variables, except for unidirectional causality from energy consumption to carbon emissions. Additionally, the country has a unidirectional causal relationship from energy consumption, GDP growth, and population growth to renewable energy consumption in both the short and long run.

With respect to the short-run causal relationship among the selected variables in the Philippines and Thailand, the feedback hypothesis is confirmed between economic growth and population growth. Carbon emissions, energy consumption, and renewable energy use do not cause one another. The Philippines has a unidirectional effect from economic growth to energy consumption as well as to carbon emissions, and Thailand does not show any causal effect among these three variables. Population growth is observed to cause both energy consumption and renewable energy use in the Philippines, whereas population growth and energy consumption cause each other in Thailand.

In summary, we found a unidirectional causality running from economic growth to CO₂ emissions in Indonesia, Malaysia, and the Philippines, a bidirectional causality in Myanmar, and no causal relationship between these two variables in Thailand. Our findings are different from those from Azam et al. (2015) as they reported no causal relationship between these two variables in Indonesia, Thailand, Singapore, and the Philippines with an exception being a unidirectional causality from economic growth to CO₂ emissions in Malaysia.

Table 5. Results of Granger-causality test.

Null Hypothesis	Short-Run Granger-Causality Test				Long-Run Granger-Causality Test			
	Indonesia	Myanmar	Malaysia	Philippines	Thailand	Indonesia	Myanmar	Malaysia
$\Delta \text{LnCO}_2 \neq \Delta \text{LnREC}$	6.20 *	1.52	0.52	0.13	4.22	6.62 *	2.80	0.52
$\Delta \text{LnCO}_2 \neq \Delta \text{LnREC}$	0.35	3.67	1.97	1.44	4.85 *	0.42	4.48	2.02
$\Delta \text{LnCO}_2 \neq \Delta \text{LnY}, \Delta \text{LnY}^2$	1.77	12.88 **	4.26	6.23	6.95	1.78	14.08 **	4.40
$\Delta \text{LnCO}_2 \neq \Delta \text{LnPOP}$	2.1	7.39 **	5.91 *	0.17	4.44	2.1	9.15 **	6.95 *
$\Delta \text{LnEC} \neq \Delta \text{LnCO}_2$	0.34	12.24 ***	3.50	0.54	5.62 *	3.45	24.60 ***	3.91
$\Delta \text{LnEC} \neq \Delta \text{LnREC}$	2.34	5.60 *	0.35	1.00	2.86	3.86	20.99 ***	1.22
$\Delta \text{LnEC} \neq \Delta \text{LnY}, \Delta \text{LnY}^2$	1.54	25.8 ***	5.17	1.71	1.44	6.52	27.57 ***	5.27
$\Delta \text{LnEC} \neq \Delta \text{LnPOP}$	8.06 **	22.74 ***	1.91	3.87	1.29	9.00 **	25.66 ***	3.10
$\Delta \text{LnREC} \neq \Delta \text{LnCO}_2$	0.96	3.56	3.83	0.02	0.46	2.85	4.05	4.06
$\Delta \text{LnREC} \neq \Delta \text{LnREC}$	0.44	0.23	2.41	1.04	3.50	2.29	3.56	3.02
$\Delta \text{LnREC} \neq \Delta \text{LnY}, \Delta \text{LnY}^2$	4.09	3.87	0.79	5.87	18.48 ***	4.36	9.47 *	0.98
$\Delta \text{LnREC} \neq \Delta \text{LnPOP}$	2.93	2.73	1.19	1.21	9.17 **	3.84	3.38	1.33
$\Delta \text{LnY}, \Delta \text{LnY}^2 \neq \Delta \text{LnCO}_2$	4.93	14.08 ***	9.58 **	17.7 ***	6.22	37.3 ***	28.67 ***	12.00 *
$\Delta \text{LnY}, \Delta \text{LnY}^2 \neq \Delta \text{LnREC}$	6.69	13.52 ***	6.46	15.77 ***	5.01	36.65 ***	24.56 ***	12.55 *
$\Delta \text{LnY}, \Delta \text{LnY}^2 \neq \Delta \text{LnPOP}$	10.77 ***	11.08 **	3.10	2.34	4.28	34.82 ***	11.61 *	9.43
$\Delta \text{LnY}, \Delta \text{LnY}^2 \neq \Delta \text{LnPOP}$	22.41 ***	3.96	11.72 **	17.35 ***	19.68 ***	52.13 ***	12.17 *	12.57 *
$\Delta \text{LnPOP} \neq \Delta \text{LnCO}_2$	0.12	13.03 ***	0.98	19.29 ***	2.70	0.93	18.93 ***	94.44 ***
$\Delta \text{LnPOP} \neq \Delta \text{LnREC}$	0.13	15.17 ***	18.04 ***	15.07 ***	9.7 ***	0.59	19.63 ***	63.13 ***
$\Delta \text{LnPOP} \neq \Delta \text{LnREC}$	2.09	19.48 ***	6.38 **	2.88	0.19	2.09	22.61 ***	69.21 ***
$\Delta \text{LnPOP} \neq \Delta \text{LnY}, \Delta \text{LnY}^2$	6.71	21.26 ***	18.13 ***	31.45 ***	9.47 **	32.22 ***	21.41 ***	87.40 ***

Notes: ***, **, and * indicate significance levels of 1%, 5% and 10%, respectively.

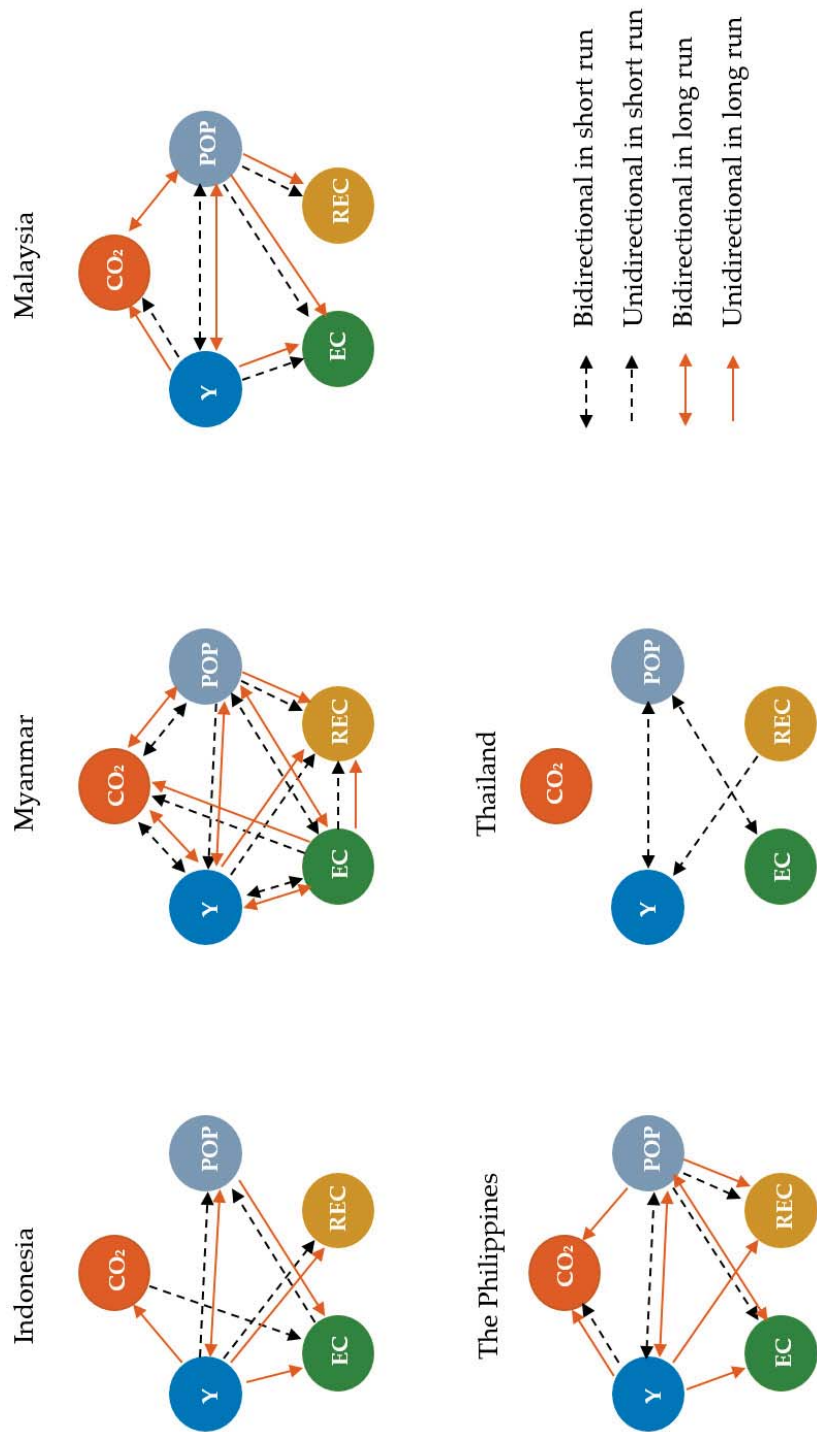


Figure 1. Summary of Granger causality tests. CO_2 —per capita CO_2 emissions; EC —per capita energy consumption; Y : real per capita GDP and its square form; POP —population growth rate; REC —per capita consumption of renewable energy.

5. Concluding Remarks and Policy Implications

By using the ARDL bounds test of cointegration, the Johansen cointegration test, and the Granger-causality test based on both VECM and VAR framework, this paper examines a long-run relationship and direction of Granger causality between economic growth, energy consumption, renewable energy usage, environment degradation (i.e., carbon dioxide emissions), in a multivariate model including population growth as an additional variable. Also, we test the validity of a well-known EKC hypothesis using two long-run estimators, FMOLS and DOLS. Our sample consists of five ASEAN members: Indonesia, Myanmar, Malaysia, the Philippines, and Thailand. The primary reasons we conduct the study are the lack of empirical studies that examines the remedial role of renewable energy to address the increasing CO₂ emissions in the region. In addition, we observe and respond to the desire and efforts made by the governments in these countries to achieve their energy mix targets, with a major focus on renewable energy in recent years.

The main findings of this paper can be summarized as follows. First, a cointegrating relationship exists among economic growth, energy consumption, renewable energy usage, environment degradation in Indonesia, Myanmar, and Malaysia but not in the Philippines and Thailand. The validity of the EKC hypothesis is confirmed in Myanmar, but not in Indonesia and Malaysia because of the inconsistent results from the FMOLS and DOLS. Second, the outcomes from the Granger-causality test vary considerably across the selected countries, among variables such as economic growth, energy consumption, renewable energy use, CO₂ emissions, and population growth. The Granger-causality test was performed with the VECM framework with variables that have a long-run relationship; otherwise the VAR framework was adopted. Our findings serve as a critically empirical source of inputs for policy suggestions and implementation to balance sustainable economic growth, conserve energy, and preserve the environment.

The findings from this paper can be used in future research and for public policy purposes. The varying characteristics of different countries cause them to develop and implement different paths to achieving the proposed renewable energy targets in the short run and long run. Our findings appear to imply that academic studies in the future should examine the relationship among GDP growth, energy use, carbon emissions, renewable energy consumption, and other macroeconomics factors, including population growth for each country separately.

The varying findings across ASEAN countries can be a useful source of policy implications. No Granger causality is found among carbon emissions, energy consumption, and renewable energy consumption in Malaysia, Thailand, and the Philippines. This implies that the current level of renewable usage is not sufficient enough to mitigate the level of CO₂ emissions and to support the total of energy usage in these two countries. Malaysia experiences a unidirectional Granger caused from economic growth to energy consumption and to CO₂ emissions which indicates energy still plays a vitally important part in the country's economic development while pollution degradation creates a concern. This policy implication could be applied for the case of Indonesia in which economic growth is observed to have a unidirectional impact not only on CO₂ emissions and energy consumption but also on renewable energy in the long run. Furthermore, for the case of Thailand, no links among economic growth, CO₂ emissions, energy consumption and renewable energy usage were found in the short run. Not only does Myanmar have a unidirectional effect from GDP growth, energy consumption, and population growth to the adoption of renewable energy, but the country also has the particular causal effect among the variables, most of which bidirectionally cause one another. Our results show that there is a trade-off between higher level of economic growth and higher levels of CO₂ emissions as well as energy consumption. More importantly, the usage of renewable energy in curbing environment degradation gains little assistance. Our study reinforces a view that while the current level of renewable energy usage is an ineffective measure for environment protection, a transformation toward less polluted renewable energy would be crucial to achieve goals of sustainable development in Malaysia as mentioned by Gill et al. (2018).

The paper has a limitation that a number of observations are relatively small, making a traditional causality test less powerful. Like previous studies, the data for analyzing the relationship among energy consumption, economic growth and environment degradation rely on the World Bank indicators, starting in 1970. Using the so-called bootstrap causality test to deal with small sample size can be a proper robustness check. This opens a potential for future studies on a single country.

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Article

Internationalization, Strategic Slack Resources, and Firm Performance: The Case Study of Vietnamese Enterprises

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Abstract: The study attempted to fill a gap in the research on international business by providing fresh evidence of the effect of the degree of internationalization on firm performance and the influence of organizational slack on this relationship. By applying a fixed-effects model to data from 569,767 Vietnamese enterprises from 2007 to 2015, a significant W-shaped linkage between internationalization and firm performance was revealed. Importantly, the results also emphasized the importance of three types of slack in the first stage of the internationalization process: absorbed slack human resources, other absorbed slack resources, and unabsorbed slack resources.

