AN ANALYSIS OF FACTORS INFLUENCING VIETNAM'S RICE EXPORT TO THE ASEAN+3 COUNTRIES

Bachelor of International Business Thesis

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EXECUTIVE SUMMARY

Export is a primary activity of foreign trade, which has a prolonged history and strongly develops in both width and depth. Along with the expansion of globalization, exporting activities among countries has promoted more and more vigorously. Vietnam - a developing country is no exception, mainly rice export - the indispensable food of many countries worldwide. With favorable natural conditions as well as abundant labour resources, Vietnam has competitive advantages to be one of the top world-class rice exporters in recent years, which has made an essential contribution to the GDP of Vietnam. Notably, in over 150 rice importers, the ASEAN+3 has always been one of the biggest and most competitive Vietnamese rice markets for many years. However, its value has witnessed a sharp fluctuation in general as well as not been high compared to the actual potential of this market, leading to low and unstable income for rice farmers. In fact, rice export is a topic that has been discussed internationally and domestically by some interested researchers. However, most of them are outdated, and the ASEAN+3 market has been ignored in all prior studies. Thus, this thesis has applied both quantitative approach with the gravity model, and qualitative method to comprehensively assess the correlation of some economic factors with Vietnam's rice export turnover to 11 nations in ASEAN+3 from 2005 to 2019. Particularly, a panel data of 161 observations has been scrutinized by Stata 14.0 to bring strong evidence for this paper's outcome.

All in all, the empirical results have revealed that Gross Domestic Product of Vietnam, the Harvesting area of rice in Vietnam, Geography Distance between importers and Vietnam, and Population of importing countries have positive correlations with total rice export revenue during the given period. Conversely, the Gross Domestic Product of importers, the Exchange rate of importers, and the dummy variable WTO express opposite effects to the dependent variable. In terms of qualitative methods, the authors have emphasized the significant influence of the government policies, quality and price of exported rice, quality of labor resources, technology, infrastructure, tariff and non-tariff factors on the general rice export scenario of Vietnam to ASEAN+3 countries. After that, some strategic recommendations have been suggested to boost the Vietnamese rice export turnover to these nations between 2021 and 2030.

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ABBREVIATIONS AND ACRONYMS LIST

ASEAN	*Association of Southeast Asian Nations*
ASEAN+3	*Association of Southeast Asian Nations along with China, Japan, and South Korea*
ERIM	*Exchange rate of importing country*
FAO	*Food and Agriculture Organization*
FGLS	*Feasible Generalized Least Squares*
FEM	*Fixed Effects Model*
FTA	*Free Trade Agreement*
GDC	*General Department of Customs of Vietnam*
GDIS	*Geographical distance between two countries*
GDPIM	*Gross Domestic Product of importing countries*
GDPVN	*Gross Domestic Product of Vietnam*
GSO	*General Statistic Office of Vietnam*
HS Code	*Harmonized System Code*
IMF	*International Monetary Fund*
INFVN	*Inflation rate of Vietnam*
LANDVN	*Harvesting area of rice in Vietnam*
LCU	*Local currency unit*
MOIT	*Ministry of Industry and Trade*
MOJ	*Ministry of Justice*
OLS	*Ordinary Least Square*
POPIM	*Population of importing country*
REM	*Random Effects Model*
VIF	*Variance Inflation Factors*
WB	*World Bank*
WTO	*World Trade Organization*
WEF	*World Economic Forum*
USDA	*United States Department of Agriculture*

INTRODUCTION

This first chapter provides a brief of the research topic overview, practical problem, research objectives, research questions, research scope, methodology, and data overview.

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CHAPTER 1: INTRODUCTION

1.1. Background

1.1.1. Topic background

Wet-rice civilization, which dated back 10,000 years in Southeast Asia, is one of the long civilizations of history (Fuller, 2011). Hence, rice is the most staple food in Asian countries where over 90% of the world's rice is produced and consumed in this region (Papademetriou, 2000). Specifically, rice export becomes one of the critical commodities and strengths of Vietnam. According to UN Comtrade (2020), Vietnam has recently surpassed Thailand in the first 7 months of 2020 to be the second-largest rice exporter just behind India, showing that our country considers rice export as one of the strategic directions and needs more attention to focus on it. Particularly, rice export becomes our strategic direction because it now makes an essential contribution to GDP. The General Statistic Office of Vietnam (GSO) (2020) indicated that the rice export of Vietnam in 2019 reached 6.37 million tons, leading to a turnover of 2.8 billion USD.

In terms of markets, one of the biggest ones in over 150 Vietnamese rice importers is ASEAN+3 which is a cooperation between 10 members of ASEAN, China, Japan, and Korea. Since joining ASEAN and ASEAN+3, the trade turnover between Vietnam and ASEAN+3 countries has increased rapidly, significantly contributing to the economic development of Vietnam as well as its member countries. Specifically, according to GSO (2020), Vietnam exported to ASEAN 2.8 million tons of rice accounting for 44% of total export output in 2018. With China, GSO (2020) showed that this country has been Vietnam's largest rice export market with 1.3 million tons of rice in 2018 and has promised to be our largest market in the following years. Additionally, Japan and Korea are also Vietnam's chance to boost its rice exports. Japan have signed the Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CPTPP) with many incentives for members including Vietnam, while Korea has given a quota of more than 55,000 tons of rice for Vietnam (GSO, 2020). With certain advantages, rice export is always a vital industry in the structure of Vietnam's agricultural exports to the ASEAN+3 market.

1.1.2. Practical problem

Vietnam has joined 16 Free Trade Agreements (FTAs) so far including Vietnam-Japan Economic Partnership Agreement (VJEPA), Vietnam-Korea Free Trade Agreement (VKFTA),

ASEAN-China Free Trade Agreement (ACFTA) and the like. These are considered as essential catalysts for boosting trade activities, especially rice exports of Vietnam. In particular, from 1989 to 2019, 30 years since first Vietnam's grain of rice was presented to the global market, Vietnam's rice export accounts for 15% of the world's total rice export (Ghoshray, 2016). That is an excellent opportunity for Vietnam to penetrate large markets such as China, Japan, Korea, and the market of 649 million ASEAN people (Aseanstats, 2019).

Indeed, the ASEAN+3 has always been one of the biggest and most competitive Vietnamese rice markets for many years. On the one hand, ASEAN+3 is an extremely competitive market for rice exports, particularly Vietnam, which has to compete with many significant rivals such as Thailand. On the other hand, the Vietnamese rice export value to this market has witnessed a sharp fluctuation in general and has not been high compared to the potential of this market, leading to low and unstable income for rice farmers. For many years, several studies has been conducted to discuss this topic, but no previous research has focused on ASEAN+3 nations. Additionally, according to rice exporters, most countries worldwide continue to import rice more to ensure food security because of the COVID-19 epidemic's impact. Vietnam should fully take advantage of this chance with appropriate measures to show its competitive advantage compared to other competitors and boost rice export turnover.

Hence, with qualitative and quantitative methods, this thesis aims to bring a scientific and comprehensive analysis of the factors influencing Vietnam's export turnover to ASEAN+3 from 2005 to 2019. In this study, the gravity model - one of the most effective and successful methods which has been deployed to assess the correlation of some essential factors with the dependent variable. From then on, the authors recommend the current rice export situation to take full advantage of this prominent market in terms of 2021-2030.

1.2. Research subject

The research subject of the thesis is the factors influencing Vietnam's rice export to the ASEAN+3 countries. Precisely, these factors include 8 quantitative variables: Gross Domestic Product of Vietnam (GDPVN), Harvesting area of rice in Vietnam (LANDVN), Inflation rate of Vietnam (INFVN), Geographical distance between two countries (GDIS), Gross Domestic Product of importing countries (GDPIM), Population of importing country (POPIM), the exchange rate of importing country (ERIM, local currency unit - LCU/USD) the dummy

variable WTO; and 6 qualitative factors namely government policies, qualities and price of exported rice, quality of labor resources, technology, infrastructure, tariff and non-tariff of importing nations.

1.3. Research scope

In this topic, the authors have analyzed the factors influencing Vietnam's rice export under the below conditions:

- Firstly, the thesis has used Vietnam's rice export data to 11 countries in the ASEAN+3 market, including Indonesia, Thailand, Singapore, Philippines, Brunei, Laos, Malaysia, Cambodia, Japan, South Korea, and China. As Vietnam has not exported rice to Myanmar since 2009 (GSO, 2020), this country was not mentioned in this study.
- Secondly, the secondary data is collected from 2005 to 2019
- Thirdly, in this study, the authors merely focus on rice commodities in general (HS code: 1006)

1.4. Research objectives

The overall objective of the thesis is to determine the model of factors affecting rice exports under Vietnam's conditions and build a system of solutions to boost exports for Vietnam's rice industry in terms of 2021-2030.

From that, four specific goals have identified that need to be implemented to achieve the above purposes:

- *Objective 1:* Analyze the current situation of Vietnam's rice exports to ASEAN+3 countries in the period of 2005-2019
- *Objective 2:* Identify critical factors affecting Vietnam’s rice exports to ASEAN+3 countries
- *Objective 3:* Analyze the impact of these factors on Vietnam’s rice exports to ASEAN+3 countries
- *Objective 4:* Develop a system of solutions to boost Vietnam's rice exports to the ASEAN+3 market in the term of 2021-2030

1.5. Research questions

To achieve our goals, investigating the interaction between each factor and the Vietnam rice export scene is required. Hence, recommendations for every factor have been given based on the results of the examination that has presented which assessment is positive or negative. As a result, the scenario of exporting rice in Vietnam to ASEAN+3 is expected flourishingly in the next ten years. In detail, it is recommended to critically discuss these following questions for the accomplishment of those tasks:

- What is the situation of rice production and export of Vietnam to ASEAN+3 countries in the period of 2005 - 2019?
- Based on the gravity model of international trade and the actual situation in Vietnam, what are the main factors affecting Vietnam's rice exports to ASEAN+3 countries?
- How are these factors correlated with Vietnam's rice exports?
- How to boost Vietnam's rice export to ASEAN+3 countries in the term of 2021-2030?

1.6. Methodology and data overview

The study practices by the combination of two methods, which are quantitative and qualitative analysis. The former identifies the correlation regarding various factors to this specific scene. Thus, several approaches, such as the Gravity model, Pearson's correlation coefficient methods, together with multiple regression models applied to Stata software version 14.0, are recommended for better comprehension. Besides, the latter method uses other genres of data, which are beyond the analysis of quantitative algorithms. In terms of data, due to the specific characteristic of the analysis scope, the accumulation of secondary data genuinely comes from accredited sources such as the General Department of Customs, General Statistics Office, International Monetary Fund, World Bank, UN Comtrade, and other official sources. Additionally, reputable journals, previous researching materials, and other expert analyses are vital for a better approach.

1.7. Conclusion

In conclusion, chapter 1 provides the readers with a short view of the topic background and practical problems about Vietnam's rice export to the ASEAN+3 market in the period of 2005-2019. This chapter points out the research purposes through research objectives and research

questions. Moreover, the readers also have a general view of the methodologies applied in this research.

1.8. Thesis outline

The thesis is constituted by five chapters (excluding the abstract, appendix, reference, list of tables and figure, abbreviations and acronyms list):

Chapter 1 – Introduction provides a brief of the research topic overview, practical problem, research objectives, research questions, research scope, methodology, and data overview.

Chapter 2 – Literature review and Theoretical model evaluate further published researches, thesis, and journals. Definitions and general theories of export are indicated in order to support the research as well. Moreover, the literature gaps are also discovered to point up the research objectives, the theoretical framework, and developed hypotheses which are elucidated in this chapter.

Chapter 3 – Methodology discusses the approach to topic research, method of collecting and processing data, analytical methods, detections for the regression model, ethical considerations, and limitations of the research project.

Chapter 4 – Analysis and Findings firstly give an overview of Vietnam's rice export situation in general and Vietnam's rice export situation to ASEAN+3 market in particular from 2005-2019. After that, the data is collected and analyzed by both qualitative and quantitative techniques to find out how given factors influence the revenue of Vietnam's rice export to the ASEAN+3 countries in the research time.

Chapter 5 – Conclusion and Recommendations answer the research questions by summarizing the findings and suggesting recommendations for improving the total of Vietnam’s rice export volume. Moreover, this chapter also indicates the rice export policy of the Vietnamese government and forecasts Vietnam's rice export trend to the ASEAN+3 market in the periods of 2021-2030.