Keywords: performance; internationalization; organizational slack

JEL Classification: F12; F14; F21; F23

1. Introduction

As internationalization in recent decades has expanded the size of the market and enabled small firms to do business on a global scale, the expansion of the presence of enterprises in the international market is no longer a strange phenomenon (Ciravegna et al. 2014). Although larger firm size and reputation are often benchmarks and advantages for acceptance in the global market, smaller firms with excellent products and services have proved their dynamic strengths in assessing and meeting the demands of customers abroad, which include activeness, flexibility and network accumulation (Dasí et al. 2015; Ciravegna et al. 2014). As a result, there is great interest in whether foreign expansion is beneficial for enterprises, given their different sizes and capabilities, and numerous studies have sought to assess the relationship between foreign expansion and firm performance as well as its influencing factors in order to optimize this relationship (Cho and Lee 2018; Dasí et al. 2015; Glaum and Oesterle 2007; Pangarkar 2008; Zhang et al. 2018; Zhou 2018; Delios and Beamish 1999). However, despite recognizing the costs and benefits associated with the increasing degree of internationalization, these studies have raised more questions than answers due to the inconclusive findings and ongoing debates (Glaum and Oesterle 2007).

Once the cost of internationalization outweighs its benefits, the global expansion will negatively impact on performance, whereas positive effects occur when the benefits of internationalization dominate its cost (Denis et al. 2002; Kim and Mathur 2008). The dominance of costs or benefits depends strongly on a firm's capabilities, characteristics, strategies, and national context (Cho and Lee 2018; Lin et al. 2011; Zhou 2018). Prior studies have viewed internationalization favorably due to the fact of its positive linear effect on performance, which is attributed to greater market access, competitive

advantage and financial success (Chen and Hsu 2010; Pangarkar 2008). However, others have found a negative linear relationship, suggesting threats of global expansion to firm performance due to the presence of foreignness liabilities such as fierce competition, high transaction costs, market volatility, and cultural diversity (Zhou 2017; Zhang et al. 2018).

New research on this issue acknowledging internationalization as a multi-stage process has also found a curvilinear relationship between internationalization and firm performance (Bobillo et al. 2010; Cho and Lee 2018; Contractor et al. 2003; Dutta et al. 2016; Lin et al. 2011; Pangarkar 2008; Zhou 2018). Empirical results have suggested that this curvilinear relationship is moderated by firm characteristics and behaviors, leading to an S-shaped relationship in the three-stage theory of Contractor et al. (2003) and the empirical results of others (Bobillo et al. 2010; Cho and Lee 2018; Lin et al. 2011; Riahi-Belkaoui 1998; Ruigrok et al. 2007), a U-shaped relationship (Assaf et al. 2012; Capar and Kotabe 2003; Chen and Tan 2012), an inverted U-shaped relationship (Chiao et al. 2006), or a W-shaped relationship for small firms (Zhou 2018). Further complicating the issue, some studies have attempted to distinguish different modes of internationalization according to product diversification strategy, including single-item export versus multi-item export. The results indicate that the single-item strategy generates more benefits for internationalizing firms in terms of performance enhancement and technology absorption (Agyei-Boapeah 2018; Sharma 2017).

Moreover, the relevant theoretical and empirical literature has recognized the importance of organizational slack as a strategic resource to relieve uncertainties and sustain firm performance in the global expansion process (Bourgeois 1981; Daniel et al. 2004; Lin et al. 2011; Tan and Peng 2003). Depending on the discretion and flexibility level, slack resources can be classified as high-discretion slack and low-discretion slack (Lin et al. 2011). Zhang et al. (2018) recently explored the moderating effects of three types of slack on the relationship between internationalization and performance: absorbed slack human resources (AHRs), other kinds of absorbed slack resources (OARs), and unabsorbed slack resources (USRs). While AHRs represent inimitable slack based on human capital accumulation, OARs reflect the surplus in business operations and are oriented toward extremely selective uses. By contrast, due to the fact of its high discretion, USRs are more likely to be used as buffers in implementing international ventures.

Compared to the rich literature on international economics focused on the internationalization performance of MNCs from advanced economies like Taiwan, Japan, and Europe, there is less evidence for the going-global performance of enterprises from emerging countries. The past three decades have witnessed rapid growth and remarkable transformation in emerging economies (EEs), and EE enterprises have benefited tremendously from global trade integration and economic convergence. One of these emerging markets is Vietnam, a developing country that has experienced recent success in trade and economic growth. The dynamic internationalization process of domestic enterprises has been a significant contributor to these successes. Due to the globalization efforts and incentive policies during the past two decades, the total export of manufactured goods has grown at an average of 10 percent per year, stimulating the development of internationalized firms and contributing to 80 percent of Vietnam's GDP in 2017 (Eckardt et al. 2018).

In contrast to the regression of globalization occurring in some countries in the Pacific and East Asia region, Vietnam has witnessed a renaissance in manufacturing and processing industries toward international expansion. A number of critical factors are responsible for this positive outcome. Among the most important of these factors is Vietnam's open trade policy, which has supported the process of internationalization of local enterprises. Vietnam, along with Singapore, holds the top position in East Asia for participating in bilateral and multilateral free trade agreements (FTAs) with the United States, Japan, Korea, and the European Union and is also a member of ASEAN and WTO. In early 2018, Vietnam and 11 other countries joined the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP). The above trade agreements are committed to drastically reducing tariffs, implementing domestic reforms, and opening up the economy to foreign investment (Eckardt et al. 2018).

In addition, Vietnam has taken advantage of its population structure through effective investments in human resources. Furthermore, to facilitate international integration, Vietnam has relentlessly invested in improving competitiveness and creating a favorable business environment for both domestic and foreign firms by lowering corporate income taxes, resulting in higher rankings in the World Economic Forum's Competitiveness Index and the World Bank's Favorable Business Environment. Vietnam has also invested in infrastructure, especially in transport, logistics, and electricity, to meet rising business demands. Last but not least, the emergence of the digital era has enabled smaller firms in Vietnam to go global by using digital networking channels and more innovative approaches (Coviello et al. 2017). However, Vietnam's commercial competitiveness, in terms of time-consuming costs, procedural fees and transaction costs for import-export activities, lags behind other countries in the region, particularly the major ASEAN countries (including Singapore, Malaysia, Thailand, and the Philippines). Despite the significant achievements of local internationalized enterprises nurtured in this emerging market, the manufacturing and processing industry in Vietnam is still relatively small and is mainly driven by foreign direct investment (FDI), which accounts for nearly 90 percent of exports. The higher level of internationalization and increasing foreign inflows in Vietnam have challenged the survival and affected the internationalization performance of local enterprises in different ways (Lin 2014).

While a rich body of previous empirical studies has focused on the internationalization performance of multinational enterprises (MNEs) from developed economies, there is a shortage of academic studies on mature and newly internationalized enterprises from EEs (Buckley et al. 2017). The rapid growth of MNEs and newly internationalized firms in EEs has challenged arguments that successful internationalization requires a well-established institutional framework, firm or country-specific resources and favorable market conditions (Buckley et al. 2017). It has been claimed that EE enterprises can overcome their deficiencies and perform more effectively in global expansion by exploiting their non-traditional capabilities, such as superior networking, resource recombination, linkages, and leverage (Contractor et al. 2007; Cuervo-Cazurra et al. 2018; Buckley et al. 2017). However, there is a lack of evidence on the role of firm behavior, specifically, how EE enterprises allocate and use their strategic organizational resources to pursue internationalization despite many uncertainties and deficiencies (Buckley et al. 2017). Furthermore, direct empirical evidence supporting the explanation of the relationship between organizational slack and firm performance is not available for EEs. To address these research gaps and contribute to the literature on international integration, this study aims to answer two research questions. First, we investigated whether there is a curvilinear (specifically a W-shaped) global expansion–performance relationship for Vietnamese enterprises. Second, we filled a gap in the literature on behavioral economics by exploring the impact of different types of organizational slack on internationalization performance. We found that the three types of slack recently delineated by Zhang et al. (2018), i.e., AHRs, OARs, and USRs, can capture human capital accumulation and the discretion level; in addition, we identified which type of slack was critical for international integration in Vietnam in each of the different stages of internationalization. The findings from this paper can be applied to Vietnam's neighboring EEs in East Asia and the Pacific region, including Thailand, Malaysia, Philippines, Myanmar, Cambodia, and Laos. The government and top management of MNEs and newly internationalized firms in these regions can use these findings to develop appropriate policies and implement effective strategies to sustain internationalization performance at the firm level.

2. Literature Review

2.1. Degree of Internationalization and Firm Performance

2.1.1. Degree of Internationalization

Although global expansion is recognized as a favorable means of overcoming imperfect home institutional factors, market, and firm or country deficiencies, it is a gradual, long-term process that accompanies a firm's accumulation of knowledge, experience, transformation of organizational structure,

and networking over time (Hutzschenreuter and Matt 2017; Buckley et al. 2017; Cuervo-Cazurra et al. 2018). In the Uppsala model, these movements require a switch in a firm's commitment modes (Johanson and Vahlne 2009). However, success stories of born-global companies exhibiting a phase-skipping process abound. To further explain the situation, Håkanson and Kappen (2017) synthesized and compared the three main rooted theories of the process of internationalization based on behavioral economics, as summarized below: the main focus of the study, the Uppsala model described by (Johanson and Vahlne 1977) and revised in (Johanson and Vahlne 2009); the born-global model of (Madsen and Servais 1997); and a new formulation and introduction of the Casino model by (Håkanson and Kappen 2017).

In their formulation of the Uppsala model, Johanson and Vahlne (1977) focus on interpreting firms' increasing resource commitments as a result of higher experience and knowledge acquisition over incremental phases of internationalization expansion. In this model, international expansion is considered as an evolutionary process that is accumulative in nature; in this process, experiential learning and knowledge gain enable decision-makers to recognize opportunities, perceive potential risks, and calculate expansion costs to move forward (Vahlne and Johanson 2017; Santangelo and Meyer 2017). Interestingly, the wait-and-see strategy is a common practice of firms using the Uppsala model, as a commitment by these firms is strongly restrained by risks (Clarke and Liesch 2017). The framework of the Uppsala model includes change variables and state variables. With respect to change variables, commitment in term of resource allocation decisions always represents a tradeoff between the benefits and costs of internationalization under conditions of uncertainty and partial ignorance, and the commitment can be subsequently altered or adapted (Johanson and Vahlne 1977). Hence, this is considered an important source of another change variable—knowledge development in terms of learning, capacity, and trust-building.

State variables are classified into capability variables and commitment/performance variables, which have a cause–effect relationship with change variables. Operational capabilities are associated with privileged access to raw materials, capital, technology, governance systems, etc., to deal with the liability of foreignness. Dynamic capabilities, on the other hand, are inimitable, often accumulated through the learning process, and reveal the ability of the firm to combine its strengths and competencies to successfully respond to the rapidly changing environment. Finally, commitment variables comprise resource distribution decisions, and performance variables refer to the outcomes that are determined by knowledge development and internal/external capabilities (Santangelo and Meyer 2017; Vahlne and Johanson 2017).

The born-global model, by contrast, emphasizes the spirit of entrepreneurship in risk-taking ventures that seek to take advantage of international niche markets. In this case, pioneering companies aim to go global without a stable foundation based on domestic revenue. The born-global model is quite different from the Uppsala model, which is highly sensitive to uncertainties and pursues a gradually incremental process of internationalization (Håkanson and Kappen 2017). In the modern world, the born-global model appears to be supported by the wide range of internet-based innovative operational approaches and digital tools that can eliminate traditional weaknesses and internationalization costs and open new horizons for newly internationalized firms in global markets (Coviello et al. 2017). In this way, despite lacking a step-by-step approach and cautious practices, born-global companies can take advantage of their means-oriented flexibilities in implementing their internationalization strategy and capturing market opportunities (Chetty and Holm 2000).

The Casino model can be considered as a convergence of the Uppsala and born-global models, as it explains the internationalization process by synthesizing a special pattern based on certain characteristics of these two models (Håkanson and Kappen 2017). Although the Casino model is similar to the Uppsala model in terms of the initial development of a strong domestic base, this model's international expansion strategy is not restricted to market uncertainties and knowledge gaps. In this model, once the initial investments are made, the marginal cost of internationalization, for example, the marginal cost to establish a new subsidiary, diminishes over time. Similar to born-global enterprises, firms implementing the Casino model are very purposive and proactive in seeking existing

opportunities. However, as in the Uppsala model, they prefer feasible market opportunities rather than uncertain ventures.

It is worth noting that a higher level of internationalization usually requires an incremental process from exports to the establishment of subsidiaries and coordination units abroad for production, marketing, and distribution and from neighboring markets to more distant markets (Johanson and Vahlne 1977, 2009; Vahlne and Johanson 2017). More importantly, improvements in resource commitment and knowledge development over time not only provide firms with a strong base for shifting to later phases of the internationalization process but also influence internationalization performance. Therefore, the Uppsala model seems to be a good fit for the main focus of the present study, which aims to explore firm-level internationalization performance across different incremental phases and investigate whether firms' behavior in terms of slack resource allocation impacts the global expansion process.

2.1.2. The Relationship between Internationalization Degree and Firm Performance

Beginning with McDougall (1989), the literature on international entrepreneurship initially focused on new ventures undertaken rapidly and proactively by multinational companies. Recent studies of international entrepreneurship have expanded to include firms' cross-border operations independent of their age and size (Zahra 2005; Jones et al. 2011; Schwens et al. 2018). In general, entrepreneurial internationalization is a business strategy by which companies seek an appropriate level of involvement in global integration to be successful (Lu and Beamish 2001; Schwens et al. 2018). Consistent with the trend in the field, this paper focuses on firms' degree of internationalization in terms of foreign sales.

Whereas early studies proposed a positive linkage between firms' internationalization and performance, later analyses have taken into account the benefits and costs of a globalization strategy (Autio et al. 2000; Marano et al. 2016). The latter view is particularly pertinent to international expansion due to the fact of its proactive, innovative, and risky nature (McDougall and Oviatt 2000). Thus, although international market entry enables firms to seek opportunities for growth and value creation, firms also face risk and failure in implementing such an entry, leading to both negative outcomes and a non-linear internationalization–performance relationship. In particular, the greater global expansion will generate additional negative impacts. High global integration may increase coordination and governance costs related to managing internationalization operations, enhance management's information processing needs, and challenge the allocation of management resources.

Two main theoretical streams have emerged to propose and describe the benefits of internationalization: theories of foreign direct investment (FDI) and theories of multinational firms. According to FDI theories, firms invest in foreign countries because of economic drivers such as low production costs, market expansion, financial markets, and incentive policies from host countries (Ruigrok and Wagner 2003). While researchers in industrial organization and international business usually concentrate on economies of scale and scope (Buckley and Casson 1976), scholars in financial economics emphasize portfolio diversification and its impact on firms' risk–return performance (Gaur and Delios 2015; Bausch and Pils 2009; Wiersema and Bowen 2008). In general, the international business field has yielded consensus in terms of the benefits of internationalization (Contractor et al. 2007). However, an essential question remains to be clearly answered: “What is the optimum degree of internationalization?”

In addition to its benefits, previous studies have stressed the costs of internationalization. Entry costs and risks in international business are mainly related to differences in language and cultural background among employees, implementing new marketing and promotion programs, seeking reliable foreign distributors or suppliers, and international compliance, among other concerns.

As doing international business generates benefits as well as costs, it is worth noting that the linkage between internationalization and performance relies on the distribution of benefits and costs in the internationalization process. As a result, a non-linear internationalization–performance relationship is likely to be the most reasonable. Previous studies have demonstrated a complex curvilinear relationship

between the degree of internationalization (DOI) and performance. The DOI reflects a firm's exports to other countries (Hitt et al. 1997; Velez-Calle et al. 2018). Many previous studies have investigated the internationalization–performance relationship, with mixed empirical results: positive linear (Delios and Beamish 1999); negative linear (Denis et al. 2002; Kim and Mathur 2008); no significant linkage (Majocchi and Zucchella 2003); inverted U-shaped (Elango 2006); U-shaped (Chen and Tan 2012); inverted S-shaped (Cho and Lee 2018); S-shaped (Ruigrok et al. 2007); and U-shaped in large firms and W-shaped in small firms (Zhou 2018). Table 1 summarizes the commonly reported relationships.

Table 1. Empirical studies on the internationalization–performance link.

Author (Year)	Measurement of DOI	Empirical Results
Majocchi and Zucchella (2003)	Ratio of exports to total sales—Italian SMEs	No significant impact on ROA
Elango (2006)	Foreign sales to total sales—12 emerging markets	Inverted U-shaped relationship between DOI and performance
Ruigrok et al. (2007)	Foreign sales to total sales—Swiss multinational companies	S-shape was shifted to the right. The higher the DOI, the lower the performance
Chen and Tan (2012)	Percentage of total sales from foreign sales Percentage of total sales from within Asia excluding China Percentage of total sales from the Greater China region—Chinese firms	Weakly negative U-shaped link between Asian sales and firm performance Weak effect
Cho and Lee (2018)	Foreign sales to total sales—SMEs in Korea	Inverted S-shaped link between DOI and firm performance (supporting the three-stage international theory)
Velez-Calle et al. (2018)	Foreign sales to total sales (internationalization depth) Geographic zone index (international breadth)—firms in Latin America	U-shaped link Inverted U-shaped link
Zhou (2018)	The ratio of the number of overseas subsidiaries to the number of total subsidiaries—manufacturing firms in China	W-shaped in small firms and U-shaped in large firms
Cuervo-Cazurra et al. (2018)	Dummy variable that equals 1 if the firm has international operations—Argentina, Brazil, Chile, and Peru	The internationalization–performance linkage varied depending on the characteristics of the home and host countries

Notes: DOI: Degree of internationalization; ROA: Return on assets.

Given the number of empirical studies on the subject and the variety of outcomes, researchers have recently attempted to reconcile the theoretical arguments by suggesting that a U-shaped, inverted U-shaped, S-shaped or inverted S-shaped curve (a horizontal three-stage) may best represent the relationship between international expansion and corporate performance (see Table 1). However, researchers have not explained the reason that many enterprises, i.e., so-called “born-global” firms, devote all of their resources to achieving high global integration and why firms with greater global expansion have better performance. In particular, few studies in this field have explored emerging markets like Vietnam. Therefore, based on the evidence, we considered a fundamental W-shaped internationalization–performance link and investigated how enterprises’ product diversification affects the global integration decision and the internationalization–performance link in the manufacturing industry of Vietnam. Moreover, this study attempted to determine the

theoretical mechanism underlying the curvilinear relationship in Vietnam, which differs from those in other developed countries.

2.1.3. Four Stages of the Internationalization Process

From an evolutionary perspective, such as that adopted in the Uppsala model, early international developers often start with a low-commitment mode and are restrained to uncertainties and knowledge ignorance (Johanson and Vahlne 1977). In this adverse condition, they attempt to develop their knowledge and experiential learning to better perceive risks and recognize opportunities. This learning process incurs a cost burden, and an analysis of relevant studies illustrates that at the initial stage of foreign entry, firms seeking market expansion often experience upfront costs such as setting costs, administrative costs, and transaction costs (Hutzschenreuter and Matt 2017). The learning theory of Johanson and Vahlne (1977) considers internationalization an incremental process in which firms enhance organizational learning and improve knowledge as they enter foreign markets. Therefore, in the early stage of foreign market entry, firms are willing to pay high costs to obtain new market knowledge and adapt to foreign cultures, industry dynamics, and business environments (Johanson and Vahlne 2009; Zhou 2018). Although internationalization may generate a new income inflow, these benefits are not sufficient to offset the initial costs. In this early stage, firms do not yet benefit from economies of scale, as both the scope and scale of global operations are still small and inefficient (Santangelo and Meyer 2017). The first phase of the internationalization process is the most uncertain and challenging step and initially incurs a huge cost burden without any predictable outcome. However, this phase paves the way for later phases. Because internationalized firms are more exposed to risks and, thus, have a high probability of a loss or poor performance in the early period of foreign entry, we proposed that DOI was negatively associated with firm performance in the first stage of foreign entry.

In the second stage, firms allocating resources to increase DOI can gain economic benefits in diverse ways: accumulating and transforming innovative and useful knowledge, which can enable firms to improve capabilities and performance (Lu and Beamish 2001); obtaining competitive advantages throughout catch-up opportunities in global markets (McDougall and Oviatt 1996); and gaining benefits from economies of scale that are sufficient to compensate for the incremental costs of further foreign expansion. Upon further implementation of global expansion, firms increase market share throughout different foreign markets (Pangarkar 2008). In addition, with an increasing number of representatives in different countries, firms have the ability to reduce country risks derived from deviations in foreign, fiscal, and monetary policies. Moreover, in this second stage, going-global enterprises can exploit markets and seek resources in a more optimal way using a wide range of strategies and advantages, such as price discrimination, arbitrage, access to low-cost inputs or even exercising global market power (Rugman 2016; Contractor et al. 2007). Therefore, we expected that the relationship between DOI and firm performance was positive in the second stage.

In the third stage, as firms continue to implement global entry, DOI increases with the expanding number of overseas subsidiaries. Conflicts of interest among these subsidiaries may occur and lead to unattainable goals of the parent company. As a result, the subsidiaries could become competitors instead of collaborators (Porter 1976). Under this scenario, firms have to overcome considerable challenges in multinational organizational management. In addition, the diversity of culture among employees across countries may become an obstacle for cooperation and coordination toward common objectives (Contractor et al. 2003). When firms are in the third phase of the internationalization process, they face greater exposure to risks due to the large resource commitment and operations beyond an optimum number of nations with increasing governance costs (Vahlne and Johanson 2017). In this way, unexpected market variations or underperformance may accidentally defeat firms as they go beyond the optimal threshold. Therefore, firm performance may decrease in the third stage.

As an expansion of the three-stage theory outlined above, Zhou (2018) described the fourth stage. This fourth stage is consistent with findings by Contractor et al. (2003) that multinational firms will attempt to reform organizational operations to improve their performance. Previous studies have

shown that if multinational firms successfully build up an international network, they can gain benefits from “arbitrage and leverage opportunities” in various markets via this network. Moreover, with investments in new technologies and innovative solutions, firms can enhance effective communication between employees of various cultural and knowledge backgrounds (Kogut 1989; Wernerfelt 1984; Hitt et al. 1997; Zhou 2018). Firms can organize short course training or seminars to promote their organizational culture and core values. The greater the internationalization, the more alternatives that are available to firms when responding to external environmental uncertainty (Trigeorgis and Reuer 2017). Moreover, at the fourth stage, highly internationalized firms have greater access to global resources, human competencies, and opportunities to practice various effective strategies using their global coverage and power (Trigeorgis and Reuer 2017). Hence, internationalization performance was expected to increase again in stage 4.

Thus, based on the above arguments, we propose that the link between DOI and performance is W-shaped:

Hypothesis 1. *The link between DOI and performance is non-linear (W-shaped): DOI is negatively associated with firm performance in the first stage; has a positive effect on performance in the second stage; is negatively associated with performance in the third stage; and positively impacts performance in the fourth stage.*

2.2. Organizational Slack and Internationalization Performance

Bourgeois and Singh (1983) propose that organizational slack is “composed of three interrelated but conceptually distinct dimensions: available, recoverable, and potential slack.” The first includes resources that have not been incorporated into the technical design of the organization; the second comprises resources that “have already been absorbed into the system design as excess costs, but may be recovered during adverse time”; and the last involves “the capacity of the organization to generate extra resources from the environment, as by raising additional debt or equity capital.” In particular, Nohria and Gulati (1997) define organizational slack as the “pool of resources in an organization that is in excess of the minimum necessary to produce a given level of organizational output.” In addition, Singh (1986) separates slack into absorbed slack and unabsorbed slack. The first refers to excess costs in organizations, whereas the second encompasses excess, uncommitted liquid resources. Lee and Wu (2016) propose that absorbed slack “can be defined as slack committed to human resource, overhead expenses, the company’s reputation, and other administrative costs. Unabsorbed slack can be defined as excess, uncommitted liquid assets, showing a firm’s ability to meet current obligations with available resources.” Therefore, recoverable slack was considered absorbed slack, and available slack was considered unabsorbed slack.

Previous studies have explored bundles of slack resources and illustrated their influence on firm outcomes. For instance, Mellahi and Wilkinson (2010) examined the effect of slack level on innovation output and found that downsizing of slack was temporally associated with innovation output. In an investigation of financial slack and research and development (R&D) investments, Kim et al. (2008) demonstrated that financial slack had an inverted U-shaped linkage with R&D investments. Other studies concentrated on examining the relationship between organizational slack and outcomes such as firm performance, R&D investments, innovation outcomes, firm growth, and corporate entrepreneurship (Bradley et al. 2011; George 2005; Tan and Peng 2003; Lee and Wu 2016).

Among recent empirical evidence on the extent to which bundles of financial and human resource slack contribute to firm performance and survival, Paeleman and Vanacker (2015) illustrated that neither parallel resource abundance (having slack in financial and human resources) nor parallel resource constraints (lacking slack in financial and human resources) are optimal for firm performance and survival. By contrast, Wiersma (2017) showed that slack leads to greater benefits, as the organization achieves many profitable investment opportunities. Their findings show that the total impact of available slack is positively associated with organizational performance, whereas the association of recoverable slack with performance is negative.

From the perspective of firm behavior, the allocation of slack resources is among the strategic decisions that can determine a firm's readiness to relieve internal and external challenges and provide possibilities for starting internationalization ventures (Lin and Liu 2012; Tan and Peng 2003; Bourgeois 1981). In this way, slack resources can be understood as a firm's tangible and intangible assets that are primarily used for contingency purposes (Bourgeois 1981). The availability of organizational slack also reflects firms' strategic decisions and resource commitment level for internationalization activities (Johanson and Vahlne 1977; Lin 2014). Understanding the moderating effect of organizational slack on the internationalization–firm performance relationship is very important because slack plays a key role in buffering internationalization ventures and promoting efficient strategies to deal with uncertainties and foreign liability (Zhang et al. 2018).

Depending on the specific characteristics and discretion level of the slack, Lin et al. (2011) divided organizational slack into two main types: high-discretion slack and low-discretion slack. By contrast, Zhang et al. (2018) estimated three important kinds of slack: AHR, OAR, and USR. While OAR and USR reflect financial slack in terms of flexibility and discretion level for use, AHR captures a firm's inimitable assets in terms of human capital accumulation and expertise. Therefore, this study takes into account the impact of these three types of slack on the internationalization–performance relationship for Vietnamese enterprises.