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LITERATURE REVIEW

The second chapter evaluates further published researches, thesis, and journals. Definitions and general theories of export are indicated in order to support the research as well. Moreover, the literature gaps are also discovered to point up the research objectives, the theoretical framework, and developed hypotheses which are elucidated in this chapter.

CHAPTER 2: LITERATURE REVIEW

2.1. Overview of export

2.1.1. Definitions of export

Export is one of the first foreign trade activities taking place between countries in the world to exploit its advantages over other countries, which is recognized as an essential way to promote economic development. Standing from different perspectives, there are many several conceptions about export.

According to Feenstra and Taylor (2010), *"Countries buy and sell goods from each other. Export is a product sold from one country to another"*. Similarly, in international trade, *"export"* refers to the sale of domestically produced goods and services to other markets (Joshi, 2005). In Vietnam, the Ministry of Justice (2005) defined that the export of goods means the bringing of goods out of Vietnam or into special zones in the Vietnamese territory.

Thus, export is a primary activity of foreign trade, it has a prolonged history and strongly develops in both width and depth. Despite having various explanations, exports are all based on one core definition: the exchange of goods between countries.

2.1.2. Importance of export

Export plays a crucial role in the socio-economic development of each country, which can increase foreign exchange, improve the balance of payments, increase revenue budget, stimulate technological innovation, change economic structures, create jobs, and improve living standards of people.

Moreover, Trinh (2018) listed five functions of exports. Firstly, export promotes inherent advantages such as resources, labor, etc.; by taking advantage of the limited resources from developed countries such as technology, management. As a result, it encourages economic and technical premises for the regular renewal of domestic production capacity. Secondly, export creates proactive capital and limits dependence on foreign loans. Expanding exports to increase foreign currency, create favorable conditions for imports, and develop infrastructure. Also, export makes an effort to expand the goods consumption market. This is shown by generating opportunities for goods to reach out to the country. The expansion of product markets contributes to stabilizing production and creating advantages by scale. Fourthly, export solves

the problem of unemployment and improves social life, which assists in attracting millions of laborers to work and also creates a source of capital to import essential consumer products to serve the daily life and meet more and more of the people's consumption needs. Last but not least, it contributes to economic restructuring, promoting production development. In fact, export devotes to economic restructuring to an outward economy as well as creates favorable conditions for related industries to develop.

For Vietnam, export is expressly vital to the economy. Minh et al. (2000) showed that export is a significant step for a country's national economy, which helps to create an important source of capital to meet the import needs and accumulation process for production. It also stimulates economic growth, increases the nation's production output through the expansion of the international market, and have a positive and effective impact on the living standards of the people.

2.2. Overview of rice export

2.2.1. Definitions of rice

Rice is a major food staple and a mainstay for the rural population and for household food security (Food and Agriculture Organization (FAO), 2006). It contains many nutrients, which is a common food for nearly half of the world's population. According to the International Rice Research Institute (IRRI), there are three main groups of rice cultivars including Indica, Japonica, and Aromatic. Indica is a major type of rice grown in subtropics and tropics of the world. Japonica rice originated from China and is grown in Japan while aromatic rice has grown in Pakistan, India (basmati) and Thailand (jasmine) (Chauhan et al., 2017). Each type of rice has its own Harmonized System Code (HS Code) is to classify import and export goods worldwide. The HS Code of some typical sorts of rice in Vietnam is listed in the table below:

Code	Description
1006	Rice
100610	Rice in the husk (paddy or rough):
10061010	Suitable for sowing
100620	Husked (brown) rice
10062010	Hom Mali rice

100630	Semi-milled or wholly milled rice, whether or not publish or glazed
10063030	Glutinous rice
10063040	Hom Mali rice
10063091	Parboiled rice
100640	Broken rice
10064010	Of a kind used for animal feed

Table 2.1: HS Code of Rice (General Department of Vietnam Customs, 2020)

In this thesis, rice is all raw or processed products and is listed in HS Code 1006.

2.2.2. Importance of rice export

Rice is the most basic food for people, especially in Asia and Africa countries that nearly cannot be eliminated. In addition to the primary roles of rice is meeting the physiological needs of humans, the development of rice production agriculture has also created jobs for farmers workers, provided materials for the industry, used machines, and technical progress. Besides, rice also has a high commercial value. Rice export contributes actively to the national economy leading to a stable source of foreign currency revenue. With that foreign currency revenue, the state can invest in many categories to develop the nation's infrastructure, economy, and culture. Overall, rice is an issue that many countries are always interested in, because it helps stabilize social life, create jobs, and also contribute to economic development.

2.2.3. Characteristics of rice export

2.2.3.1. Seasonality in trade

Rice is a short-term food crop that develops and matures in about 3-4 months. It is grown seasonally with different planting and harvesting times, leading to forming the seasonality in exchanging goods as well (Ha, 2015). It means that the amount of rice supplied in the market is uneven at each time of the year, this depends on the time of planting. Overcoming this feature requires exporting countries to always have appropriate storage plans to avoid oversupply and price squeeze.

2.2.3.2. The majority of rice is consumed locally

Presently, the amount of world rice consumption has increased in accordance with the population increase. However, the majority of rice exchanged in the world rice market accounts

for only a very small percentage, which is caused by the limit in the production capacity of these countries or the rapid increase of population size. According to the USDA (2020), the world total of rice production in 2019 was 493.8 million metric tons, while the global exports only reached 42.9 million metric tons, accounting for nearly 9%. Asian countries produced the most, accounting for 90% of the world's rice production; but these countries supplied only 7% of the world's traded rice.

2.2.3.3. Rice is the commodity with relatively low elasticity of demand

The elasticity of demand is the responsiveness of demand to changes in the price of the commodity (Nayar, 2009). If the close substitutes are available, elasticity is high because if the price increases slightly, the consumers shift over to other close alternatives available. As a result, demand decreases sharply. In contrast, if close substitutes are not available, then the elasticity will be low. Thus, rice is the commodity with relatively low elasticity of demand.

2.2.3.4. Other characteristics of rice export

Rice exports are influenced by natural conditions, based on the characteristics of rice and agricultural products that are generally dependent on natural conditions such as land, climate, and weather. This impact is represented by susceptibility to external factors, specifically, all changes in natural conditions directly affect the growth and development of rice, thereby affecting rice export output.

In summary, each country has its unique characteristics and conditions to develop rice production and export. The process of globalization is taking place actively, requiring nations to have appropriate strategies and ways to turn favorable factors into their own competitive advantages in international competition.

2.3. General theories of export

2.3.1. Mercantilism

Mercantilism was the first economic thought of the Bourgeoisie's economists in the 17th and 18th centuries. Heckscher (2013) stated that although this theory aimed genuinely at the leading mercantile economies in Western Europe, it was more progressive than the Medieval policies and the pioneer while emphasizing the vitality of international trade in the wealth of specific countries. Besides export efforts, the priority of high-value assets, a minimum import, and the

encouragement of domestic carriers, the national government also plays a vital role through trade protection and foreign trade monopoly policies to ensure the countries' benefits and export mission. Mercantilist economists were quite radical when they saw international trading as *"a zero-sum game,"* however, this theory is an essential premise for the further development of later approaches.

2.3.2. Adam Smith's Theory of Absolute Advantage

Smith (1963) showed his objection to the statement of Mercantilist while seeing the existence of global trade as a game (Schliesser, 2005). In other words, it brought practical benefits to both sides when implementing a principle called *"Division of works"*. In detail, a country specializing in manufacturing industries has an absolute advantage over the opponent, which allows for the more cost-effective production and boosts productivity. Besides, the economist also explained that the supreme power of a termite depends on its natural conditions or efforts. While reasonable terms can be interpreted as available natural and abundant resources, the advantage of physical endeavor is the development of technology and high specialization. In short, the absolute theory shows that every country benefit from international trade rather than a zero-game rule.

2.3.3. David Ricardo's Discovery of Comparative Advantage

According to Samuelson (2004), several economists argued that what happened when one country had power in almost every product compared to the others, or a nation did not have an absolute advantage over the others. David Ricardo answered these concerns in his comparative advantage doctrine. It is demonstrated that a specific country exported goods at a relatively lower price than the other. In other words, one country exported goods produced with relatively higher efficiency than the other. The following comparison specifies this theory:

$$\frac{Labor\ cost\ to\ produce\ 1\ unit\ X\ in\ A}{Labor\ cost\ to\ produce\ 1\ unit\ X\ in\ B} < \frac{Labor\ cost\ to\ produce\ 1\ unit\ Y\ in\ A}{Labor\ cost\ to\ produce\ 1\ unit\ Y\ in\ B}$$

As can be seen, David Ricardo's theory supported Adam Smith's view that international trade brings reasonable conditions to both countries and solves the limitations of Adam Smith's theory. Also, it stated that international trade taking place with other countries has absolute disadvantages in terms of commodities. However, this theory also has certain obstacles, such as the difference in consumption of each country affecting international trade or the diversity in the production of goods of other countries.

2.3.4. Haberler's Opportunity Cost Theory

According to Filip (2017), Gottfried von Haberler overcame the limitation of David Ricardo's comparative advantage theory by explaining the concept of opportunity cost. Understandably, the X item's opportunity cost was the number of Y commodities giving up to produce an additional unit of goods X. Thus, the exchange ratio of the specific merchandise is expressed in terms of its opportunity cost and the opposite. Roberts (2007) has a more understandable explanation when bringing economic studies into real life. He thought that people often think about foregone opportunities, which the authors didn't choose and would probably regret. When visualizing the comparison between the two countries, the one with the lower opportunity cost has a comparative advantage in that item over the other. Finally, the opportunity cost approach was superior to determining benefits between the two countries compared to the application of labor assumption.

2.3.5. Heckscher-Ohlin Model

The Heckscher-Ohlin doctrine has improved earlier theories in many respects since it was born in the early 20th century. Indeed, the H-O theory identified a country exported goods when the production requires relatively large amounts over the other country. Accordingly, the following comparison is to calculate the ratio between the factors to determine abundance:

$$\frac{Lx}{Kx} > \frac{Ly}{Ky}$$

In detail:

Lx and Ly are the amounts of labor needed to produce a unit X and Y

Kx and Ky are the capital required to provide units X and Y, respectively.

Despite the limitations of applying HO theory in a presently complex context, the approach strengthens David Ricardo's missing positions by emphasizing trade exchange as the exchange of redundant elements to get the scarcity factor.

To sum up, these international trade theories have provided the basis of scientific approach and knowledge to promote the advantages of the economy. Generally, all methods acknowledged the critical role of international trade in the world economy. Indeed, many states made use of these fundamentals to boost their export activities. However, due to the complicated fluctuations of the practical situation, each argument may exist with specific prohibitions. Hence, it is

necessary to consider, research, and evaluate possible conditions when offering solutions to promote export, particularly rice export movements.

2.4. Frameworks to analyze factors influencing export of goods

Indeed, many economists have implemented distinct types of models to achieve a better interpretation, such as the supply export model and demand import model, the SMART model, and the gravity model.

2.4.1. The Supply Export Model and Demand Import Model

Goldstein and Khan (1978) have developed the supply export model and demand import model as the fundamental economic models applied to the analysis of export activities. Understandably, the supply export model is the level of domestic output that businesses are willing to produce and supply at a given price. Since the change in price is hugely different, the supply model has been into two types: long-term and short-term. Besides, the demand export model describes the number of goods and services produced domestically, which attracts the availability of economic agents to offer at specific prices.

Nevertheless, the quantification of factors affecting the exporting activities among various countries is overwhelming for the two models. While the supply export model lacks external factors such as the macro-economic, political issues, GDP of the partnership countries, etc., the demand import model cannot convey the impacting intensity of factors adequately on exporting activities. As a result, experts have not employed these models in many present types of research, which requires a further scrutiny examination.

2.4.2. The SMART model

Economists utilize the SMART model in the quantitation of the correlation between the agreements and the general commercialization. According to Mahmood et al. (2017), the SMART figure is familiar with micro studies to estimate the impact of free trade agreements on a given market. The advantage of this model is the precise approach to the effects of negotiations on trade activities. However, it has shown limitations in evaluating the interaction of different markets. Besides, posing a lot of hypothetical variables can affect the accuracy of model results.