2.2.1. The Moderating Effect of Absorbed Slack Human Resources (AHRs)

As mentioned above, AHR (measured by the ratio of the number of employees to total sales) is considered a critical resource for implementing an internationalization plan. Absorbed slack human resources can be defined as a firm's long-term intangible assets established through accumulated human capital and expertise that are very difficult to imitate, such as sophisticated solutions, complete processes, experiences, disciplines, and professionals (Zhang et al. 2018; Dutta et al. 2016). For firms, learning, experience, and improvement require a long period. In addition, AHRs are extremely important for newly internationalized firms in the first stage of joining the global market, as this stage requires accumulated international experience and in-depth knowledge to overcome the challenges of foreign liability and cultural diversity (Lin and Liu 2012). Hence, AHRs are expected to enhance a firm's internationalization performance in the early stages.

However, the importance of AHRs may gradually fade away in later stages due to the increasing cost burden associated with the retention of highly qualified experts. The skills and knowledge of these experts are highly attached to specific tasks instead of multi-task diversification (Zhang et al. 2018). Therefore, as firms reach higher degrees of the internationalization process, AHRs may no longer be an advantage. However, the overall effect of AHRs on international performance at each stage is difficult to predict. From the theoretical aspects discussed above, we obtained the second hypothesis.

Hypothesis 2. *Absorbed slack human resources (AHRs) positively moderate the internationalization–performance relationship of Vietnamese enterprises.*

2.2.2. The Moderating Effect of Other Kinds of Absorbed Slack Resources (OARs)

The second type of slack, OARs, originate from the financial surplus from business operations (measured by the difference between working capital and the salary budget divided by total sales) and are allocated for very selective contingency use, particularly for relieving internal pressures (Daniel et al. 2004; Bourgeois 1981). This kind of slack is characterized by a low discretion level for use. Moreover, OARs in term of excess financial cashflow may be challenged by economic downturns, inefficient investments, or long payback periods during the firm's operation time. More importantly, internationalization requires firms to start new ventures under uncertain and unpredictable conditions, but OARs are oriented toward facilitating firm operations and absorbing shock (Zhang et al. 2018). Despite its disadvantages, OARs are a vital resource that enable firms to stabilize firm performance and eliminate shocks to sustain firm development. In this way, OARs are a key resource for opening

new horizons for launching internationalization and maintaining firm performance when going global. Thus, we obtained the third hypothesis:

Hypothesis 3. *Other kinds of absorbed slack resources (OARs) positively moderate the internationalization–performance relationship of Vietnamese enterprises.*

2.2.3. The Moderating Effect of Unabsorbed Slack Resources (USRs)

Among the three types of slack, unabsorbed slack resources (USRs) appears to be the most uncommitted flexible type of additional resource in favor of implementing innovation and internationalization strategies (Nohria and Gulati 1996). The USRs are estimated by the ratio of current assets to current liabilities. While OARs are used to smooth daily operations by buffering internal pressures, USRs can enable firms to launch new ambitious goals, such as investing in new opportunities and diversifying products and markets (Lin 2014; Zhang et al. 2018). Because enterprises are often characterized by limited budgets and low access to abundant resources, the allocation of a firm’s strategic organizational resources to USR has a very high opportunity cost and requires the right investment in truly feasible projects (Dutta et al. 2016). It is important to note that managers in enterprises are under extremely high pressure to ensure efficient portfolio and capital use, especially when implementing complex long-term strategies like international integration. Nevertheless, a higher level of USRs undeniably contribute to activating and facilitating the global expansion process. Thus, we obtained the fourth hypothesis:

Hypothesis 4. *Unabsorbed slack resources (USRs) positively moderate the internationalization–performance relationship of Vietnamese enterprises.*

3. Methodology

3.1. Data Sample

This study used data on all Vietnamese enterprises drawn from the General Statistics Office of Vietnam (GSO) database, which consists of annual reports of all enterprises operating in Vietnam, from 2007 to 2015. During the study period, GSO compiled 2,850,883 records belonging to approximately 900,000 operating firms listed by firm IDs. After filtering out samples not following basic Vietnamese standards, such as those with negative assets or a negative number of employees, we constrained for a suitable range according to the entire variable list to eliminate outliers. Finally, the data used for analysis contained a total of 1,732,265 samples of 569,767 Vietnamese firms, which accounted for 61% of the initial population. According to Vietnamese law, small enterprises have a total labor force under 100 and total assets under 20 billion VND (equivalent to 741 million EUR) or a total labor force under 50 and total assets under 50 billion VND (equivalent to 1852 million EUR). This kind of enterprise accounts for 91.51% of the sample. Similarly, medium enterprises have a total labor force under 200 and total assets under 100 billion VND (equivalent to 3704 million EUR) or a total labor force under 100 and total revenue under 300 billion for trading and service industries. Medium enterprises account for 8.49% of the sample.

3.2. Measurement

3.2.1. Firm Performance

Firm performance can be estimated based on accounting indexes or justification of managers. As a proxy for firm performance, this study used return on assets (ROA), which has been popularly used in many previous studies (Daniel et al. 2004; Zhang et al. 2018), in addition, to return on sales (ROS) or return on equity (ROE). Because of the characteristics of Vietnamese enterprises, which include limited

financial management and a lack of financial capabilities, we strongly suggest using ROA to avoid the unobservable bias of ROE.

3.2.2. Internationalization

There are many ways to estimate firm DOI. The DOI can be calculated based on a firm's operations overseas, including its operation time in years, a number of overseas subsidiaries, or amount of outward FDI (Lu and Beamish 2004; Zhang et al. 2018). However, for Vietnamese enterprises, this measurement is not appropriate, as most Vietnamese enterprises do not operate abroad. Therefore, we estimated the DOI of enterprises by the ratio of total foreign sales to total revenue (Zhao and Ma 2016; Korsakienė and Tvaronavičienė 2012; Dutta et al. 2016).

3.2.3. Organizational Slack

Previous studies of the relationship between internationalization and firm performance have suggested an important role for organizational slack (Tan 2003; Lin and Liu 2012; Lin 2014; Zhang et al. 2018; Daniel et al. 2004; Bourgeois 1981; Dutta et al. 2016). Following Zhang et al. (2018), AHRs are measured as the ratio of the number of workers to total sales, USRs as the ratio of current assets to current liabilities, and OARs as the difference between working capital and total labor cost divided by total sales.

3.2.4. Control Variables

This study had four control variables: product diversification (PDIVER), experience in business (AGE), firm size (FIRM_SIZE), and technology gap (TECH_GAP). Bowen and Wiersema (2009); Chang and Wang (2007); Kumar et al. (2012), and Tallman and Li (1996) have described the impact of product diversification strategies on firm performance. Following Santarelli and Tran (2016), we estimate PDIVER by entropy. The AGE was represented by firm operating years, and FIRM_SIZE was measured by the natural logarithm of firm revenue. TECH_GAP was estimated by the gap between the firm average wage and the average wage of the industry. In addition, two dummy variables, YEAR and INDUSTRY, were introduced to prevent unobservable bias of the research model.

3.3. The Model

A research model was designed to investigate the relationship between internationalization and firm performance and the impact of the three types of organizational slack on this relationship. The main research model is as follows:

$$\begin{aligned} \text{ROA}_{it} = & \beta_0 + \beta_1 \text{DOI}_{it} + \beta_2 \text{DOI}_{it}^2 + \beta_3 \text{DOI}_{it}^3 + \beta_4 \text{DOI}_{it}^4 + \beta_5 \text{AHR}_{it} + \beta_6 \text{OAR}_{it} + \beta_7 \text{USR}_{it} \\ & + \beta_8 \text{PDIVER}_{it} + \beta_9 \text{FIRM_SIZE}_{it} + \beta_{10} \text{AGE}_{it} + \beta_{11} \text{TECH_GAP}_{it} + \mu_i + \varepsilon_{it} \end{aligned}$$

The model in this study was estimated by a fixed-effects-based regression following the results of a Hausman test (Hausman 1978) indicating that a fixed-effects regression was more appropriate than a random-effects regression for our dataset. The next step in the analysis procedure was to check for collinearity among the independent variables. As shown in Table 2, the correlations between independent variables were relatively low; all were less than 0.3 (Neter et al. 1990), indicating low bias and high reliability. The variance inflation factor (VIF) test was also used to test for collinearity in the research model. The mean VIF was 1.17, and the highest VIF was 1.67, which indicates that multicollinearity was not a problem in our model.

Table 2. Descriptive statistics and variable correlations.

	Mean	SD	ROA	DOI	AHR	OAR	USR	PDIVER	FIRM_SIZE	AGE	TECH_GAP
ROA	−0.003	0.178	1	-							
DOI	0.001	0.013	0	1	-						
AHRs	0.007	0.024	−0.0026 *	0.0008	1	-					
OARs	−0.762	0.717	0.0001	−0.0002	−0.0102 *	1	-				
USRs	0.023	0.910	−0.0001	0.0002	0.0193 *	0.0243 *	1	-			
PDIVER	0.031	0.154	0.0092 *	0.0107 *	−0.0071 *	0.0007	1	-			
FIRM_SIZE	8.305	1.822	0.0362 *	0.0368 *	−0.1290 *	0.0117 *	−0.0076 *	0.1452 *	1	-	
AGE	3.974	4.248	0.0402 *	0.0262 *	−0.0145 *	−0.0008	−0.001	0.1173 *	0.2387 *	1	-
TECH_GAP	−0.032	0.274	0.0118 *	0.0146 *	−0.0096 *	−0.0018 *	−0.0001	0.0150 *	0.1294 *	0.0153 *	1

Notes: ROA: Return on assets. DOI: Degree of internationalization. AHR: Absorbed slack human resources. OAR: Other kinds of absorbed slack resources. USR: Unabsorbed slack resources. PDIVER: Product diversification. FIRM_SIZE: Firm size. AGE: Firm operating years. TECH_GAP: the gap between the firm average wage and the average wage of the industry. * p-value < 0.05.

4. Results and Discussion

To estimate the impact of DOI on firm performance, a fixed-effects-based regression model and random-effects model were first considered due to the fact of their popularity and appropriateness for panel data. The results of the Hausman test ($p = 0.000$) recommended the use of a fixed-effects model for our large unbalanced 2007–2015 panel data. However, according to two studies (Bell et al. 2018; Bell and Jones 2015), the Hausman test is not always optimal for determining the preferred model. An alternative approach to check the appropriateness of a fixed-effect versus random-effect model is provided by Mundlak (1978) work. The comparative advantage of the Mundlak approach to the Hausman test is that the former can be applied to scenarios with the heteroskedastic error or intragroup correlation. According to the Mundlak approach, a panel-level average of time-varying proxies is calculated and checked to determine whether the panel-level means are jointly equal to zero in the random-effects estimator with other covariates in the model. In the present study, the results of the Mundlak approach rejected the hypothesis that the coefficients of our model were jointly equal to 0, which implies that a correlation between the time-invariant unobservable bias and regressors exists and that the fixed-effect model would be more appropriate. The coefficients of Fixed Effect Model (FEM) and Random Effect Model (REM) that were used to conduct the Hausman test and Mundlak approach are illustrated in Appendix A. We also conducted firm clustering to reduce heteroskedasticity and autocorrelation bias in the model. On the right-hand side of the equation, other important explanatory variables, such as organizational slack, product diversification, firm size, firm age, and technology gap, are comprehensively reviewed and added to avoid missing-variable status and enhance the possibility of explaining unobserved variants. Organizational slack is also used as a moderator to explore how this critical variable moderates the relationship between DOI and firm performance. The problems of heteroskedasticity and autocorrelation are eliminated by using industry/year clusters and dummies for ownership identities. Because the VIF was 1.17 (less than 10), there was no concern of multicollinearity in our estimation.

As the R^2 value of the quartic estimation was highest among the linear, quadratic, cubic, and quartic models, we report the quartic estimation of the DOI–performance relationship. First, as shown in Table 3, the coefficient of DOI was significantly negative ($\beta = -0.226$, $p < 0.01$). In other words, internationalization triggers a negative impact on firm performance in the first stage. On the contrary, the quadratic term of DOI shows the opposite trend in the second stage, with a significantly positive influence on firm performance ($\beta = 1.526$, $p < 0.01$). Interestingly, the magnitude of this upturn is quite strong and outweighs the initial loss. Next, the cubic coefficient of DOI indicated a significantly negative effect on firm performance in the third stage ($\beta = -2.836$, $p < 0.01$). The magnitude of the negative downturn in the third stage was quite large compared to the benefits in stage 2. Then, at the final stage, the quartic term of DOI indicated a significantly positive relationship between internationalization and performance ($\beta = 1.558$, $p < 0.01$), as the curve shifts up strongly again after the decline in the third stage. Therefore, the empirical evidence indicated a W-shaped curvilinear relationship between internationalization and firm performance across the four different stages, supporting the first hypothesis.

This result is consistent with that of Zhou (2018), who also found a W-shaped DOI–performance relationship for small Chinese firms from 2001 to 2014. Most studies measuring the curvilinear impact of DOI on performance have discovered an S-shaped relationship (Bobillo et al., 2010; Cho and Lee 2018; Lin et al. 2011) or U-shaped relationship (Assaf et al. 2012; Capar and Kotabe 2003; Chen and Tan 2012), and the present study is among the very few providing strong evidence that performance shifts toward a W-shaped trend under the presence of DOI. While the theory of Contractor et al. (2003) rejects the argument that “the more international integration, the more benefits”, this study once again challenges the three-stage theory of Contractor et al. (2003) by supporting the fourth stage of internationalization. In this way, internationalization can start with an initial loss due to the presence of foreign liability before moving to the second prosperous stage with accumulated experiences and offset benefits. Moreover, internationalization does not end at the third stage, where performance

continues to diminish with higher levels of internationalization, but recovers again and truly thrives in the fourth stage as a result of increasing maturity of international integration, which brings enormous improvements such as advanced technology upgrades, innovative solutions, effective networking, and within-organization communication (Hitt et al. 1997; Zhou 2018).