2.4.3. The Gravity model

Sosnovec (2018) indicated that the first formal use of Tinbergen's model (1962) relied on Newton's model of universal gravitation for interstate commerce application. This pattern is

well-known as the Gravity Model. Nowadays, economists utilize this model widely to measure and analyze the factors affecting exports between countries. Especially, the basic theoretical model between the two economies A and B is expressed by the following formula:

$$EX_{ABt} = K*GDP_{At}^{\beta1}*GDP_{Bt}^{\beta2}*DIS_{AB}^{\beta3}*\varepsilon$$

In particular:

EX_{ABt}: the trade turnover between country A and B at year t

$GDP_{At}^{\beta1}$ and $GDP_{Bt}^{\beta2}$: the economic scale of two countries A and B in year t

$DIS_{AB}^{\beta3}$: the distance between the two countries.

$\beta1$, $\beta2$, $\beta3$: Regression coefficient of each factor included in the model

ε: Random error

Indeed, gravity models are favorable in the analysis of the determinants affecting trade as well as international trade movement. Many empirical experts have tested and added to the model other variables matching to each country's actual conditions. The variables of the model implement flexibly in both qualitative and quantitative forms. Despite the wrongful selection of variables results in an inaccurate examination, the model shows its superiority compared to other models due to the comprehensive investigation of commercial activities across nations. Hence, the authors have employed this model as a fundamental approach for identifying Vietnam's rice export activities in the ASEAN+3 market.

2.5. Recent studies relating to thesis's topic

2.5.1. Foreign studies

2.5.1.1. In terms of research methods

To analyze the determinants of agricultural products export in general and rice export in particular, studies in the world often use two main methods: qualitative and quantitative.

- Qualitative method

This is an analytical method based on theoretical analysis, experience as well as the level of knowledge of the researcher, which has become popular with a lot of studies. However, since Tinbergen (1962) and Linnemann (1966) defined the essential variables to explain trade flows between any two nations through a gravity model, this method has no longer worked adequately, especially when analyzing quantitative variables. On the other hand, qualitative analysis is still

in parallel with quantitative analysis in some studies. It always focuses mainly on the non-quantitative variables (qualitative) affecting exports such as product quality, government policies, the development of science and technology, and so forth. For example, the studies by Robert (1994) and Onaran (2008) utilized qualitative analysis methods to assess the influence of infrastructure and economic policies on agricultural products export in some developing countries.

- Quantitative method

Besides qualitative analysis, quantitative analysis has been interested in recent years to quantify the influence of factors on the export turnover of a product or commodity groups in a country. There are some leading models for this analysis, but the gravity model is the most popular and the best one. However, there have not much studies analyzing factors affecting rice exports of a country. Regarding data, most of the previous studies used panel data. Many researchers used a variety of statistical methods of analysis, including the OLS - Ordinary least squares (Rahman, 2009), FEM and REM (Bac (2010), Elshehawy et al. (2014)), or ARDL method - Autoregressive Distributed Lag (Zarenejad, 2012). In particular, OLS regression is the most popular method because of its simplicity.

Overall, both methods (qualitative and quantitative analysis) are widely used in assessing the influence of factors on agricultural exports in general and rice in particular. However, the quantitative method has demonstrated more efficiency for quantifiable variables because of the specific assessment on each determinant, according to the current trend.

2.5.1.2. In terms of research findings

The number of studies directly related to rice exporting in the period from 2000 is quite modest. Therefore, the overview of international studies is related to the factors affecting the export of general in different markets by gravity models. From there, the authors clarify the overview of the thesis research.

Internationally, there are many empirical studies which may be mentioned such as Eita (2008), Zarenejad (2012), Khan et al. (2013), Weckström (2013), Elshehawy et al. (2014), etc., whose studies confirm the positive relationship between GDP of importing-exporting countries and export turnover. Along with that, the geographic distance negatively correlates with the dependent variable in most above research. In addition to three main factors, some other

variables were added to analyze the determinants depending on specific goods, such as population, inflation rate, the exchange rate, participation in FTAs, etc. Eita (2008) shows that the GDP of the importing country and the GDP of Namibia caused the export to increase, while the geographical distance reduced export turnover. Also, Namibia's exchange rate did not affect exports. In contrast, the exchange rate variable was positively correlated with exports in Russia (Weckström, 2013). Additionally, the population was analyzed in research by Elshehawy et al. (2014), which associates significantly with Egyptian exports. While participating in FTAs associates with bilateral trade in a study by Yang and Martínez (2014), it discouraged Egyptian agricultural exports (Hatab et al., 2010). Generally, each factor in each paper represented various influences due to the type of commodities and the research scope.

2.5.2. Domestic studies

2.5.2.1. In terms of research methods

The qualitative method has been more popular with a lot of research in many fields compared to the other for many years in Vietnam. For example, Su (2012) studied the situation of Vietnam's rice export from 1989 to 2011 with the export market, quality, opportunities, and challenges. However, there are many shortcomings because the factors selected for analysis can still be quantified by numbers such as GDP, population, inflation rate, harvesting area, etc. Recently, the quantitative analysis method has become more prevailing compared to the past, but there are still not many prior studies in rice exports.

2.5.2.2. In terms of research findings

In Vietnam, the gravity model is also modified with some essential commodities, which are a series of researches such as Hieu and Thuy (2010), Tho (2013), Tu (2016), Trinh (2018). Notably, some new factors such as the level of openness, the harvesting area of rice, and the like are analyzed to be suitable with the actual situation of a developing country. For example, the level of openness and participation in free trade has no significant impact on Vietnam's exports to 40 export countries from 1995 to 2011 (Tho, 2013). Besides, due to differences in conditions, the GDP variable in some research is expressed differently compared to the above international studies. Trinh (2018) indicates that the GDP of Vietnam did not affect export turnover, while import nations' GDP displayed an inverse relationship with Vietnam's exports to the Eurasian Economic Union between 2006 and 2017.

In term of the rice industry, in particular, there were a few empirical studies which might be included such as My (2016), Bui and Chen (2017), Yen and Thao (2017). However, each researcher chose different determinants, research time, and market, leading to different outcomes. In detail, the study by My (2016) found that additional factors of population, inflation rate, participants of WTO, APEC, and the harvesting area of rice also had a positive relationship with Vietnam's export of rice and coffee. On the other hand, the GDP of importing countries expressed the inverse relationship with rice export value. Also, this author pointed out that the geographical distance variable between Vietnam and the importing partner countries had no significance in its research model. In contrast, the GDP of Vietnam, geographical distance, and the inflation rate of Vietnam harvested area posed a positive effect on the rice exporting revenue of Vietnam to ASEAN markets from 2000 to 2015 (Yen and Thao, 2017). Differently, geographical distance factor, shared borders were revealed by Bui and Chen (2017) that they did not have much influence on rice export activity. Additionally, this study discovered that the exchange rate (local currency unit - LCU/USD) of importers negatively affected the dependent variable with research time from 2004 to 2013.

2.5.3. Summary of literature review

Overall, there have not much studies using gravity models to evaluate factors affecting the rice export in the world and Vietnam in recent years. From the reviews, the authors have some conclusions. Initially, the Gravity model of trade has been the most popular theory to explain the trade flows between countries for decades but it is not the most ideal for all countries on the planet as trade flows between the various nations vary incredibly. Besides, the model can have different variables but it is indispensable for three primary factors: GDP of the exporting country, GDP of the importing country, and the geographical distance between the two countries. Secondly, participation in free trade areas and economic cooperation may become an advantage for a country in exporting agricultural products in general and rice in particular to other member countries in the same group. On the basis of the organization's general regulations, they create a fair and healthy competitive environment for member countries.

The table below summaries of key studies related to the thesis:

No.	References	Thesis title	Methods and Data	Findings
1	Zarenejad (2012)	Factors affecting the world's rice import demand from Iran	- Demand Import Model - ARDL method - Time Series between 1989-2006	- Rice export price of Iran (+) - Rice export price of the world (+) - Income level of importing countries (+) - Real exchange rate between IRR/USD (+)
2	Tho (2013)	Determinants of Vietnam's exports: A gravity model approach	- Gravity model - OLS - FEM, REM - Panel data between 2004 to 2008 on Vietnam's 61 importing countries	- GDP of Vietnam (+) - FDI of Vietnam (-) - GDP per capita of importing country (-) - Geographical distance (-) - Real bilateral exchange rate (+) - Free Trade Agreements (0)
3	Yang and Martínez (2014)	A panel data analysis of trade creation and trade diversion effects: The case of ASEAN–China Free Trade Area	- Gravity model - Pooled OLS - FEM, REM - Panel data between 1995 to 2010	- Geographical Distance (-) - Population of exporting country (0) - Population importing countries (0) - GDP of Vietnam (+) - GDP of importing countries (-)
4	My (2016)	Study on factors affecting the export of some agricultural products of Vietnam	- Gravity model - Pooled OLS - FEM, REM - Panel data between 1997-2013	- GDP of Vietnam (+) - GDP of importing countries – rice commodities (-) - Population of Vietnam * Population importers (+) - Agricultural land area of Vietnam * agricultural land area of importing countries (+) - Inflation rate (+) - Geographical distance (-) - Economic gap (0) - Opening level of economy (+) - Participant of WTO, APEC (+)
5	Bui and Chen (2017)	An Analysis of Factors Influencing Rice Export in Vietnam Based on Gravity Model	- Gravity model - OLS - FEM, REM - Panel data between 2004 - 2013	- GDP of Vietnam (0) - GDP of importing countries (+) - Geographical Distance (0) - Exchange rate (-) - The populations of importing countries price (+)
6	Yen and Thao (2017)	Factors affecting Vietnam's rice export to ASEAN market; results of analysis by gravity model	- Gravity model - OLS, FEM, REM - Panel data between 2000-2015	- GDP of Vietnam (+) - Geographical Distance (+) - Inflation rate of Vietnam (-) - Harvesting area of Rice in Vietnam (+) - Economic gap (-)

Table 2.2: Summary of key studies related to the thesis (Authors, 2020)

(+), (0), (-) indicate positive, no and negative correlation, respectively

2.5.4. Literature gap

It is obvious that many pieces of research were conducted in various time and space conditions, so the impact of each determinant may be disparate. In fact, international studies analyzing the factors affecting rice exports may not be totally applied in the Vietnam case. The reason is that these factors have influenced uniquely due to differences in economy size, politics, natural conditions, rice production characteristics, etc. Besides, most of the research was conducted many years ago with outdated data, so it is no longer topical. Notably, all past papers have ignored the ASEAN+3 market, one of the biggest and most potential Vietnamese rice markets in many years. Hence, this is the first research on Vietnam's rice exports to ASEAN+3 from 2005 to 2019 combining with qualitative and quantitative analysis in order to make a detailed, topical and comprehensive analysis of determinants in rice export in compliance with the actual conditions of Vietnam. From that, the authors have built a system of solutions to boost Vietnam's rice exports in the period 2021-2030.

2.6. Proposed research model - Hypothesis development

2.6.1. Selected theoretical model

2.6.1.1. The original model

Within this thesis, the authors have utilized the model of Tinbergen (1962) as a reference for constructing the theoretical theory. The simple form of the gravity model in international trade with three primary explanatory variables equivalent to three groups: factors affecting supply and demand, and gravity-hindering/stimulating factors are as follows:

$$EX_{ABt} = K*GDP_{At}^{\beta 1}*GDP_{Bt}^{\beta 2}*DIS_{AB}^{\beta 3}*\varepsilon$$

In particular:

EX_{ABt}: the trade turnover between country A and B at year t

$GDP_{At}^{\beta 1}$ and $GDP_{Bt}^{\beta 2}$: the economic scale of two countries A and B in year t

$DIS_{AB}^{\beta 3}$: the distance between the two countries.

β1, β2, β3: Regression coefficient of each factor included in the model

ε: Random error

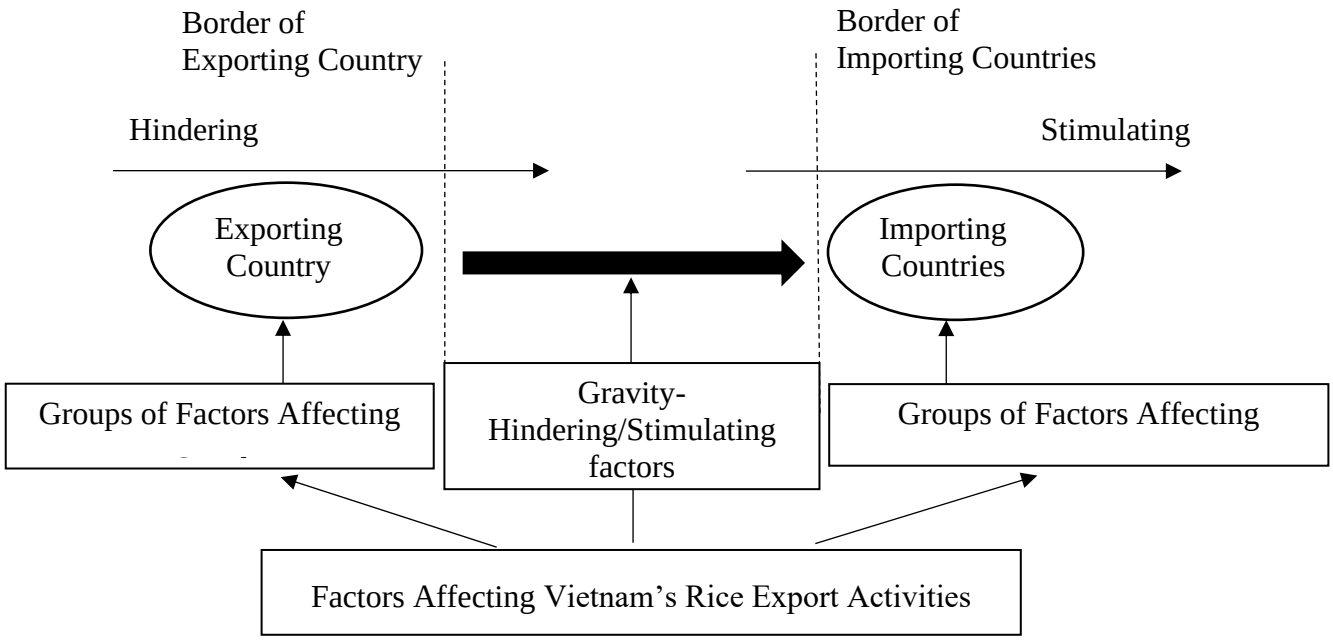

Figure 2.1: Factors affecting international trade (Tinbergen, 1962)

2.6.1.2. The modified model

The selected model is based on the original framework of Tinbergen (1962) with three main groups, such as factors affecting supply and demand, and gravity-hindering elements. Furthermore, the authors also reviewed and based on several reputable journals that are related to the study topic to develop variables as well as hypotheses. The particular model with a total of eight explanatory variables related to Vietnam's rice export circumstances was investigated as follows:

$$EXP_{ijt} = A*GDPVN_{it}^{\beta 1}*LANDVN_{it}^{\beta 2}*INFVN_{it}^{\beta 3}*GDIS_{ij}^{\beta 4}*GDPIM_{jt}^{\beta 5}*POPIM_{jt}^{\beta 6}*ERIM_{jt}^{\beta 7} *WTO^{\beta 8}*u_{ijt}$$

Where:

EXP_{ijt}: dependent variable represented by Vietnam's total rice export volume to 11 importing partners in year t (t = 2005, 2006…)

$GDPVN_{it}$: Gross Domestic Product of Vietnam in year t

$LANDVN_{it}$: Harvesting area of rice in Vietnam in year t

$INFVN_{it}$: Inflation rate of Vietnam in year t

$GDIS_{ij}$: Geographical distance between Vietnam and country j

$GDPIM_{jt}$: Gross Domestic Product of importing country in year t

$POPIM_{jt}$: Population of country j in year t

$ERIM_{jt}$: Exchange rate of country j's currency/USD in year t

WTO: a dummy variable. Get a value of 0 if the rice importing country has not joined the WTO; receive value 1 if the rice importing country is a member of WTO in year t.

A is a constant $_i$: Vietnam $_j$: importing countries

u_{ijt} is the standard random error $_t$: year analysis

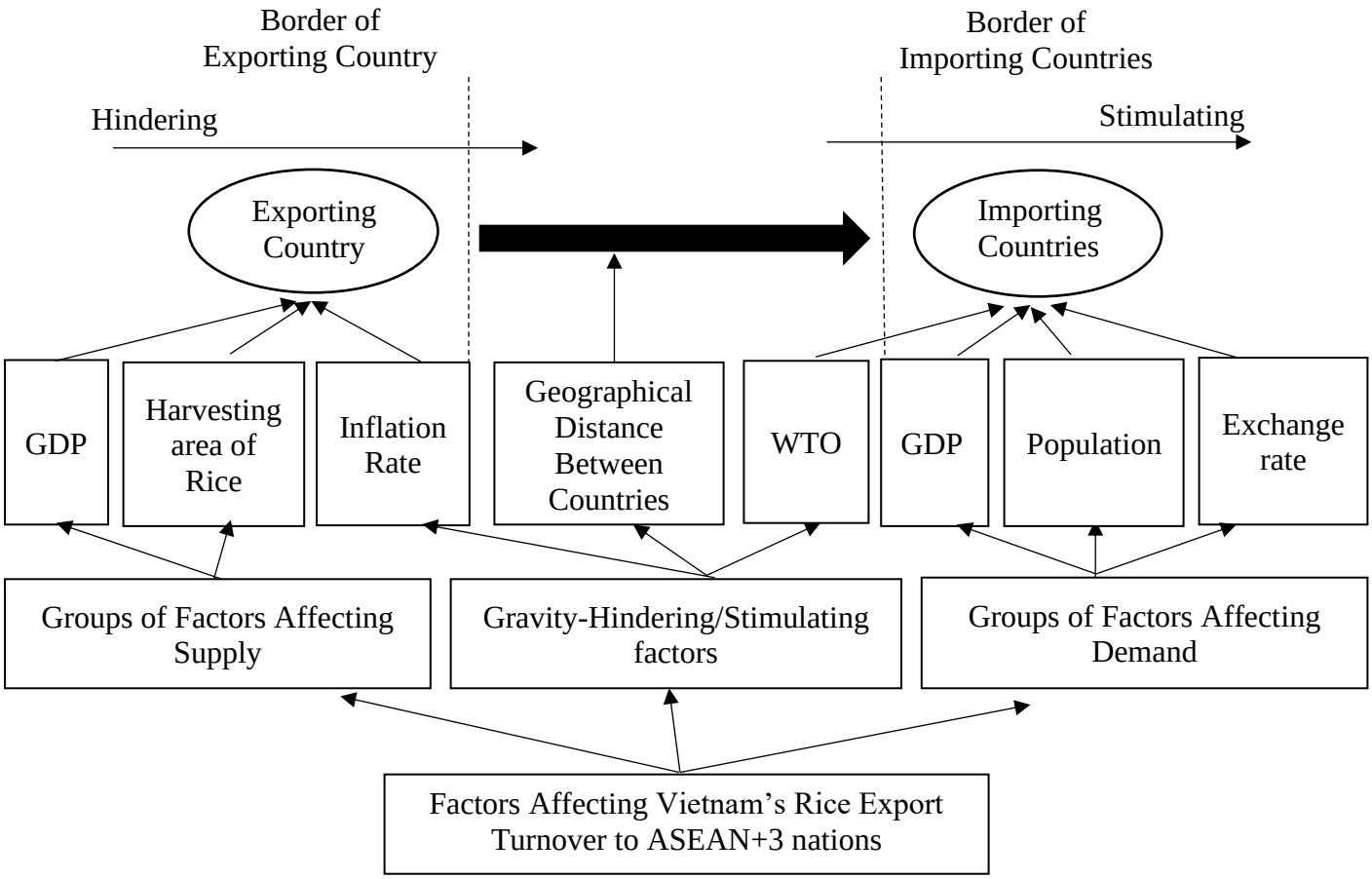

Figure 2.2: Factors affecting Vietnam's rice export turnover (Authors, 2020)

The estimation of the model would be presented on a log-log scale (natural logarithm) due to the tremendous value of the variables involved. However, the Inflation variable would not be transformed into ln to lessen the danger of the relative logarithm error - value is much less than zero as following:

$$lnEXP_{ijt} = A + \beta_1 * lnGDPVN_{it} + \beta_2 * lnLANDVN_{it} + \beta_3 * INFVN_{it} + \beta_4 * lnGDIS_{ij} + \beta_5 * lnGDPIM_{jt} + \beta_6 * lnPOPIM_{jt} + \beta_7 * lnERIM_{jt} + \beta_8 * WTO_{jt} + u_{ijt}$$

2.6.2. Variable description - Hypothesis development

2.6.2.1. Dependent variable

EXP - Vietnam's total value rice export

The dependent variable is measured by Vietnam's exports from the General Statistics Office of Vietnam website in the period of 2005-2019. In particular, exports are measured in million USD. The higher this value is, the more output of the rice export.

2.6.2.2. Independent variables

GDPVN - Gross Domestic Product of Vietnam

Most studies such as Eita (2008), Elshehawy et al. (2014), Zhang and Wang (2015), Long and Hoa (2015) demonstrated that GDP of the exporter is positively correlated with the country's exports of goods. In other words, when the GDP of an exporter increases, the supply of goods and services increases with more export opportunities. The reason is that the exporting country has conditions to invest in developing science and new species, improving productivity and quality to increase export capacity.

➡ ***H1: GDP has a positive correlation with Vietnam's rice exports***

LANDVN - Harvesting area of rice in Vietnam

The harvesting area of rice plays a vital role in a country's agricultural production as My (2016) indicated before. Regardless of how large or small the area of rice land is, it determines the size of the domestic output and the country's rice export strategy. In this research, it is measured by the total land area used to grow rice in Vietnam during the year. In general, regarding exporting countries, the area of rice cultivation is positively correlated with the rice export turnover due to the expansion of the production scale and the increase in the output of goods, which boost the rice export activity and reduce import demand.

➡ ***H2: Harvesting area of rice in Vietnam is positively associated with Vietnam's rice exports***

INFVN - Inflation rate of Vietnam

Inflation is a quantitative measure of the rate at which the average price level of goods increases over the year. It is a constant rise in the general level of prices where a unit of currency buys less than it did in the previous year (James, 2020). Similarly, Yen and Thao (2017) proved that

inflation rate and rice export turnover have a negative effect after analyzing the factors affecting rice export turnover to the world market. In fact, inflation growth leads to a reduction in exports due to goods and services being costlier in the international market, which might reduce the competitive advantage of Vietnamese rice.

➡ ***H3: Inflation negatively correlates with Vietnam's rice exports***

GDIS - Geographical distance between two countries

The geographic distance between the two countries is the distance between two capitals of two nations, which is known as a proxy for transportation and transaction costs. A longer distance means that the two countries are located far away from each other, which implies higher transport costs and hence, likely to cause a negative correlation on the bilateral flows of trade. On the contrary, the closer the distance is, the lower risks of freight transportation are, thus contributing to the promotion of import-export activities. This inverse relationship was mentioned in many prior studies such as Yang and Martínez (2014), My (2016), etc.

➡ ***H4: The geographical distance is negatively correlated with Vietnam's rice exports***

GDPIM - Gross Domestic Product of importing country

The GDP factor of the importers substantially reflects the ability to pay for goods that it consumes (Bui and Chen, 2017). In the importing country, the high GDP growth leads to an increase in people's income and a higher demand for imported goods to serve the needs of domestic consumption and production. However, the importing country with high GDP growth might have sufficient capacity to meet domestic demand as well as produce goods as import substitution. Thus, it might be difficult for the exporter to penetrate the market. Besides, the demand for goods depends on the type of goods that are luxury or inferior products. Accurately, the demand for inferior goods would drop when people's incomes rise. Vietnamese rice is rated with medium-low quality and not diversified, resulting in a decreasing demand for importing countries with high GDP growth. According to the Vietnam Development Report 2016 (World Bank, 2016), there is a noticeable reduction in rice consumption among the urban population and higher-income groups in East and Southeast Asia in general.

➡ ***H5: GDP of importing country is negatively correlated with Vietnam's rice exports***

POPIM - Population of importing countries

The population of the importing countries demonstrate the market's potential demand for goods as well as its labor force. In light of population growth, the need for goods increases, especially essential commodities such as agricultural products, that cause effects on the export turnover of the partner country. The population of the importing country is positively correlated with the export activity of the partner country (My, 2016).