Table 3. The relationship between DOI and firm performance.

Fixed-Effects Model	
Dependent Variable	ROA (Firm Performance)
DOI (Degree of internationalization)	−0.226 *** (0.073)
DOI ²	1.526 *** (0.445)
DOI ³	−2.836 *** (0.828)
DOI ⁴	1.558 *** (0.466)
AHRs (absorbed slack human resources)	0.001 *** (0.000)
OARs (other kinds of absorbed slack resources)	−0.000 (0.000)
USRs (unabsorbed slack resources)	0.000 * (0.000)
PDIVER (product diversification)	−0.003 *** (0.001)
FIRM_SIZE (firm size)	0.004 *** (0.000)
AGE (firm age)	0.003 *** (0.000)
TECH_GAP (technology gap)	0.007 *** (0.001)
OWNERSHIP dummies	Yes
Industry dummies	Yes
Year dummies	Yes
_cons	−0.038 *** (0.004)
N	1,732,265
R-square	0.004

Standard errors in parentheses: * $p < 0.10$, *** $p < 0.01$.

Table 3 also shows that AHRs positively affect firm performance ($\beta = 0.001$, $\rho < 0.01$), while OARs had no influence on performance ($\beta = -0.000$, $\rho > 0.1$). The significantly positive relationship between USR and firm performance was quite weak, with a very small coefficient ($\beta = 0.000$, $\rho < 0.1$). From the perspective of firm behavior, on the one hand, high availability of slack resources may enable a firm to start its new ventures abroad and to tackle the uncertainties associated with a higher level of internationalization (Lin and Liu 2012; Lin et al. 2011). The AHRs are a critical determinant of the stimulation of firm performance and growth, as it reflects an inimitable resource via human capital accumulation (Tan and Peng 2003; Dutta et al. 2016). On the other hand, abundant slack may be a signal of inefficient capital use, which may trigger a negative impact on firm performance (Zhang et al. 2018). Because slack may originate from different strategic sources, the type of slack and its level of flexibility vary across industries.

In addition, product diversification had a significantly negative impact on firm performance ($\beta = -0.003$, $\rho < 0.01$). This finding indicates that the single-item strategy is a wiser choice for enterprises. By specializing in the best thing that it can produce, supply or serve, a firm can reach a higher position in its learning curve, generate more innovations, and achieve higher productivity and performance targets (Sharma 2017). In addition, scholars consider international diversification an essential strategic tool for firms entering global markets. Agyei-Bboapeah (2017) proposes that product-diversified firms may retain greater performance since they confront lower cash flow volatility. However, they can also experience poor performance if they have to deal with agency costs (Agyei-Boapeah 2018). Interestingly, the newly added variable of technology gap has a significantly positive coefficient, which may reflect the far lower technological level of Vietnamese enterprises compared with foreign firms in developed countries. Therefore, global integration may generate greater motivation and opportunities for Vietnamese enterprises to absorb knowledge spillovers and strengthen their production systems (Goh 2005).

The relationships between firm performance and other control variables representing firm characteristics, such as firm size ($\beta = 0.003$, $\rho < 0.01$) and firm age ($\beta = 0.007$, $\rho < 0.01$), are also significantly positive. Firm size was identified as a strong moderator of the DOI–performance relationship by Zhou (2018). Undoubtedly, firm size functions as a control variable in the present study, but it is closely linked to a firm’s internal capabilities. Thus, the larger the firm, the greater its capabilities to deal with uncertainties and launch successful international campaigns. Firm age, on the other hand, can reflect the international experiences of the firm. Firms with rich international experiences are undeniably more likely to succeed in the global market (Hsu et al. 2013).

Figure 1 illustrates the W-shaped relationship between DOI and Vietnamese enterprises’ performance from 2007 to 2015. Based on the figure and the estimation of extreme values, the first stage of the internationalization process is completed as the DOI of Vietnamese enterprises reaches approximately 9.9 percent. The second stage occurs between DOI of 9.9 percent and 44 percent. The third stage extends from DOI of 44 percent to 82.47 percent. The fourth stage occurs when DOI exceeds 82.47 percent. Firm performance is highest when the DOI of Vietnamese enterprises reaches approximately 44 percent. By contrast, firm performance is lowest when the DOI of Vietnamese enterprises reaches approximately 82.47 percent.

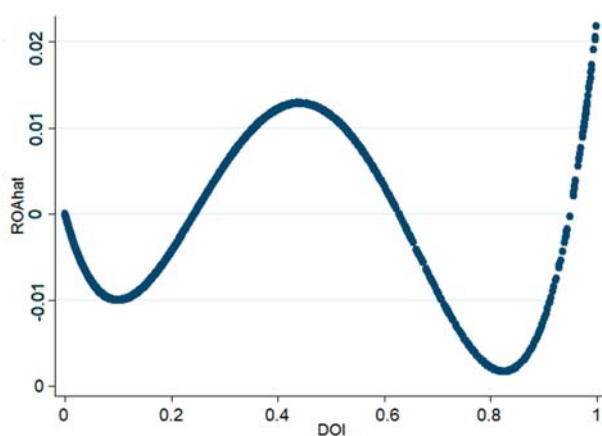


Figure 1. The relationship between the degree of internationalization and Vietnamese firms’ performance from 2007 to 2015 (Notes: ROAhat is estimated according to the coefficients of regression results).

Table 4 presents the results for the potential moderating effects of the three types of organizational slack on the relationship between DOI and the performance of Vietnamese enterprises. Based on the observed W-shaped relationship between internationalization and firm performance, we estimated

three thresholds of DOI in the population. We then separately analyzed the moderating effects of the organizational slack in each stage. First, the coefficients for the interaction term DOIxAHR are significantly positive for the first stage ($\beta = 46.057$, $\rho < 0.1$) and the second stage ($\beta = 173.585$, $\rho < 0.05$). Thus, a higher level of AHRs in the first two stages of the internationalization process will enhance the internationalization–performance relationship of Vietnamese enterprises. The large magnitudes of these terms imply a very strong moderating effect of AHRs. However, as the DOI reaches a higher percentage in the later stages, the results indicated that there was no influence of AHRs on the internationalization–performance relationship (stage 3: $\beta = -0.047$, $\rho > 0.1$; stage 4: $\beta = -0.043$, $\rho > 0.1$). This new empirical evidence is consistent with the results of Zhang et al. (2018), who found an inverted U-shaped moderating effect of AHRs. In summary, the second hypothesis is supported only in the first and second stages and not in the two later stages.

Table 4. The moderating effects of AHRs, OARs, and USRs across the four stages of internationalization.

	(Stage 1)	(Stage 2)	(Stage 3)	(Stage 4)
	ROA	ROA	ROA	ROA
DOI (degree of internationalization)	−0.227 *** (0.072)	−0.174 (0.136)	−0.095 *** (0.023)	−0.060 *** (0.021)
AHRs (absorbed slack human resources)	0.001 *** (0.000)	−63.653 ** (28.076)	0.070 (0.109)	0.042 (0.565)
OARs (other kinds of absorbed slack resources)	−0.000 (0.000)	−0.017 (0.016)	0.000 (0.000)	−0.000 (0.000)
USRs (unabsorbed slack resources)	0.000 * (0.000)	8.480 * (4.678)	−0.807 ** (0.344)	0.029 (0.088)
PDIVER (product diversification)	−0.003 *** (0.001)	−0.027 (0.050)	−0.019 (0.037)	0.745 (0.942)
DOIxAHR	46.057 * (26.030)	173.585 ** (75.865)	−0.047 (0.176)	−0.043 (0.575)
DOIxOAR	0.022 *** (0.008)	0.063 (0.054)	−0.000 (0.000)	0.000 (0.000)
DOIxUSR	13.621 *** (3.885)	−23.096 (18.781)	1.443 *** (0.555)	−0.029 (0.089)
FIRM_SIZE	0.004 *** (0.000)	−0.031 (0.030)	0.003 (0.003)	0.012 * (0.006)
AGE	0.003 *** (0.000)	0.009 (0.008)	0.001 * (0.001)	0.004 *** (0.001)
TECH_GAP	0.007 *** (0.001)	0.112 ** (0.054)	0.006 (0.025)	−0.040 (0.050)
_cons	−0.052 *** (0.001)	0.209 (0.294)		
N	1,563,517	119,574	35,639	13,535
R ²	0.031	0.147	0.071	0.146

Standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The early stages of the internationalization process are strongly supported by the presence of AHRs, which consists of accumulated human capital, expertise, international experiences, and innovative solutions (Dutta et al. 2016). In this way, the availability of AHRs represent an inimitable key for unlocking the door to global markets, which requires in-depth knowledge and experiences to deal with uncertainties and complexities (Zhang et al. 2018). However, in the later stages of internationalization, retaining highly qualified labor and experts represents an unexpected cost

burden for enterprises, as these individuals tend to specialize in specific tasks and have difficulty in meeting new job requirements. This may partly explain why there is no influence of AHR on the internationalization–performance relationship.

Second, the interaction term DOI \times OAR is only significantly positive in the first stage ($\beta = 0.022$, $\rho < 0.01$). This result indicated that there were no moderating effects of OARs on the internationalization–performance relationship beyond the first stage (stage 2: $\beta = 0.063$, $\rho > 0.1$; stage 3: $\beta = -0.000$, $\rho > 0.1$; stage 4: $\beta = 0.000$, $\rho > 0.1$). Because OARs are oriented for very selective use with a low discretion level, it is often used to relieve internal pressures and smooth firm operation rather than investing in new opportunities (Daniel et al. 2004; Bourgeois 1981). However, a firm should always have stable performance and a growth rate approaching sustainable development before pursuing an internationalization strategy. This makes OARs vital for going global, especially for the first stage of an internationalization launch. Thus, the third hypothesis is only supported in the first stage of the internationalization process.

Third, among the three types of slack, USRs are considered the key resource to help enterprises break limits and pursue ambitious targets, including an internationalization strategy. The results show that the coefficient of the interaction term DOI \times USR was significantly positive in the first ($\beta = 13.621$, $\rho < 0.01$) and third stages ($\beta = 1.443$, $\rho < 0.01$). In other words, USRs positively moderate the internationalization–performance relationship in the first and third stages of global expansion. By contrast, USRs did not affect the influence of internationalization on performance in the second ($\beta = -23.096$, $\rho > 0.1$) and fourth stages ($\beta = -0.029$, $\rho > 0.1$). Because USRs are characterized by their readiness and easy redistribution, it can facilitate the full exploitation of the expansion opportunities of internationalization regardless of geographical location and industry (Zhang et al. 2018; Nohria and Gulati 1996). Notably, firm performance decreases in stage 1 and stage 3 of the internationalization process due to the presence of foreign liability in stage 1 and under-controlled diversity in stage 3 (Contractor et al. 2003). As a result, USRs are more effective as a moderator in these stages to help the firm overcome international challenges.

4.1. Contributions

First, the findings contribute strong evidence for a W-shaped internationalization–performance linkage across the four different stages of internationalization. Specifically, Vietnamese enterprises' performance initially decreased in the first stage as a result of early barriers arising from foreign liability, followed by an increase in the second stage due to the higher market size and economies of scale. Next, firms again experienced a downward trend as DOI goes beyond the optimum threshold and triggers the negative impacts of loose governance control. However, instead of ending with this diminishing outcome at the third stage, the firm once again recovers and truly thrives in the fourth stage, when it successfully attains maturity in the learning curve. All three types of slack had positive influences on the relationship between internationalization and performance at the early stages of the internationalization process, especially at stage 1.

Interestingly, USRs, which are considered the most available slack in terms of discretion and readiness for implementing internationalization strategies, positively moderated the effect of internationalization on performance in stages 1 and 3. These stages appeared to be the most difficult stages faced by newly internationalizing firms. Moreover, the lower product diversification of Vietnamese enterprises was beneficial, as product diversification negatively affected firm performance. In addition, other explanatory variables related to firm characteristics, such as firm size, labor size, age, and technology gap, were significant determinants of enhanced firm performance.

The empirical results have practical contributions from a managerial perspective. First, a long-term action plan is very important in implementing internationalization strategies because firms face many uncertainties and complexities during this process. Reaching a higher level of internationalization forces firms to make strategic decisions on resource allocation that can determine their survival. Therefore, until their growth stabilizes, firms must be calm and avoid aggressive global expansion and

successfully nurture their internal capabilities. Second, as slack resources are extremely important in the initial stage of launching international integration, firms must allocate each type of slack efficiently and promptly to take advantage of internationalization without harming their daily business operations.

4.2. Limitations and Further Study

This paper has several limitations that may also provide scope for future studies. Because the enterprise dataset does include unlisted firms, the measurements of some interesting variables or multi-dimensional indicators of DOI may not fully capture the internationalization level of Vietnamese enterprises. Future studies employing smaller groups of listed enterprises with adequate data may provide new evidence. In addition, the measurement of AHRs of enterprises and their interaction term with DOI are presented in very small values. Consequently, the insignificant effects of these proxies are considerable limitations in this paper. Therefore, future studies should find appropriate measurements to overcome these limitations.

Moreover, intangible assets play a crucial role in many businesses, and the effect of human slack resources should be considered in this context. Thus, future research can investigate the interaction effect of human slack resources and R&D investment on firm performance.

5. Conclusions

This study attempted to fill a gap in the research on the international business of enterprises by investigating whether the relationship between internationalization and enterprise performance exhibits a W-shaped trend using unbalanced panel data of 569,767 Vietnamese enterprises from 2007 to 2015 (surveyed by GSO). While the implementation of international strategies requires a certain level of slack resources, enterprises are often characterized by limited resources. Thus, three types of organizational slack, i.e., AHRs, OARs, and USRs, and their interaction terms with DOI were added to an econometric model as moderators to examine whether each kind of slack and its inherent characteristics influence the internationalization–performance relationship. In addition, independent variables such as product diversification, firm size, firm age, product diversification, and technology gap were added to the right-hand side of the equation as important predictors of firm performance. If this paper could have one message, it would be to have entry strategies based on different types of local resources (Meyer et al. 2009). The higher the level of internationalization, the better the firms can make strategic decisions on resource allocation that can determine their survival. Since slack resources are so essential in the initial stage of global integration, the firms must allocate each type of slack efficiently and promptly to take internationalization business opportunities. This further illustrates that the importance of the global competitiveness has partly been established by internationalization strategies, which stimulates the economic growth and reduce poverty so important to nations (Tomizawa et al. 2019).

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. The coefficients of Fixed Effect Model (FEM) and Random Effect Model (REM).

	Hausman		Mundlak
	FEM	REM	REM vce (Robust)
	ROA	ROA	ROA
DOI	−0.003 (0.010)	−0.002 (0.009)	−0.002 (0.006)
AHRs	0.001 *** (0.000)	0.001 *** (0.000)	0.001 *** (0.000)
OARs	−0.000 (0.000)	−0.000 (0.000)	−0.000 (0.000)
USRs	0.000 (0.000)	0.000 (0.000)	0.000 * (0.000)
PDIVER	−0.003 ** (0.001)	−0.002 (0.001)	−0.002 ** (0.001)
FIRM_SIZE	0.004 *** (0.000)	0.004 *** (0.000)	0.004 *** (0.000)
LABOR_SIZE	0.003 *** (0.000)	0.001 *** (0.000)	0.001 *** (0.000)
AGE	0.003 *** (0.000)	0.003 *** (0.000)	0.003 *** (0.000)
TECH_GAP	0.007 *** (0.001)	0.006 *** (0.001)	0.006 *** (0.000)
mean_DOI	0.000 (0.000)	−0.075 *** (0.021)	−0.075 *** (0.015)
mean_AHR	0.000 (0.000.)	−0.001 *** (0.000)	−0.001 *** (0.000)
mean_OAR	0.000 (0.000)	−0.000 (0.000)	−0.000 (0.000)
mean_USR	0.000 (0.000)	−0.000 (0.000)	−0.000 (0.000)
mean_PDIVER	0.000 (0.000)	0.007 *** (0.002)	0.007 *** (0.002)
mean_FIRM_SIZE	0.000 (0.000)	−0.003 *** (0.000)	−0.003 *** (0.000)
mean_AGE	0.000 (0.000)	−0.002 *** (0.000)	−0.002 *** (0.000)
mean_TECH_GAP	0.000 (0.000)	−0.004 *** (0.001)	−0.004 *** (0.001)
_cons	−0.051 *** (0.001)	−0.017 *** (0.001)	−0.017 *** (0.001)
N	1,732,265	1,732,265	1,732,265
R ²	0.004		

Notes: vce: variance-covariance matrix of the estimators. *** $p < 0.01$.

Table A2. Hausman test.

	(b)	(B)	(b-B)	sqrt(diag(V _{b-V_B}))
	est7	est6	Difference	SE
DOI	−0.0029642	−0.0020761	−0.0008881	0.0022336
AHR	0.0005098	0.0005713	−0.0000615	0.0000226
OAR	-1.50×10^{-9}	-2.15×10^{-9}	6.41×10^{-10}	2.78×10^{-9}
USR	1.01×10^{-6}	1.02×10^{-6}	-6.12×10^{-9}	6.96×10^{-7}
PDIVER	−0.0025694	−0.0018824	−0.000687	0.0002745
FIRM_SIZE	0.0037832	0.0040962	−0.000313	0.0000441
LABOR_SIZE	0.0031273	0.0006498	0.0024776	0.0002044
AGE	0.0030544	0.0030589	-4.53×10^{-6}	0.0000138
TECH_GAP	0.0070024	0.0062325	0.0007699	0.0001346

Chi² = 180.36. *p*-value = 0.000.

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Article

Fiscal Decentralisation and Economic Growth across Provinces: New Evidence from Vietnam Using a Novel Measurement and Approach

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Abstract: Fiscal decentralisation has attracted great attention from governments, practitioners, and international institutions with the aims of enhancing economic growth in the last 5 decades. However, satisfactorily measuring the degree of fiscal decentralisation across countries has appeared to be problematic. In addition, the link between fiscal decentralisation and economic growth across provinces has largely been ignored, in particular for emerging markets such as Vietnam. As such, this study is conducted to determine the extent of fiscal decentralisation and to assess its impact on economic growth based on data from all 63 provinces of Vietnam in the period after the 2008 financial crisis. Instead of using traditional measures of fiscal decentralisation, the study uses the Fiscal Decentralisation Index (FDI) together with the two most important and inseparable components of the index, those being (i) the Fiscal Importance (FI) and (ii) the Fiscal Autonomy (FA). The Difference Generalised Method of Moments (DGMM) is utilised to correct for the potential problem of endogeneity between fiscal decentralisation and economic growth. Results show that the two indicators (FI and FDI) have a negative impact while FA has a positive impact on economic growth across provinces. On the ground of these empirical findings, implications for specific policies have emerged for Vietnam and other emerging markets on the extent of fiscal decentralisation, and its major determinants, which positively support economic growth in the future.

Keywords: fiscal autonomy; fiscal decentralisation; fiscal importance; DGMM; Vietnam**JEL Classification:** C33; O47; H72

1. Introduction

A decision regarding fiscal division has never been a purely economic decision. The relationship between economic growth and fiscal decentralisation is always a pertinent matter to different actors in the economy. Many theoretical and quantitative studies seeking to understand, evaluate and quantify growth effect of the fiscal decentralisation have been conducted (Lin and Liu 2000; Oates 1972; Thiessen 2005; Thornton 2007; Woller and Phillips 1998; Zhang and Zou 1998).

Distinguished from other studies, Vo (2010, 2019) and Vo et al. (2019) argue that the theories on fiscal decentralisation can be presented and summarised on two main aspects: (i) Fiscal Autonomy (FA) and (ii) Fiscal Importance (FI). On that basis, the author has developed the Fiscal Decentralisation Index (FDI) and applied it to different countries. In this study, for the first time, the FDI is adopted and fully applied on a provincial level in the context of Vietnam. As such, fiscal decentralisation by provincial governments will be more thoroughly evaluated through the FDI that reflects Fiscal Autonomy and Fiscal Importance.

In this study, we focus on whether increasing fiscal decentralisation will help or hinder provincial economic growth in Vietnam. Few studies on fiscal decentralisation are conducted in Vietnam due to difficulties in gathering data for quantitative research (Nguyen and Anwar 2011). Moreover, when assessing the extent of fiscal decentralisation in provincial governments, most of the previous studies focus on calculating the ratio of provincial revenue and provincial expenditure over total fiscal revenue and total fiscal expenditure, respectively. This assessment, though simple, is unable to shed light on the most fundamental features of the fiscal decentralisation process. As such, we employ the framework of Vo (2010) in order to clarify the growth effect of fiscal decentralisation in the context of Vietnam.

According to reports from Vietnam's Ministry of Finance (MOF), in 2015, Vietnam's public debt level was at 61.30% Gross Domestic Product (GDP). The fiscal deficit was around 5.00% GDP. In the composition of Vietnam's public debt, the government's debt has always accounted for a large percentage compared to provincial debts. The evidence shows that most of the resources for investment and development are held by the Ministries, and then partially allocated to the provinces.

Currently, only 13 out of 63 provinces in Vietnam achieve fiscal balance. Ho Chi Minh City (HCMC), despite being an economic powerhouse, still has difficulty in balancing its budget. On the other hand, many provinces and cities still rely on provisions from the central government. As a result, fiscal decentralisation reforms have become an urgent problem to the government in the process of public re-investment. However, fiscal decentralisation, the transfer of budget responsibilities from the central government to the provincial government, should follow a roadmap with specific programs and plans and be carefully assessed.

Our study significantly contributes to policy influences as well as to the current literature of fiscal decentralisation. First, although the link between fiscal decentralisation and economic growth is critical, few studies have been conducted in Vietnam. For example, Vo (2009b) compared the level of fiscal decentralisation in Vietnam to other Asian countries. The study focused on a macroeconomics level of fiscal decentralisation and its potential impact to economic growth for the case of Vietnam. Su et al. (2014) examined the effect of fiscal policies on the sustainability of economic growth at a provincial level in Vietnam, but their focus was on the long-run relationship between the two key variables with a very crude measurement of fiscal decentralisation. Our study is distinct and different from previous studies. First, a more appropriate measure of fiscal decentralisation is utilised in this study. This measure of fiscal decentralisation takes into account both major aspects of fiscal decentralisation including (i) fiscal autonomy and (ii) fiscal importance of subnational governments. Second, we attempt to empirically investigate the relationship between fiscal decentralisation and economic growth in Vietnam based on an appropriate econometrics approach. Based on important findings from this study, we can offer proper policies and recommendations for the appropriate extent of the fiscal decentralisation not only for Vietnam's Governments but also for other developing countries. Third, and the first of its kind in Vietnam, we utilize a panel of Vietnam provinces for the analysis which is in contrast to another study which was conducted by Nguyen (2009), who used the cross-sectional data of all provinces in Vietnam. An obvious advantage of panel data is not only taking such heterogeneity explicitly into account by controlling for individual variances, but also utilizing more information and less collinearity among the selected variables, more degrees of freedom, and more estimation efficiency (Gujarati and Porter 2009). As such, our study provides additional and important empirical evidence on the link between fiscal policy and economic growth.

Following this introduction, the paper is constructed as follows: The literature review is examined in Section 2. Section 3 introduce the fiscal decentralisation and its measurement in previous studies while Section 4 discusses the research methodology. Section 5 presents empirical results and discussions, followed by conclusions and policy recommendations in Section 6.

2. Literature Review

2.1. Theoretical Background

Besides empirical research, many scholars assess the effect that fiscal decentralisation has on economic growth. Fiscal decentralisation can affect economic growth in two different directions. Firstly, fiscal decentralisation can lead to economic growth due to the public spending aspect. Secondly, fiscal decentralisation can cause a destabilisation of the macroeconomics, meaning a negative impact on economic growth. Thirdly, the impact of fiscal decentralisation on economic growth differs between developed and developing countries, specifically a positive impact in developed countries but a negative one in developing countries. The reason is that in developing countries, the provincial government lacks management capability when decentralised, leading to budget leaks or wasteful and inefficient public investments.

Oates (1993) argues that public spending on infrastructure and social elements has a positive effect on provincial economic development as the local government better understands the features of local population as well as their needs, thus distributing public resources more efficiently than the central government. Similarly, Zhang and Zou (1998) argue that the local government has more advantages in providing public services locally than the central government. As a result, the decentralisation of revenue sources and spending responsibilities to the provincial government is a way to improve the efficiency of public sector investment, reducing fiscal deficits and helping to develop the economy.

Vo (2010) presents an assessment of the main channels through which fiscal decentralisation will have a positive impact on the local economy. Firstly, fiscal decentralisation brings efficiency in distributing resources. This tends to ensure that local preferences will be met with minimum expenses, as the relatively more accessible local government, compared to the central government, helps to reduce the costs of providing public goods and services. Secondly, competition among provincial governments will increase when there is decentralisation—the pressure of re-selecting provincial leadership will motivate higher productivity and reduce careless spending, thus growing the local economy. Since the size of each provincial government is smaller than that of the state, it can lead to an optimal scale of education, medical services and infrastructure provision, trimming administrative expenses and raising efficiency. Thirdly, fiscal decentralisation induces economic growth by reducing corruption. The extent of corruption is often related to bad management, impeding economic growth by draining government revenue and increasing wasteful spending.

On the other hand, there are opposing theoretical views on the impact of fiscal decentralisation on economic growth. According to Prud'Homme (1995) and Tanzi and Schuknech (1996), given the assumptions that fiscal decentralisation matches spending responsibilities and that the provincial government lacks capability and accountability, fiscal decentralisation can have a negative effect on economic growth. Prud'Homme (1995) and Tanzi and Schuknech (1996) argue that the provincial government cannot be efficient in delivering public goods and services on a national level due to the economies of scale. Fiscal decentralisation incurs the risks of corruption and self-interests at the provincial level as the power of authority lies with the provincial leadership.

2.2. Empirical Studies in Foreign Countries

There are several empirical studies on the relationship between fiscal decentralisation and economic growth in different countries. Most utilise panel data of different provinces of one country or of across countries. China is a representative case study on this relationship from a provincial angle. Zhang and Zou (1998) used panel data of 28 provinces of China in the 1986–1992 period, concluding that the extent of fiscal decentralisation affects economic growth negatively. On the other hand, Lin and Liu (2000) discovered the positive effect of fiscal decentralisation on growth by using panel data of Chinese provincial governments from 1970–1993. As such, these studies covering different periods of time appeared to report significantly different results. Moreover, these two studies were interested in the economic reform in China in 1978. While Zhang and Zou (1998) excluded the

period with major economic reform in China in the data utilised in their analysis, [Lin and Liu \(2000\)](#) utilised the longest possible period of data. However, [Lin and Liu \(2000\)](#) did not take into account any technique in order to exclude the potential impact of the economic reform on the growth effect of fiscal decentralisation. As such, systematic shocks in a long time period may possibly bias the empirical results when the major events are not satisfactorily controlled for.