➡ ***H6: Import country's population has a positive association with Vietnam's rice exports***

ERIM - Exchange rate of importing countries

The exchange rate is the rate at which one currency will be exchanged for another. In this study, the exchange rate of importers are presented as the purchasing power of money for goods, specifically rice, which can be understood as the real exchange rate of foreign currency against the local currency (LCU/USD). There is a significant association between this factor and importer price (Bui and Chen, 2017). Clearly, the local currency devaluation might make the purchase price of imported goods go up and affect the import value.

➡ ***H7: Exchange rate of importing country is negatively correlated with Vietnam's rice exports***

WTO - World Trade Organization

Participation in the majority of trade agreements such as WTO is expected to provide more significant market access opportunities with many tariff preferences for the country, which will contribute to promoting export value. Previous studies have also shown this relationship, such as Yang and Martínez (2014), My (2016), etc. Besides, Keynes (1963) indicated that trade activity is one of the factors affecting the size of an economy. Therefore, the participation of international organizations might theoretically increase the size of the economy to create motivation to increase rice exports. Within this research, the WTO variable is used in the form of a dummy variable, and it is expected to have a positive impact on the total rice export volume of Vietnam.

➡ ***H8: WTO is positively correlated with Vietnam's rice exports***

2.6.2.3. Summary of variables

Variables	Variables Description	Measurement Method	Expected signs
Dependent variable			
EXP	Vietnam's total value of rice export	The total value of Vietnam's rice exports (USD)	
Independent variables			
GDPVN	Gross Domestic Product of Vietnam	Vietnam's GDP (USD)	(+)
LANDVN	Harvesting area of rice in Vietnam	Total harvesting area of rice in Vietnam (thousand hectare)	(+)
INFVN	The inflation rate of Vietnam	Measure the change of the consumer price index of a fixed basket of goods and services over time (%)	(-)
GDIS	The geographical distance between the two countries	The difference of distance between the capital of the rice importing country and Hanoi (km)	(-)
GDPIM	Gross Domestic Product of importing countries	Importing country's GDP (USD)	(-)
POPIM	The population of importing countries	The population of importing countries (people)	(+)
ERIM	Exchange rate of importing countries	The real exchange rate of foreign currency (USD) against the local currency (local currency unit - LCU/USD)	(-)
WTO	World Trade Organization	The dummy variable indicates whether or not the importing countries have joined the WTO in that year. (Participating countries: 1, non-participating countries: 0)	(+)

Table 2.3: Summary of variables and expected signs (Authors, 2020)

(+), (-) indicate positive and negative correlation, respectively

2.7. Conclusion

This chapter aims to give an overall look at the situation of the rice market, definitions of export, and general theories, along with the theoretical framework and developed hypotheses as a solid foundation for our study. Furthermore, the literature and the related model to this study are also compared and evaluated. The literature gap is also given to make sure that this thesis is implemented outside of the box. In the next chapter, the research methodologies are determined to help investigate the relationship amongst variables.

The third chapter dicusses the approach to topic research, method of collecting and processing data, analytical methods, detections for the regression model, ethical considerations, and limitations of the research project.

METHODOLOGIES

03

CHAPTER 3: METHODOLOGY

3.1. Introduction

The Research Onion by Saunders et al. (2009) has become more influential when they represent the various aspects of research methodology as an onion. Every layer of the onion describes the single steps of a research study from general to specific phases. Thus, the layers indicate the different elements of a study that have to be adopted in a progressive way till they arrive at data collection and analysis, which is the innermost layer. The advantage of the research onion is that it expresses a series of crucial elements and stages to develop an appropriate and coherent research design. The following subsections would explore further each layer of the onion including research philosophy, approach, strategy, and method.

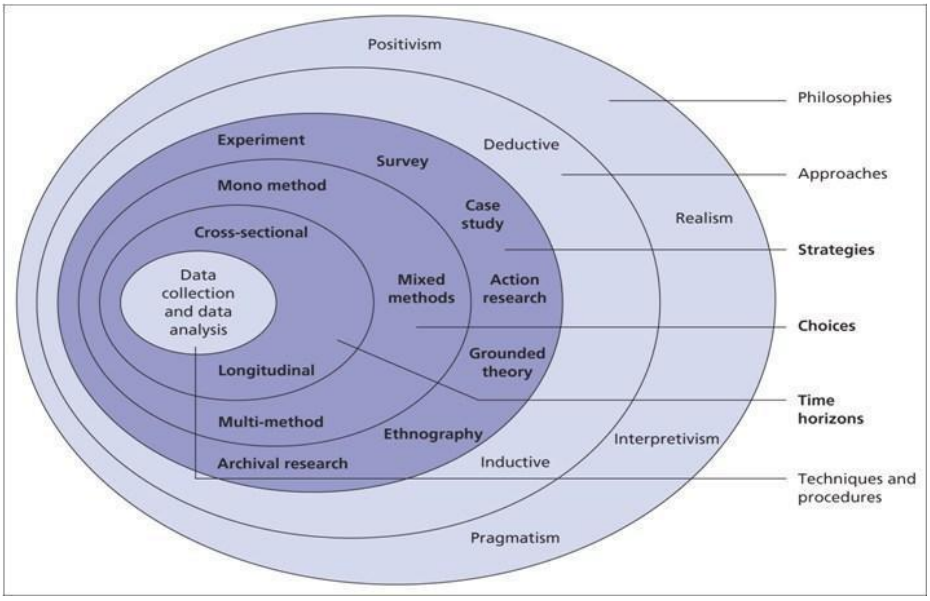

Figure 3.1: Research Onion (Saunders et al., 2009)

3.1.1. Research philosophy

The outermost layer refers to research philosophy. As defined by Saunders et al. (2009), it is a system of beliefs and assumptions about the development of knowledge. It contains not only the methodological choice and strategies differences, but also the critical assumptions in the collection, interpretation, and analysis of data collected.

From the aspect of the research, philosophies have been built up into four crucial views: *Positivism*, *Interpretivism*, *Pragmatism*, and *Realism*. Firstly, *positivism* claims that the social

world can be understood objectively. It is a doctrine that states that the only authentic knowledge is scientific and that such knowledge must be scientifically verified or otherwise based on strict scientific methods. The opposite of the research mentioned above is *interpretivism* that individuals are different and complex, they understand the same 'objective reality' in very different ways, and have individual reasons for their action, thus scientific methods are not appropriate. Thirdly, *pragmatics* "recognize that there are many different ways of interpreting the world and undertaking research, that no single point of view can ever give the entire picture and that there may be multiple realities" (Saunders et al., 2009). Finally, *realism* is based on the principles of positivist and interpretivist research philosophies. It is a concern for fact or reality and rejection of the impractical and visionary.

To the purpose of measuring the factors impact upon Vietnam's rice export volume, gathered-data and developed-hypothesis need to be conducted and examined in an objective manner. In conjunction with this feature, this research is the most suitable with the *Positivism* philosophy, consequently.

3.1.2. Research approach

The second layer, which is the choice of the appropriate research approach. Saunders et al. (2009) argued that there are two main research approaches: *induction and deduction.*

Deductive research tends to proceed from the theory to confirmation or rejection. Thus, hypothesis upon a pre-existing theory and then formulates the research approach to test it, and it is characterized as a move from general to specific results.

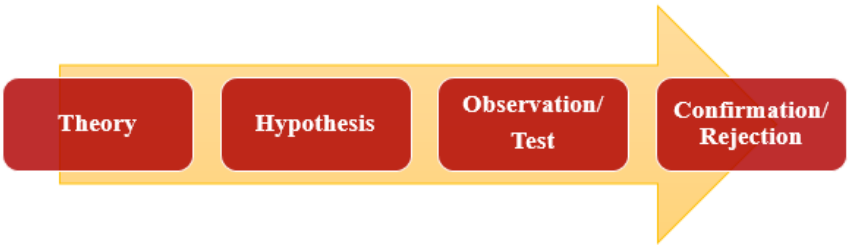

Figure 3.2: Deductive approach model (Saunders et al., 2009)

In contrast, ***inductive research*** tends to proceed from method to theory. The dataset was used in the inductive analysis method to draw conclusions that had not been tested before. Hence the inductive approach is characterized as a move from the specific to general. (Saunders et al., 2009).

Figure 3.3: Inductive approach model (Saunders et al., 2009)

The table below shows more clearly the difference between Deductive and Inductive approach.

Deduction	Induction
• Moving from theory to data • Common with natural sciences • A highly-structured approach • Explain the causal relationship between variables • Select samples of sufficient size to generalize the conclusion	• Moving from data to theory • Common with social sciences • Flexible structure to permit changes • Understanding of meaning humans attach • Less concern with the need to generalize

Table 3.1: Major differences between Deduction and Induction (Saunders et al., 2009)

Within the scope of this study, because of following positive research philosophy, the authors have adopt a deductive approach to observe the 161 observations affecting Vietnam's rice export to 11 countries in the ASEAN+3 market, including Indonesia, Thailand, Singapore, Philippines, Brunei, Laos, Malaysia, Cambodia, Japan, Korea, and China in the period of 2005-2019. Hypotheses are first developed upon a pre-existing theory (including Definitions of rice exports, Comparative and Absolute Advantage, Opportunity Cost Theory, etc.). Then the data would be collected objectively and transparently to test the theories as well as the hypotheses have raised earlier. The evaluation, comments, and solutions would also be rough out based on the result.

3.1.3. Research strategy

The third layer refers to the research strategy which is a method of the research style that the authors use to collect and analyze data. In other words, this is how researchers intend to carry out the works (Saunders et al., 2009). There are several strategies such as experiment, survey, case study, action research, grounded theory, ethnography, archival research, etc. Each one contains its advantages and disadvantages and no research strategy is inherently superior or inferior to any other. Therefore, researchers should be thoughtful in the choices of strategies. In the research strategy, more than one research strategy can be implied as long as they are

efficiently reasonable for the work and some strategies can be used as a part of the others that all support the final result.

In this thesis, archival research and experiment strategy are put into operation. The archival research strategy allows for explanatory or descriptive analysis of variable relationship changes tracked over a long period. The experiment strategy would assist the authors in hypothesis creation, data analysis, and relationship verification between factors and Vietnam's rice export turnover.

3.1.4. Research methods

A research method is a systematic plan for conducting research. Sociologists draw on a variety of both qualitative and quantitative research methods, including experiments, survey research, participant observation, and secondary data. Quantitative research is generally associated with Positivism and the deductive approach. By using numerically measured data, applying statistical techniques, this research can formulate facts and uncover patterns among variables. On the other hand, non-numeric numbers are widely associated with qualitative data. Qualitative method data collection technique is commonly textual data, for instance, interviews, focus groups, conversational analysis, and observation. It is commonly associated with Interpretivism philosophy. (Denzin and Lincoln 2005). Overall, the table below reveals the comparison between Qualitative and Quantitative method:

	Pros	Cons
Qualitative	● Flexible (can often adjust methods when developing new knowledge) ● Can be conducted with small samples	● It cannot be analyzed statistically or generalized to broader populations ● Difficult to standardize research
Quantitative	● It can be used to systematically describe large collections of things ● Generate reproducible knowledge	● Requires statistical training to analyze data ● Requires larger samples

Table 3.2: Comparison between Qualitative and Quantitative method (Authors, 2020)

The authors have utilized two analysis methods to comprehensively investigate the given issues, which are the qualitative and quantitative forms. Accordingly, the former has focused on identifying the statistics, which have difficulties in transforming into specific numbers. Hence,

the authors have provided evaluations of particular qualitative data, such as government policies, quality and price of rice, human resources, technology, infrastructure, tariff and non-tariff barriers based on the theoretical basis and practical observations. The latter has emphasized the investigation results to detect fluctuations in Vietnam's rice export and import activities in distinct markets over time. Notably, the authors have employed this method to assess the variation of Vietnam's rice export turnover in research markets in a certain period. Thereby the limitations of Vietnam's rice export activity are evaluated objectively.

3.2. Data sources

The collected data can be distinguished into *primary data* and *secondary data.* According to Collis and Hussey (2013*), primary data* are generated from an original source and used through the lens of their research, not through that of previous research. In contrast, *secondary data* have been collected from an existing source and have already gone through an analysis process.

Due to the specific characteristics of this research, secondary data is the most suitable for conducting and analyzing. Authors gathered useful data from The World Bank (WB), General Statistics Office, USDA, UN Comtrade, IMF, FAO, several reputable journals and so forth to the aim of ensuring three force features of secondary data: reliability, suitability, and adequacy for both qualitative and quantitative analysis

Data sources details of each variable are summarized in the following table:

Variables	Variables Description	Measurement Method	Data sources
Dependent variable			
EXP	Vietnam's total value of rice export	The total value of Vietnam's rice exports (USD)	UN Comtrade
Independent variables			
GDPVN	Gross Domestic Product of Vietnam	Vietnam’s GDP (USD)	World Bank
LANDVN	Harvesting area of rice in Vietnam	Total harvesting area of rice in Vietnam (hectare)	General Statistics Office of Vietnam
INFVN	The inflation rate of Vietnam	Measure the change of the consumer price index of a fixed basket of goods and services over time (%)	World Bank

GDIS	The geographical distance between the two countries	The difference of distance between the capital of the rice importing country and Hanoi (km)	Website: http://www.timeanddate.com/
GDPIM	Gross Domestic Product of importing country	Importing country's GDP (USD)	World Bank
POPIM	The population of importing country	The population of importing country (people)	World Bank
ERIM	Exchange rate of importing countries	The real exchange rate of foreign currency (USD) against the local currency (local currency unit - LCU/USD)	World Bank
WTO	World Trade Organization	The dummy variable indicates whether or not the importing countries have joined the WTO in that year. (Participating countries: 1, non-participating countries: 0)	Website: https://www.wto.org

Table 3.3: Variable's data source details (Authors, 2020)

3.3. Data collection methods

After the data classification and data sources identification process, verifying the data's authenticity is a vital part of the accuracy examination results. Therefore, national and global reputable organizations are this paper's priorities in the analysis procedure.

According to the statistics selection, the authors have employed various data related to the rice export scene of Vietnam, particularly in ASEAN+3. Otherwise, the data gathering procedures required statistics within 2005-2019 in terms of quantitative input utilized by Stata 14.0 for regressive analysis. Simultaneously, reputable journals, previous research, and several expert reports, such as Yang and Martinez (2014), Bui and Chen (2017) provide information on other determinants affecting the Vietnam rice export situation, such as the government policies, qualities and price of exported rice, labor sources conditions, technology, infrastructure, tariff and non-tariff of importing nations.

Despite the missing observations due to the delay of data updating, it has shown a negligible impact on the analysis result. Eventually, these data sources, after being under the scrutiny of synthesizing and analysis, provide an overview of the current situation and factors affecting Vietnam's rice exports.

3.4. Data analysis methods

3.4.1. Software for statistics - STATA

Currently, STATA has widely assisted research fields across various industries, such as economics, sociology, political science, and epidemiology. Acock (2008) stated that STATA was excellent software for analyzing statistical variables. In addition to visualizing graphical statistics, the most outstanding characteristic of STATA is data analysis according to the sample schema using regression tools, which make STATA much more accessible compared to other analytical software, such as E-View or SPSS. While EView has several limitations in analyzing the correlation between variables, SPSS engages obstacles in handling complex variables for estimating and analyzing data in the panel data. Besides, neither EView nor SPSS provides a pleasant user experience in visualizing graphs and user interfaces. Consequently, the authors employed this software version 14.0 to identify the correlation between ASEAN+3 nations and Vietnam in terms of rice export circumstances.

3.4.2. Data analysis

3.4.2.1. Descriptive statistic

Fisher and Marshall (2009) demonstrated that descriptive statistics are the numerical procedures or graphical techniques used to organize, present, and analyze the characteristics of the given statistics. The statistical description focuses on analyzing the central tendency, known as the midpoint of distribution, and the dispersion of variables around the midpoint position.

In detail, economists measured the central tendency of the variables by their mean, median, the minimum and maximum value of variables. Similarly, the dispersion or variance expressed as the sample variance, standard deviation, skewness, and kurtosis. Accordingly, the establishment of the statistical relationship between the two variables is genuinely transparent through statistical data descriptions, which is understandable as the correlation coefficients.

3.4.2.2. Pearson's correlation coefficient

Pearson's correlation coefficient or *Pearson's r* is the first invention of correlational measure, and the current standard method employed to identify the association (Chee, 2015). According to Burn and Grove (2005), *Pearson's r* measures the strength, direction, and the linear association between two interval or ratio variables.

Hence, the examination results of the direction (positive or negative) and the association measures (coefficient of determination) are displayed. In particular, when the absolute value of r is close to 1, these two quantitative variables have a linearly correlated relationship. Conversely, if r is zero, the two variables do not correlate. In this paper, *Pearson's r* has been employed to identify the strength of the relationship among variables affecting the Vietnam rice export's situation to ASEAN+3.

3.4.2.3. Multiple regression model

Regression analysis is a statistical technique for investigating and modeling the relationship between variables (Montgomery et al., 2012). It uses an equation to express the relationship between a variable of interest (the response) and a set of related predictor variables. A regression model that involves more than one regressor variable is called a multiple regression model. In the author's thesis, EXP_{ijt} is the response, while $GDPVN_{it}$, $LANDVN_{it}$, $INFVN_{it}$, $GDIS_{ij}$, $GDPIM_{jt}$; $POPIM_{jt}$, $ERIM_{jt}$ and *WTO* is a set of related predictor variables.

For panel data regression models, three commonly used methods are Pooled Ordinary Least Squares (Pooled OLS), Fixed Effect Model (FEM), and Random Effect Model (REM).

a. Pooled Ordinary Least Squares

Hill et al. (2011) defined that the pooled OLS model is one where the data on different individuals are simply pooled together with no provision for individual differences that might lead to different coefficients. The method of ordinary least squares is attributed to Carl Friedrich Gauss, a German mathematician. Under certain assumptions, the method of least squares has some very attractive statistical properties that have made it one of the most powerful and popular methods of regression analysis. Considering factors in research, Pooled OLS model could be illustrated as:

$$lnEXP_{ijt} = A+\beta_1*lnGDPVN_{it}+\beta_2*lnLANDVN_{it}+ \beta_3*INFVN_{it}+ \beta_4*lnGDIS_{ij}+ \beta_5*lnGDPIM_{jt} + \beta_6*lnPOPIM_{jt}+\beta_7*lnERIM_{jt}+\beta_8*WTO+ u_{ijt} \quad (1)$$

Where:

EXP_{ijt}: Vietnam's total rice export volume to ... importing partners in year *t* (t = 2005, 2006…)

$GDPVN_{it}$: Gross Domestic Product of Vietnam in year *t*

$LANDVN_{it}$: Harvesting area of rice in Vietnam in year *t*

$INFVN_{it}$: Inflation rate of Vietnam in year *t*

$GDIS_{ij}$: the geographical distance between Vietnam and country *j*

$GDPIM_{jt}$: Gross Domestic Product of country *j* in year *t*

$POPIM_{jt}$: Population of country *j* in year *t*

$ERIM_{jt}$: The exchange rate of country *j* in year *t*

WTO: dummy variables

A is a constant $_i$: Vietnam $_j$: importing countries

u_{ijt}: error term $_t$: year analysis

b. Fixed Effects Model (FEM) and Random Effects Model (REM)

The pooled OLS model has some disadvantages such as longitudinal data can make the OLS estimated coefficients inconsistent and inefficient in this thesis. In order to overcome the deficiency encountered in the Pooled OLS model, FEM and REM models are used.

According to Hill et al. (2011), as both the individuals' special characteristics and the time-invariant variables might bias and influence the independent variables, they are assumed to be captured by the intercept. Individual intercepts are included to ''control'' for individual-specific, time-invariant characteristics. A model with these features is called a fixed-effects model (FEM). The intercepts are called fixed effects. Extending the model in (1), the authors wrote the model below:

$$lnEXP_{ijt} = A_k + \beta_1 * lnGDPVN_{it} + \beta_2 * lnLANDVN_{it} + \beta_3 * INFVN_{it} + \beta_4 * lnGDIS_{ij} + \beta_5 * lnGDPIM_{jt} + \beta_6 * lnPOPIM_{jt} + \beta_7 * lnERIM_{jt} + \beta_8 * WTO + u_{ijt}$$

Where: A_k: (k=1...n) intercept term, other components remain the same role.

Similarly, the random effects model (REM) has the same assumption but the individuals in the sample were randomly selected, leading the individual differences as random rather than fixed. A new equation was formed:

$$lnEXP_{ijt} = \bar{A} + \beta_1 * lnGDPVN_{it} + \beta_2 * lnLANDVN_{it} + \beta_3 * INFVN_{it} + \beta_4 * lnGDIS_{ij} + \beta_5 * lnGDPIM_{jt} + \beta_6 * lnPOPIM_{jt} + \beta_7 * lnERIM_{jt} + \beta_8 * WTO + \boldsymbol{\nu}_{ijt}$$

Where:

Ā: intercept term, $\boldsymbol{\nu}_{ijt}$: combined errors ($u_{ijt} + u_k$), other components remain the same role.

Despite the fact that FEM is a decent estimation strategy to assess the effects of independent variables on the dependent variable, FEM cannot estimate the coefficients for factors with a

fixed value over time, for example, the distances among Vietnam and importing countries, which are significant factors in the gravity model of trade. Nevertheless, REM can evaluate the coefficients of the factors which have fixed value overtime yet cannot give great outcomes if the observations selected in the model are heterogeneous. Overall, both methods have pros and cons, therefore, the authors utilize the Hausman test for picking the best ideal technique for the comprehensive perspective on the effects of these key factors.

3.4.2.4. Breusch – Pagan Lagrange test

To determine which is more suitable between REM and Pooled OLS models, the authors have performed the Lagrange Multiplier test. There are also two hypotheses:

- H_0: u_k and independent variables are not correlated
- H_1: u_k and independent variables are correlated

According to the test, H_0 indicates that the variances across entities are zero. In case p-value > 0.05, the authors would accept H_0 and embrace Pooled OLS; otherwise, the REM would be prioritized.

3.4.2.5. Hausman test

Hausman test is to check for any correlation between the error component u_k and the regressors in a REM (Hill at al., 2011). As follow, there are two hypotheses:

- H_0: u_k and independent variables are not correlated
- H_1: u_k and independent variables are correlated

If p-value < 0.05, the authors reject H_0 and choose FEM because u_k and independent variables are correlated. In contrast, if p-value > 0.05, the authors accept H_0, meaning the authors encourage REM and reject FEM.

3.5. Detections for the regression model

Based on the testing results, the authors can choose a suitable model for the research data. However, the selected model is likely to have defects, so some necessary tests need to be carried out to confirm the chosen model is optimal.

3.5.1. Detection for Multicollinearity

Mansfield et al. (1982) demonstrated that multicollinearity might have several adverse effects on estimated coefficients in a multiple regression analysis. In fact, multicollinearity is the phenomenon when there are moderate or high correlations among predictor variables. Also, this phenomenon could emerge among three or considerably more variables. Normally, the VIF test could be applied to ascertain the presence of multicollinearity errors. Specifically, if VIF > 2 has signs of multicollinearity, this is undesirable. If VIF > 10, there must be multiple collinearities. On the contrary, if VIF < 2, there isn't the existence of multicollinearity errors.

To fix the multicollinearity error, there are usually two popular solutions. The first is expelling the independent variable, whose VIF coefficient exceeds the standard value. Second, the researchers can collect more data to increase the sample size. Likewise, the thesis studies with quite a large number of observations (161) in this case, so it is still valuable as a larger sample may make the variance smaller and the estimated coefficient more accurate than small samples.

3.5.2. Detection for Autocorrelation

Autocorrelation can also be known as lagged or serial correlation, as it illustrates the connection of a variable's present value and its past values. In fact, autocorrelation can mess up in conventional analyses (for example, Pooled OLS regression) accepting the independence of observations. To recognize the serial correlation in a panel-data model, Wooldridge (2002) derived a straightforward test. At that point, simulation results showing that the test has excellent size and force properties in reasonably sized samples (Drukker, 2003).

Specifically, there were two hypotheses:

- H_0: There is no autocorrelation
- H_1: There is autocorrelation

With a Prob > F > 0.05, the authors conclude to accept the H_0 hypothesis (this is expected when doing the test). Conversely, the authors reject H_0 and assume that there is an existing autocorrelation.