In Romania, [Adrian and Petronela \(2015\)](#) conducted research on the relationship between fiscal autonomy and provincial development at a district level in the 2008–2011 period. An increase in provincial fiscal autonomy tends to increase the extent of development in that province. From these results, it can be implied that the higher the extent of provincial fiscal autonomy, the higher the capability of provincial public authorities in meeting the needs of local communities, hence raising local economic growth.

National panel data are also extensively used in other research. [Martinez-Vazquez and McNab \(2006\)](#) use panel data from 66 developed and developing countries between 1997 and 2002. The Ordinary Least Squares (OLS) technique is employed to analyse the relationship between fiscal decentralisation, macroeconomic stability and economic growth. The authors concluded that fiscal decentralisation in developed countries has a negative impact on economic growth while in developing countries, the impact is unclear.

[Ezcurra and Rodríguez-Pose \(2013\)](#) used panel data from 21 Organisation for Economic Cooperation and Development (OECD) countries in Central and Eastern Europe between 1990 and 2005. Based on OLS regression results, the study concluded that fiscal decentralisation negatively affects economic growth. Similar results were found in a study by [Baskaran and Feld \(2013\)](#) in 23 OECD countries between 1975 and 2008 based on a fixed effect model.

2.3. Studies in Vietnam

Some studies on fiscal decentralisation have been recently conducted in Vietnam. [Nguyen \(2009\)](#), based on the endogenous economic growth theory, the fiscal theory, and the relationship model between economic growth and fiscal decentralisation, determined a relationship between fiscal decentralisation and economic growth in 64 provinces of Vietnam in two different time periods, 1997–2001 and 2002–2007.

Another study by [Su et al. \(2014\)](#), based on the endogenous growth model, used panel data from 62 provinces between 2000 and 2011 and utilised the Pooled Mean Group (PMG) and Difference Generalized Method of Moments (DGMM) technique by [Arellano and Bond \(1991\)](#) to empirically analyse the relationship between fiscal policies and economic growth in Vietnam. The study puts forward the following conclusions: (i) Fiscal decentralisation and economic growth are positively correlated in the long term, however, when the economy detracts from the long-term equilibrium, government efforts in adjusting fiscal policies have little effectiveness, (ii) Revenue decentralisation is positively correlated with economic growth in the long term, while expenditure decentralisation is negatively correlated with economic growth, and (iii) Regular expenditure on education and training, scientific research, environment and medical services, positively affects economic growth, while investment spending has a negative impact. [Su et al. \(2014\)](#) discussed various aspects of fiscal policies, however, they estimated fiscal decentralisation as a simple ratio of provincial fiscal expenditure or revenue over total fiscal expenditure or revenue. Nevertheless, it is argued that they focused on the growth effect of fiscal policy instead of a growth effect of fiscal decentralisation.

[Vo \(2009b\)](#) looked into the status of fiscal decentralisation in Vietnam based on lessons from other Asian countries. The study points out that the degree of fiscal autonomy of provincial governments in Vietnam is the lowest among comparable Association of Southeast Asian Nations (ASEAN) countries (Indonesia, Philippines and Thailand) and China. If the government of Vietnam wants to reform fiscal decentralisation to improve provincial fiscal autonomy, factors that can help to boost fiscal decentralisation include allowing provincial governments to set appropriate fees in the local context and lowering the tax remittance rate to the central government. Although [Vo \(2009a\)](#) did a great comparison of fiscal decentralisation between Vietnam and other Asian countries using a strong

foundation of theories and historical fiscal data, he did not make further steps to identify the influence of fiscal decentralisation to economic growth in his paper using a quantitative approach.

3. Fiscal Decentralisation and Measurement

3.1. Fiscal Decentralisation

Fiscal decentralisation, also known as financial decentralisation, is the transfer of partial power from the upper government to lower tiers of the government. This is part of public sector reforms, creating a competitive environment for different levels of government in providing optimal public goods and services to the society and stimulating economic growth (Bird et al. 1993; Liu et al. 2017; Martinez-Vazquez et al. 2016).

Fiscal decentralisation is understood as the process of shifting rights and responsibilities from the central government to the provincial government or to the private sector. Fiscal decentralisation is concerned with the distribution of public resources between the central and provincial government, focusing on the two main issues that are the division of revenue sources and spending responsibilities (Woller and Phillips 1998). Fiscal decentralisation can also be defined as the delegation of rights, responsibilities and interests between different levels of government in budgetary management and execution.

3.2. Measurements of Fiscal Decentralisation

There are various measurements of fiscal decentralisation in empirical research, based on two main indicators, (i) expenditure ratio and (ii) revenue ratio. Each author has his own assessment on the extent of decentralisation and the features of each country or region in order to construct a measurement of fiscal decentralisation (Rodríguez-Pose and Krøijer 2009; Rodríguez-Pose et al. 2009).

A number of previous studies have measured the extent of fiscal decentralisation from a spending angle (Law et al. 2014; Rodríguez-Pose et al. 2009; Zhang and Zou 1998). Additional spending financed by the central government for assigned programmes and missions is deducted from total expenditure by the provincial government. As a result, total fiscal spending is equal to total spending by provincial governments after deducting additional spending made by the central government to the provincial government. The Expenditure Ratio (ER) is calculated as follows:

$$ER = \frac{\text{Total spending by provincial government}}{\text{Total fiscal spending}}$$

Other scholars measure fiscal decentralisation from a revenue angle (Lin and Liu 2000; Thornton 2007). The revenue ratio is calculated as the total revenue by the provincial government over the total fiscal revenue, in which total provincial revenue includes the revenue that the province receives in full and the portion of revenue between the provincial and central government after deducting additional provisions from central budget. The Revenue Ratio (RR) is calculated as follows:

$$RR = \frac{\text{Total revenue by provincial government}}{\text{Total fiscal revenue}}$$

The closer ER and RR get to 1, the higher the extent of revenue decentralisation.

In a different approach, Vo (2008, 2009a) developed the Fiscal Decentralisation Index (FDI), which comprises Fiscal Autonomy (FA) and Fiscal Importance (FI). First, fiscal autonomy is the transfer of taxing powers and assignment of responsibilities for the delivery of public goods and services. It is

affected by regulations regarding fiscal transfers between the central and provincial government as well as provincial borrowings (Vo 2008, 2009a). Fiscal autonomy is calculated as follows:

$$FA = \frac{\sum_{i=1}^p OSR_i}{\sum_{i=1}^p E_i}$$

In which: OSR_i is the own-sourced revenue and E_i is the own-sourced expenditure of the province i , and p is the number of provinces.

The formula implies that the value of FA is within the (0,1) range, with a minimum value of 0 and a maximum value of 1. If FA is equal to 1, the province has sufficient budgetary revenue to match its budgetary spending, reflecting a high level of autonomy and independence from the central budget, allowing the province to be proactive and innovative in growing its economy. Conversely, if FA is low or close to 0, the province is almost entirely dependent on the central budget as its own revenue cannot cover its spending.

Secondly, fiscal importance is the relative significance of fiscal activities undertaken by the province compared to those by the state. Provincial fiscal autonomy implies that by decentralisation regulations, the provincial government can balance its revenue sources by managing its tax bases in order to finance the expenses incurred in delivering public goods and services. In Vo (2008, 2009a), public expenditure representing fiscal activities is calculated as follows:

$$FI = \frac{\sum_{i=1}^p E_i}{TE}$$

In this formula, FI is the fiscal importance of province i , TE is the total public sector expenditure by all levels of government in the country, while E_i is the public expenditure incurred by the province i . The value of FI is within the (0,1) range. The closer FI gets to 1, the higher the percentage of the total fiscal spending by the country accounted for by the public spending of the province, reflecting the significant standing of the province. Conversely, if FI gets close to 0, the public spending by the province is very low relative to the country, implying a minor role in national economic development.

Combining the two aforementioned indicators, Vo (2008, 2009a) proposed the Fiscal Decentralisation Index (FDI), calculated as follows:

$$FDI = \sqrt{FA \times FI} = \sqrt{\frac{\sum_1^p OSR_i}{\sum_1^p E_i} \times \frac{\sum_1^p E_i}{TE}}$$

The FDI of the provincial government is capped at unity (1.0). Accordingly, there are 4 degrees of FDI measurement:

- *Perfect fiscal decentralisation*: $FDI = 1$
- *Relative fiscal decentralisation*: $0.5 < FDI < 1$
- *Relative fiscal centralisation*: $0 < FDI < 0.5$
- *Perfect fiscal centralisation*: $FDI = 0$

4. Research Methodology and Data

4.1. Research Model and Data

The research applies the endogenous growth model to empirically study the impact of fiscal decentralisation on provincial economic growth. The regression equation is as follows:

$$\ln Y_{it} = \beta_0 + \beta_1 \ln Y_{it-1} + \beta_2 PC_{it} + \beta_3 CON_{it} + e_{it}$$

In which: i and t denote data from province i ($i = 1, 2, \dots, 63$) in year t ($t = 2008, \dots, 2013$).

Economic growth is measured as the log of provincial GDP per capita: LnY_{it} is a function of the lagged variable LnY_{it-1} , PC_{it} is the degree of fiscal decentralisation and CON_{it} are the control variables. Details of the variables utilised in this study are carefully presented in Table A1 in the Appendix A. According to Vo (2008, 2009a), the degree of fiscal decentralisation is measured by the following three indicators: (i) Fiscal Autonomy (FA), (ii) Fiscal Importance (FI), and (iii) Fiscal Decentralisation Index (FDI). The selected control variables are (i) investment capital in the province, (ii) labour force growth rate, (iii) inflation rate of the province, and (iv) trade openness. Table 1 summarises the definition of variables used in previous studies.

Table 1. Summary of variables used in the study.

No.	Variable	Definition	Study	Expectation
<i>Dependent variable</i>				
1	Y	GDP per capita		
<i>Fiscal Decentralisation (PC) includes</i>				
2	FA	Fiscal autonomy	Vo (2008, 2009a)	+
3	FI	Fiscal importance	Vo (2008, 2009a)	+
4	FDI	Fiscal decentralisation index	Vo (2008, 2009a)	+
<i>Control Variables (CON) includes</i>				
5	POP	Labour force growth rate	Zhang and Zou (1998)	+
6	INF	Inflation rate	Hanif et al. (2014), Zhang and Zou (1998)	–
7	CAP	Investment capital in the province	Zhang and Zou (1998)	+
8	OP	Trade openness	Zhang and Zou (1998)	+

Based on mixed findings from Zhang and Zou (1998) and Lin and Liu (2000), we consider that including two extremes of the world economy (the global financial crisis in 2007 and the world recession in 2014) can possibly affect the macroeconomic fundamentals in Vietnam. As such, in order to consider the effects arising from these potential influences, we reasonably consider that it is appropriate to conduct the analysis covering the period from 2008 to 2013. In addition, we note that historical data on public finances at the provincial level are very limited in Vietnam in terms of availability. As such, the data set used for the research are the balanced panel data of 63 provinces of Vietnam within the six years from 2008 to 2013 with 378 observations. The data are sourced from Ministry of Finance (MOF), General Statistics Office (GSO), and Annual Abstract of Statistics on provinces of Vietnam.

On the basis of relevant theories and empirical results on fiscal decentralisation and economic growth from other previous studies, we provide the following expectations, as indicated in Table 1.

4.2. Regression Methodology

Although different econometric methods have been employed to study the relationship between fiscal decentralisation and provincial economic growth, in this research, the authors used the Difference Generalized Method of Moments (DGMM) by Arellano and Bond (1991). The DGMM method helps to solve several problems. Firstly, as the variables in the model can be considered endogenous, panel data regression on the relationship between fiscal decentralisation and economic growth can occur in two directions, from the independent variables to the dependent variables or vice versa. The regression of these variables can lead to a correlation with the error term, which means there exists bias coefficients. Secondly, fixed effect potentially involves characteristics of unobserved factors and errors of presented variables. Thirdly, the introduction of the lagged variable in the equation will lead to autocorrelation. Fourthly, panel data used in the study has a short time period (short T) and a large number of panel members (large N).

5. Results and Discussions

The sample is formed from data collection of 63 provinces of Vietnam from 2008 to 2013, with 378 observations. Table 2 depicts the descriptive statistics. Figure 1 shows the degree of fiscal autonomy, Ha Noi and Ho Chi Minh City (HCMC), the two largest cities, have high FA ratios in 2013 (78.28%

and 82.64%, respectively) as these two cities have large revenue sources, supporting their own fiscal autonomy. Ha Giang had the lowest FA ratio in 2013 at 11.94%. Ha Giang, being a poverty-stricken province in the northwest mountainous region, has no advantageous factors to appeal to businesses. As such, it has little revenue source that cannot cover its expenditure needs and has to rely almost entirely on provisions from the central government. Ha Noi, HCMC and Da Nang have higher FA ratios than other provinces in the country.

Table 2. Descriptive statistics of variables in the model.