3.5.3. Detection for Heteroskedasticity

Heteroskedasticity error commonly takes place when the volatility of a variable is not equivalent across the range of values of the variable anticipating it. If they change, the estimated equations will be inaccurate or omit critical, independent variables affecting the dependent variable. When

there is Heteroskedasticity's existence, if the authors still use conventional OLS formulas, the tests can cause false conclusions. The Breusch - Pagan Lagrange based test can be widely deployed in this case to determine whether this error occurs in the model. Specifically, there were two hypotheses:

- H_0: The variance across facts is constant
- H_1: The variance across facts is not constant

If p-value < 0.05, reject H_0. Conversely, if p-value > 0.05, the authors accept H_0 and conclude that the variance is constant (this is the expected result).

To overcome heteroskedasticity error and other errors which might exist in the model, Hoechle (2007) demonstrated Feasible Generalized Least Square (FGLS) estimation is the best method, which is appropriate when the number of time periods is greater than the number of cross-sectional units, T > N. In this thesis, we have researched 11 countries during 15 years; therefore; FGLS is the perfect choice to ensure the effectiveness of the model.

3.6. Ethical considerations and Limitations

3.6.1. Ethical considerations

Apparently, research ethics plays a pivotal role in any research considered as it guides the authors to acceptable behaviors based on a set of moral standards. Saunders et al. (2012) indicated the ethical obligation system concerning the research process. In detail, deception is considered forbidden because it is unethical, and all researchers need to understand that exactness of the data has to be assured, as it is a fundamental principle in social science. Therefore, the authors have put forth an attempt to stick with vital ethical principles throughout the entire study.

Also, the authors consistently have taken crucial ethical issues into account during research periods, especially in references collected and data information. So as to get the best outcomes for the thesis, there is a ton of data and literature reviews from accessible research papers and academic websites. Therefore, the authors not only have made the best effort to check the data validity, reliability, and accuracy but also guaranteed that the gathered information and all the definitions as well as statements applied in this study had all been cited correctly and kept in the reference section, as our sincere respect to these references.

Furthermore, any intentional, biased, and negative assessments are ensured not to include in any specific research outcome. In other words, the authors assure to bring out a fair, objective, reliable, and accurate thesis.

Last but not least, the team has taken full accountability for all the findings and assure that this research will not harm anybody. Hence, with the entirety of the reasons above, the authors have solid confidence in this research's ethical issues.

3.6.2. Limitations of the research project

Regardless of all the author's endeavors, it is unavoidable that there are still some limitations existing in this research. First shortcoming of this study was related to the lack of prior empirical researches on determinants of rice export using the gravity model, which the authors have utilized as our literature in this study. The second obstacle the authors encountered is the time constraint. Regularly, researchers are required to engage with this study for a long time to achieve the best outcome. While this research has finished during the period from May 2020 to August 2020, the four-month period seems to be inadequate for the authors to analyze the issues more profoundly. Finally, the inaccessible data is the ultimate difficulty the authors have confronted. The data in this paper is panel data which is collected from many different nations over many years, from 2005 to 2019. Nevertheless, authors have made incredible attempts to guarantee the model as accurately as possible, resulting in the finished research in the most detailed and comprehensive manner.

3.7. Conclusion

To sum up, this chapter focuses on interpreting specifically about research methods, the model employed, data collection, ethical considerations as well as limitations in this thesis. Additionally, this study also utilized analytical methods like descriptive analysis, Pearson's Correlation Coefficient, and multiple regression analysis to deliver the precise and truthful investigation in the research topic. Then, the regression results, as well as findings are completely clarified in the next chapter.

04

ANALYSES & FINDINGS

Chapter 4 firstly gives an overview of Vietnam's rice export situation in general and Vietnam's rice export situation to ASEAN+3 market in particular from 2005-2019. After that, the data is collected and analyzed by both qualitative and quantitative techniques to find out how given factors influence the revenue of Vietnam's rice export to the ASEAN+3 countries in the period of 2005-2019.

CHAPTER 4: ANALYSIS AND FINDINGS

4.1. Overview of Vietnam's rice exports

Rice and agricultural products are always one of the leading export items in Vietnam. They have contributed a significant portion to Vietnam's total export turnover as well as GDP, making Vietnam to be one of the top world-class rice exporters. To understand the current situation of Vietnam's rice exports, it is necessary to consider some other aspects as follows.

4.1.1. Rice export output

With favorable natural conditions, Vietnamese rice has competitive advantage to be a large rice producer worldwide. According to statistics of the International Rice Research Institute (IRRI) (2019), Vietnam's rice area accounts for 82% of the arable land in Vietnam. In particular, about 52% of rice production is produced in the Mekong Delta and 18% in the Red River Delta.

Although the large area of rice means bringing a potential amount of rice output, most of Vietnam's agricultural exports are in raw or semi-processed forms. Markedly, saline intrusion in the Mekong Delta is at a severe and fierce level in 2020 leading to the shortage of freshwater occurs on a large scale, seriously affecting rice output in particular.

4.1.2. Rice export turnover

Regarding the situation of rice export, this chart below showed the situations of Vietnam's rice export turnover from 2005 to 2019.

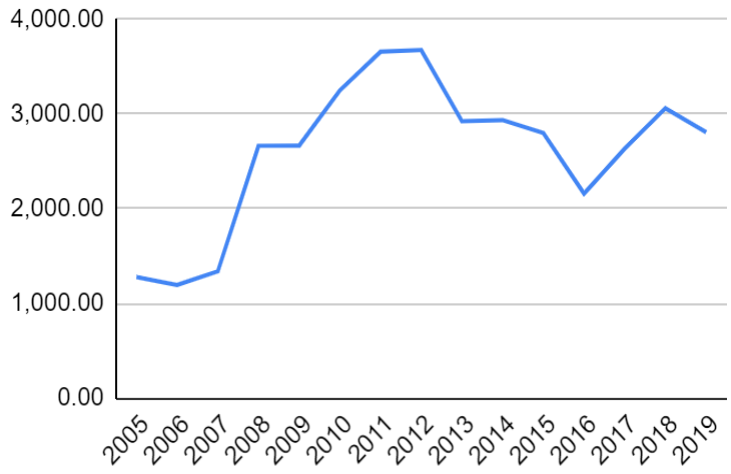

Chart 4.1: Vietnam's rice export turnover, 2005-2019 (Unit: million USD)
(General Department of Customs, 2019)

Viet Nam's annual rice export volume accounts for about 15% of the world's total figure. (Ministry of Industry and Trade, 2019). As we can see from the chart above, the rice turnover fluctuated year by year but overall increased 119.37%, from $1279.27 million in 2005 to $2806.35 million in 2019. In 2012, when the public debt crisis hit Europe and affected globally, Vietnam's rice export activities were also adversely affected with evidence that both production and value of exported rice in 2013 fell sharply compared to 2012. Since the beginning of the year to August 2020, Vietnam has exported nearly 3.9 million tons of rice, equivalent to $1.9 billion. Although the output decreased, its value has increased by nearly 11% over the same period in 2019 (GDC, 2020).

4.1.3. Main markets

Rice is the most important and the most basic food for people, especially in Asia and Africa. According to USDA (2020), the primary rice export market of Vietnam is Asia (66%) and Africa (21%), shown in the chart below.

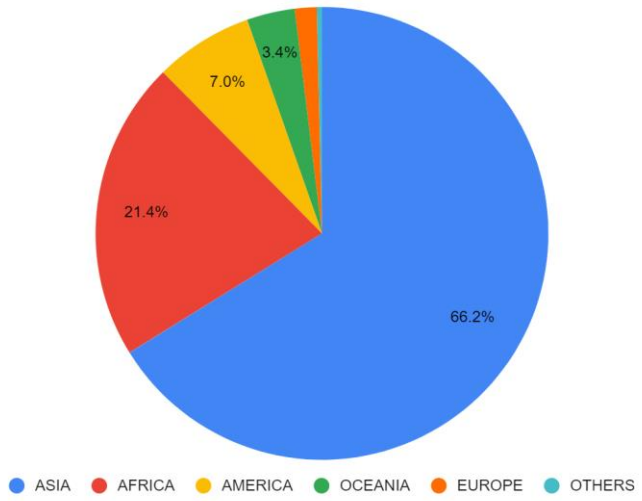

Chart 4.2: Vietnam's Rice Export by Markets in 2019 (USDA, 2020)

4.1.4. Main rivals

In fact, Vietnam today has some formidable competitors in the same segment and the same market such as India, Thailand, Cambodia and Pakistan. Specifically, Thailand has always been a leading competitor of Vietnam's high-quality rice export contracts. Indeed, while Thai rice is famous for high-quality and branded, Indian rice is relatively cheap in large quantities. In 2019, India exported 9.79 million tons of rice, valued at $7.1 billion. Along with cheap rice like India,

a new competitor of Vietnam in recent years is Pakistan which is gradually showing its ability to export rice in the world market with a fairly stable and steady increase in market share in recent years. Strikingly, Covid-19 pandemic in 2020 has caused countries like India to restrict exports, rice from Thailand was also in shortage, and sources of Cambodia and Myanmar are mostly low-yield rice. Only Vietnam has not only rice to ensure national food security but also surplus to export. Overall, these countries are still obstacles that Vietnam needs to find ways to overcome in order to improve the quantity and value of rice exports.

4.2. Overview of ASEAN+3 countries

4.2.1. Introduction of ASEAN+3 countries

ASEAN, in addition to 10 official members, including Vietnam, Thailand, Malaysia, Indonesia, Philippines, Singapore, Myanmar, Laos, Cambodia, Brunei, also has an exclusive cooperation mechanism called ASEAN Plus Three (APT) with 3 countries: China, South Korea, and Japan. In 2000, at the Singapore Summit, ASEAN+3 was officially launched. After 20 years of establishment, APT cooperation has broadened and deepened to cover a wide range of areas of political and security, economic and finance, and socio-culture. Many Agreements and Initiatives have been negotiated, signed, and implemented between country members such as ASEAN Economic Community (AEC), ASEAN Trade in Goods Agreement (ATIGA) and the like. Besides, ASEAN's economic and trade relations with China, South Korea, and Japan have also developed rapidly through the signing of trade agreements such as the ASEAN-China Free Trade Area (ACFTA), ASEAN-Korea Free Trade Agreement (AKFTA), ASEAN-Japan Comprehensive Economic Partnership (AJCEP).

Since ASEAN+3 was officially adopted, member countries' trade situation has gained many positive signals. ASEAN (2020) stated that trade between ASEAN and the Plus Three countries in 2018 increased by 6.8 percent to $869.1 billion or 31.0 percent of ASEAN’s total merchandise trade. Joining trade agreements is a passport of Vietnam to ASEAN+3 countries, gives Vietnam commodities more opportunities to export to different markets. It also brings the participating countries to have more conditions for commercial development.