Variable	Observations	Unit	Mean	Standard Variation	Min	Max
Fiscal autonomy	378	%	42.63%	16.90%	11.94%	99.71%
Fiscal importance	378	%	1.59%	1.71%	0.37%	12.37%
Fiscal Decentralisation Index	378	%	7.74%	4.17%	3.65%	30.16%
Inflation	378	%	−0.35%	7.93%	−22.48%	23.70%
Labour force growth rate	378	%	2.11%	3.14%	−16.12%	17.80%
Trade openness	378	%	78.20%	107.45%	0.19%	898.55%
Ln (investment capital)	378		30.06	0.86	27.71	33.26
Ln (GDP per capita)	378		16.91	0.60	15.45	19.79
Ln (lag of GDP per capita)	378		16.73	0.69	15.25	22.71

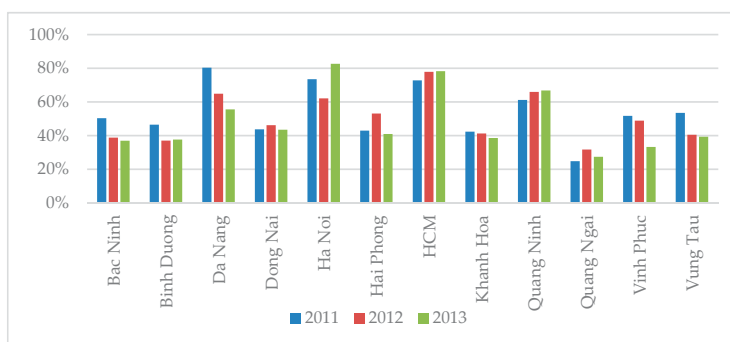


Figure 1. Fiscal autonomy ratio of selected provinces in Vietnam over the 2011–2013 period.

Looking at Fiscal importance (FI) in Figure 2, Ha Noi had the highest FI ratio in the country (11.2% in 2010). Budget spending of provinces in the Red River Delta region was consistently among the highest in the country. Tra Vinh had the lowest FI ratio, at 0.365% in 2011.

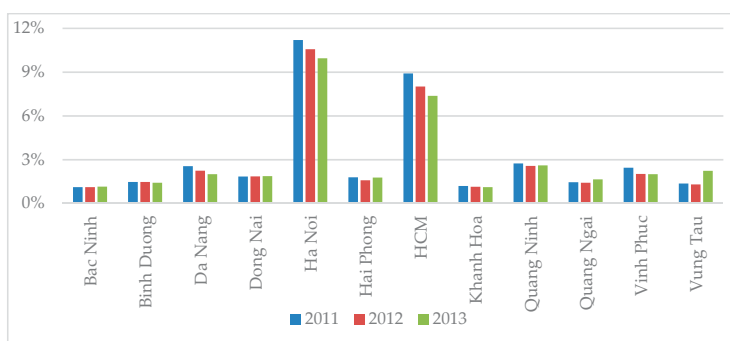


Figure 2. Fiscal importance ratio of selected provinces in Vietnam over the 2011–2013 period.

In Table 3, Ha Noi had the highest FDI of the country (30.16% in 2009), followed by HCMC, as tax revenue sources are concentrated in these two cities and they also have significantly higher economic development than other provinces. When the FDI calculation proposed by Vo (2008, 2009a) was applied, the portion of tax revenue split between the central and provincial government was deducted from the own-sourced revenue of the province. Since this tax revenue source accounts for a higher percentage in HCMC's budget revenue composition than Hanoi's, HCMC's FDI was lower than that of Hanoi, even though HCMC had the highest budget revenue sum in the country. Ca Mau had the lowest FDI value (3.65% in 2009).

Table 3. The value of fiscal decentralisation index for 13 provinces in 2008–2013 (%).

Province	2008	2009	2010	2011	2012	2013
Bac Ninh	7.15	6.82	7.94	7.50	6.59	6.53
Binh Duong	10.83	12.80	8.56	8.27	7.37	7.32
Da Nang	15.41	14.38	14.95	14.30	12.06	10.54
Dong Nai	11.18	10.10	10.40	8.96	9.24	9.02
Ha Noi	29.84	30.16	29.43	28.69	25.62	28.67
Hai Phong	8.25	8.08	9.16	8.76	9.18	8.51
HCM	27.92	26.66	25.42	25.47	24.98	24.01
Khanh Hoa	8.96	8.69	8.14	7.13	6.87	6.56
Quang Ninh	11.98	10.21	11.60	12.95	13.02	13.21
Quang Ngai	7.37	6.98	6.57	6.00	6.72	6.72
Vinh Phuc	7.86	10.70	10.76	11.26	9.93	8.16
Vung Tau	10.53	9.47	8.70	8.54	7.24	9.36

We initially consider the correlation among the variables in the proposed model by looking at a correlation matrix, which is shown in Table A2 in the Appendix A. It can be observed that there is a strong correlation among FDI, FI and FA. Thus, we separately use those three explanatory variables in different estimations. Estimation results in Table 4 show that fiscal decentralisation has an impact on economic growth in Vietnam in terms of DGMM estimations.¹ In particular, positive FA (statistically significant at the 5% significance level) implies a positive effect on provincial economic growth. This is consistent with a study by Adrian and Petronela (2015), which states that the degree of fiscal autonomy helps to boost the economic growth of the province. This fiscal autonomy allows the provincial government to proactively and flexibly manage its responsibilities, independent of the central government.

On the other hand, FI has a negative impact on provincial economic growth, as seen from its negative coefficient at the 1% significance level. FDI has a negative impact, although at a lower extent compared to FI. This can be explained by the fact that in most provinces in Vietnam, fixed expenses account for a major portion of total fiscal spending. As a result, if regular spending can be lowered while investment spending is increased, provincial economic growth can be stimulated. In addition, the extent of fiscal decentralisation in provincial governments in Vietnam is very low, with large gaps in FDI among provinces. The FDI values of provinces in Vietnam belong to the Relative Fiscal Centralisation category. This is in line with the theory which argues that the impact of fiscal decentralisation on economic growth in developing countries is negative, as well as with previous

¹ We have utilised the fixed and random effects model and our analyses indicate that the fixed effect mode appears to be more appropriate than the later on the ground of the Hausman test. Detailed analyses of these approaches are available upon request. However, we consider that with the appearance of the lagged value of the dependent variable in the regression, the estimated coefficients using both fixed and random effect models may be biased. As such, in this study, we used the Difference Generalised Method of Moments (DGMM) to correct the potential problem of endogeneity between fiscal decentralisation and economic growth. Thus, necessary statistical tests, including AR(1), AR(2), and Sargan tests were conducted and presented to ensure the appropriateness of the DGMM.

studies (Zhang and Zou 1998; Martinez-Vazquez and McNab 2006; Ezcurra and Rodríguez-Pose 2013; Baskaran and Feld 2013).

The lag of economic growth has a positive effect on its current value, as seen from the positive estimation coefficient at the 1% significance level in all of the three regression equations. The estimation coefficients of labour force growth rate and trade openness, the control variables, are mostly positive but are statistically insignificant. The results concur with studies by Nguyen (2009) Nguyen (2009). Trade openness has a positive coefficient that is statistically significant when the fiscal decentralisation variable is FDI. This is consistent with results from the study by Zhang and Zou (1998). The investment capital variable has a positive coefficient at the 1% significance level, except for the FA model. As such, it can be concluded that investment has a positive effect on provincial economic growth.

Table 4. Results (using the Difference Generalized Method of Moments (DGMM)).

Dependent Variable: Economic Growth (LnGDPPC)			
Fiscal Decentralisation Variable	FA	FI	FDI
Fiscal autonomy	0.30 **		
Fiscal importance		−6.08 ***	
Fiscal decentralisation index			−1.84 **
Labour force growth rate	−0.03	0.07	0.06
Trade openness	0.00	0.01	0.02 **
Investment capital	0.02	0.20 ***	0.18 ***
Inflation rate	0.48 ***	0.43 ***	0.43 ***
Lag of Economic growth	0.89 ***	0.74 ***	0.73 ***
Constants	1.17 ***	−1.39	−0.64
AR (1)	0.00	0.00	0.00
AR (2)	0.27	0.51	0.46
Sargan test	0.07	0.11	0.13
Legend:	*** $p < 0.01$; ** $p < 0.05$		
Number of observations	378		

Notes: ***, and ** indicate significance levels of 1%, and 5%, respectively. LnGDPPC—the logarithm of Gross Domestic Product per capita.

Results from the model also show that inflation rate has a positive coefficient at the 1% significance level. In other words, inflation rate in the 2008–2013 period has a positive impact on provincial economic growth. This contradicts the author’s expectation but falls in line with Nguyen (2009).

6. Conclusions and Recommendations

This study was conducted to determine and quantify the degree of fiscal decentralisation in 63 provinces of Vietnam between 2008 and 2013. The fiscal decentralisation index used in this study is based on the Fiscal Decentralisation Index developed by Vo (2008, 2009a). In this index, two important and inseparable constituent elements, Fiscal autonomy and Fiscal importance, are considered and utilised. The DGMM technique was employed to correct for the endogeneity in the model. The study has identified the degree of fiscal decentralisation in different provinces in Vietnam as well as the Fiscal autonomy and Fiscal importance capability of the 63 provinces. At the same time, the main focus of this study was to discover and quantify the relationship between fiscal decentralisation and provincial economic growth in Vietnam in the 2008–2013 period.

Based on the results of the study, certain macroeconomic policy implications can be summarised as follows. Initially, the government should improve provincial autonomy in finding revenue sources as provincial governments face constraints due to central government regulations. As of now, provincial governments are only authorised to set certain fees and rates within the current legal framework. Revenue from these fees and rates is in fact very small, accounting for only 10% of the provincial budget revenue. Provincial governments have limited means to create revenue sources, little control over the revenue collected and no incentives for prospective revenue sources. Taxing power lies with

the central government, including both tax rates and tax bases, thus leaving limited space for provincial autonomy. As a result, provincial governments are compelled to raise revenue from land sources, a source fully delegated to local governments but volatile due to its dependence on the real estate sector. Therefore, it is advisable to let provinces have the authority to set certain taxes appropriate for the local context, to adjust certain tax rates and to increase the retained portion of tax revenue meant to be split with central government. These measures will help provincial governments to balance their budget, reducing their reliance on the central government.

Government offices need to tighten control over spending, ensuring budget revenue matches expenditure needs, thereby avoiding budget deficits. Government spending should be publicised to prevent redundancy or budget leaks, while expenditure should be linked to accountability of provincial leadership, increasing transparency and reducing deficits. Government fixed expenses should be lowered through public finance reforms and workforce simplification in order to increase spending on investment to stimulate economic growth.

Additionally, Vietnam is a developing country, with vastly different levels of development among provinces. Rapidly increasing fiscal decentralisation will incur risks in resource management at the provincial level as key personnel at provincial governments are not sufficiently competent in macroeconomic management. Moreover, corruption and self-interests are also cause for concern. As a result, fiscal decentralisation should be implemented with a roadmap of specific plans and programmes to ensure effectiveness. The government needs to fight corruption and self-interests while training provincial governments to be more competent in order to enhance economic growth. At the same time, the following results were achieved through this study.

The government should increase investment capital, including state capital, on key regions as well as regions with economic and social disadvantages to narrow the gap in economic development among provinces. At the same time, incentives should be in place to raise non-public capital and foreign direct investments to help with provincial economic development. Also, inflation rate should be maintained at an appropriate level for macroeconomic stability, keeping consumer prices at a suitable level. The State Bank of Vietnam should have an enhanced role in setting interest rates that are accessible to businesses.

Global integration should be intensified to create new jobs and to seek new export markets for Vietnamese goods. Other than traditional ones, Vietnam should identify new export markets to increase its inbound foreign currencies. The investment environment should be continuously improved to assist businesses. The government also needs specific solutions to help companies prepare and improve their competitive advantage in an increasingly open market that embraces international standards.

This paper has its own limitations which should be considered in future studies. First, although the number of observations were sufficient for this paper and relevant for the purpose of this study focusing on a particular period of time (around the times with major economic events such as the global financial crisis and recessions) to consider the effects of fiscal decentralisation on economic growth across provinces, a full period of data may need to be considered in empirical studies in the future. Second, as [Vo \(2010\)](#) has advocated the subnational governments, including both provincial and district levels, studies in the future may also need to consider the second level of subnational governments (the district level).

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Conflicts of Interest: The authors declare no conflict of interest.

Appendix A

Table A1. Data source of variables.

No.	Variable	Definition	Measurement	Source
1	GDP	Economic growth	Ln (Provincial GDP / provincial population)	GSO
2	FA	Fiscal autonomy	Provincial own-sourced revenue/ Provincial own-sourced spending	MOF
3	FI	Fiscal importance	Provincial own-sourced spending/ Total fiscal spending of country	MOF
4	FDI	Fiscal decentralisation index	$\sqrt{FA \times FI}$	MOF
5	POP	Labour force growth rate	(Labour force year $t + 1$ —Labour force year t)/Labour force year t	GSO
6	INF	Inflation rate	(CPI year $t + 1$ —CPI year t)/CPI year t (%)	GSO
7	CAP	Investment capital in the province	State capital + non-state capital + foreign capital	GSO
8	OP	Trade openness	Export + import volume (%GDP)	GSO

Notes: MOF—Ministry of Finance; GSO—General Statistics Office.

Table A2. The correlation matrix among variables.

Variable	FA	FI	FDI	INF	POP	OP	CAP	GDP
FA	1.00							
FI	0.33	1.00						
FDI	0.63	0.93	1.00					
INF	0.06	−0.02	0.00	1.00				
POP	0.05	0.04	0.05	−0.09	1.00			
OP	0.26	0.25	0.31	−0.02	0.17	1.00		
CAP	0.37	0.70	0.74	−0.08	0.02	0.47	1.00	
GDP	0.25	0.30	0.37	−0.09	−0.02	0.43	0.70	1.00

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