4.2.2. The situation of Vietnam's rice export to ASEAN+3 from 2005 to 2019

For many years, the ASEAN+3 market has always been the leading and most extensive market of Vietnam's rice exports. According to statistics from World Bank (2020), Vietnam's Trade

Intensity Index (TII Index) for the ASEAN+3 market is 14.27 on average during the research time, which is 14 times larger than the average export level of the whole world. It means that Vietnam's exports are intense with this market, of which rice export is one of the key commodities. Specifically, Vietnam's rice export turnover from 2005 to 2019 was shown in the chart below:

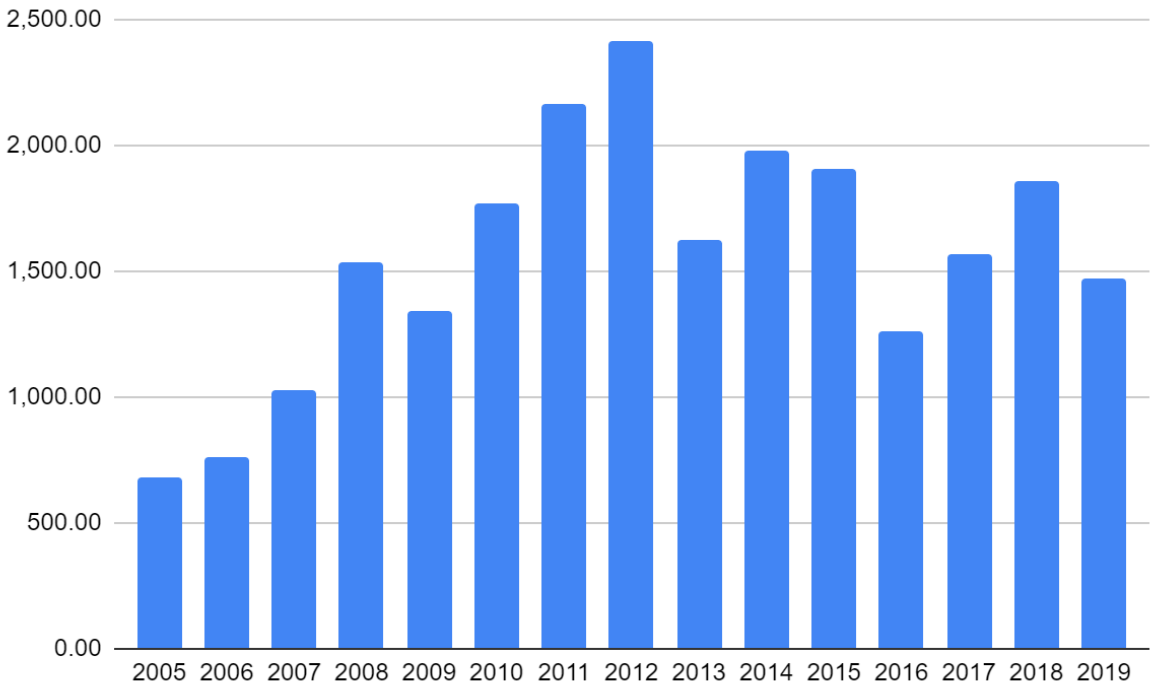

Chart 4.3: Vietnam's Rice Export Turnover to the ASEAN+3 countries from 2005 to 2019 (Unit: million USD) (UN Comtrade, 2020)

In the 2005-2019 period, Vietnam's rice export turnover to the ASEAN+3 market generally increased but fluctuated sharply year by year. The total rice export turnover averaged $1,558 million from 2005 to 2019, of which 2012 saw the highest export value of $2,418 million, while in 2005, it was only $683 million. This fluctuation came from many circumstances: the global debt crisis in 2012, the increase in the conditions of quarantine of importing countries, or the stiff competition from the rivals.

Regarding the main rice importing countries of Vietnam in the ASEAN+3 market, Philippines ranked first with 35.9% of the market share, followed by China (28.1%), Indonesia (14.6%) and Malaysia (13.8%) (General Department of Customs, 2019).

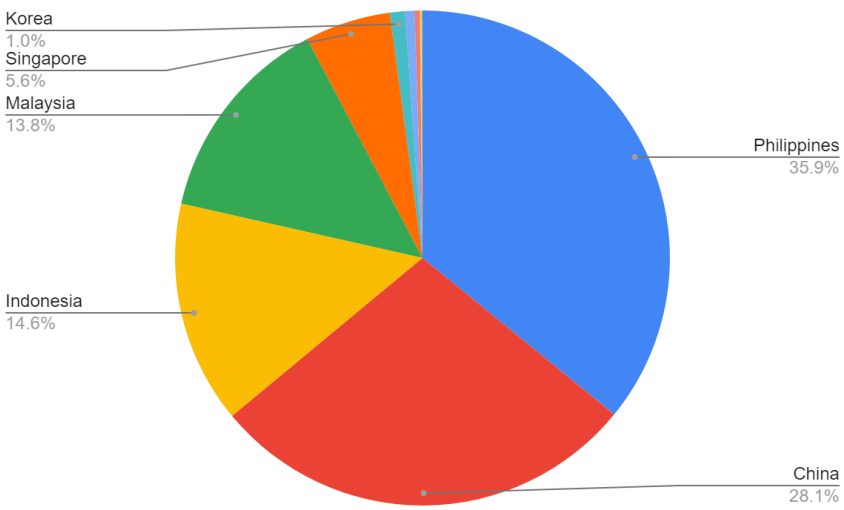

Chart 4.4: The market share of ASEAN+3 countries to import rice of Vietnam (General Department of Customs, 2019)

4.3. Analysis of factors influencing rice exports

4.3.1. Quantitative

Based on the theoretical model of quantifying influences proposed in Chapter 2, the current estimation model is as follows:

$$lnEXP_{ijt} = A+\beta_1*lnGDPVN_{it}+\beta_2*lnLANDVN_{it}+ \beta_3*INFVN_{it}+ \beta_4*lnGDIS_{ij}+ \beta_5*lnGDPIM_{jt} + \beta_6*lnPOPIM_{jt}+\beta_7*lnERIM_{jt}+\beta_8*WTO+ u_{ijt}$$

4.3.1.1. Descriptive statistics

Before elucidating the influence of the factors, the authors have made a preliminary assessment of each independent variable's fluctuation through descriptive statistics via the table below:

Variable	Obs	Mean	Std. Dev	Min	Max
lnEXP	161	15.95	3.43	6.497	20.89
lnGDPVN	165	25.66	0.47	24.78	26.29
lnLANDVN	165	8.93	0.03	8.87	8.97
INFVN	165	7.65	5.86	0.63	23.12
lnGDIS	165	7.48	0.56	6.18	8.21
lnGDPIM	165	26.27	2.22	21.73	30.29

lnPOPIM	165	17.35	2.09	12.81	21.05
lnERIM	165	4.5	3.28	0.22	9.56
WTO	165	0.95	0.22	0	1

Table 4.1: Descriptive statistics (Stata 14.0 results, 2020)

The table above illustrates the result of 165 observations in 11 ASEAN+3 countries from 2005 to 2019 excluding the EXP variable with 161 observations due to inaccessible data. In fact, the authors rely on not only transformed data (ln) but also the actual data to analyze each variable comprehensively.

Regarding standard deviation, five variables including lnEXP, INFVN, lnGDPIM, lnPOPIM, lnERIM have high standard deviations which are 3.43, 5.86, 2.22, 2.09, 3.28, respectively. This result implies that these variables are highly volatile. In contrast, the variable lnLANDVN has the lowest standard deviation of 0.03, which displays that Vietnam's rice area is less unstable compared to other dependent variables. The rest of variables have relatively low figures standing for the low volatility.

To begin with, Vietnam's total value of rice export (EXP) has 161 observed variables. The Philippines, China, Indonesia, and Malaysia are the four countries with the most substantial average import value of Vietnamese rice during the study period, of which the largest one is the Philippines' value in 2008 with nearly $1.18 billion (ln~20.89). In contrast, Laos, Cambodia, and Thailand are the three countries with the lowest average rice export turnover, of which the rice export turnover to Laos in 2017 was only $633 (ln~6.497). This outcome is understandable as these three nations are also the three major rice producers and exporters in the ASEAN and worldwide.

Second is the GDPVN as a catalyst for Vietnam's economy. In 15 years, this value increased rapidly and continuously. Primarily, the value in 2019 increased by 4.5 times compared to 2005, from over $57 billion to nearly $262 billion (ln~26.29). Along with the average annual GDP growth rate of 6.4% (World Bank, 2020), these data have shown Vietnam's prosperity and stability in the research time.

Thirdly, LANDVN fluctuated over 15 years, but the difference is not significant. In particular, in 2005, Vietnam had a total of 7,329.2 thousand hectares for rice cultivation, but two years

later, it was only 7,207.7 thousand hectares (ln~8.87). Due to the process of industrialization and modernization of the country, the area of rice cultivation had become smaller and smaller to devote to industrial and urban infrastructure, which could directly threaten not only rice export turnover but also national food security. Therefore, in the following years, the government has taken adequate measures to increase the harvesting area. As a result, this figure grew gradually and marked the highest in 2013 with 7,902.5 thousand hectares (ln~8.97). However, it has witnessed a gradual decrease in recent years.

Fourthly, INFVN changed quite sharply throughout the study period. Particularly, the ratio peaked at 23.12% in 2008 due to the impact of the world economic crisis. Thanks to the government's great efforts, it has been controlled successfully below 5% per year in the following years. Notably, the lowest is 0.63 in 2015.

The fifth is GDIS, among 11 countries, four countries are far away from Vietnam less than 2025 km (ln~7.48), accounting for 36.36%. In this case, the shortest distance belongs to Laos, with only 481 km (ln~6.18). Conversely, the remaining seven countries are over 2025 km from Vietnam. The furthest country is Japan, with about 3668 km (ln~8.21).

Sixthly, regarding the GDPIM, there was an upward trend from 2005 to 2019. In detail, there are three countries with average GDP below $100 billion, accounting for 27.3%. Laos is the country with the lowest GDP, with a value in 2005 of just over $2.7 billion. Meanwhile, the remaining eight countries all have a high average GDP. China has the highest GDP, especially in 2019, with over $14 thousand billion. To sum up, this result shows that most importers in ASEAN+3 are relatively developed countries with a considerable economic scale.

Seventhly, in 165 observations of POPIM, only three countries with average population over 15 years are more significant than 100 million, namely Japan, Indonesia, and China. In particular, China's population in 2019 was nearly 1.4 billion, more than 3200 times the population of Brunei in 2019, and more than 3800 times the figure in 2005 (the smallest of 165 observations in this variable). Therefore, it is evident that most nations in ASEAN+3 have small and medium populations.

Eighthly, in terms of ERIM, the mean of this variable is 4.5, which is equivalent to the actual value of approximately 2,279. Specifically, there are three importers with an LCU/$exchange rate higher than this value accounting for 27.27%, namely Laos, Indonesia, Cambodia.

Nevertheless, Brunei had the lowest average exchange rate at 1.25 in 2005, which was 11,000 times smaller than that of Indonesia, with 1 $equivalent to nearly 14,237 IDR (Indonesia Rupiahs).

Last but not least, with 165 observations of the dummy variable WTO in ASEAN+3, it is apparent that most countries joined the WTO before 2005 and received a value of 1. However, Laos only joined this organization on February 2, 2013, so it received a value of 0 from 2005 to 2012.

4.3.1.2. Pearson's Correlation Coefficient

As mentioned in chapter 3, the strength, direction, and the linear association between two interval or ratio variables are scrutinized carefully through Pearson test as below:

(obs=165)

	GDPVN	LANDVN	INFVN	GDIS	POPIM	ERIM	GDPIM	WTO
GDPVN	1.0000							
LANDVN	0.7166	1.0000						
INFVN	-0.4678	-0.3134	1.0000					
GDIS	-0.0000	-0.0000	0.0000	1.0000				
POPIM	0.0229	0.0155	-0.0121	0.3352	1.0000			
ERIM	-0.0027	-0.0083	-0.0079	-0.3084	0.2130	1.0000		
GDPIM	0.1445	0.1089	-0.0561	0.7051	0.7937	-0.1748	1.0000	
WTO	0.1762	0.1366	-0.1433	0.5254	0.1873	-0.3169	0.3923	1.0000

Figure 4.1: Pearson's Correlation Coefficient (Stata 14 results, 2020)

Overall, it can be seen that most of the variables show a little or low correlation with each other. In this case, all correlation coefficients are under 0.8. Specifically, the strongest correlation is between lnGDPIM and lnPOPIM, as higher POPIM might act as a proxy of higher GDPIM. Likewise, the positive correlation between lnGDPVN and lnLANDVN is also high. It is understandable as the area of rice land is directly related to agricultural production, leading to a high correlation with GDP. In general, the correlation in the figure among variables exhibits that none of the pairwise correlations is high enough to lead to the multicollinearity issue.

4.3.1.3. Multiple regression analysis

Thanks to Stata 14.0 software, the authors use three regression models, pooled OLS, FEM, REM, to analyze eight independent variables. However, it is challenging to choose the optimal model when only relying on these outcomes. Therefore, the authors conduct the necessary tests (presented in chapter 3) to choose the most appropriate model.

a. Breusch-Pagan Lagrange Test

After utilizing Pooled OLS model (included in Appendix 2) and REM, the authors have performed the Lagrange Multiplier test to determine which is more suitable between them in this case. In detail, the null hypothesis indicates the variances across entities. The rejection of the null hypothesis reveals that the authors should go for REM as a more efficient model. In contrast, the Pooled OLS should be prioritized. The below figure implies a result with p-value < 0.05 leading to a rejection of the null hypothesis. Hence, it is undeniable that the more appropriate model in scrutinizing the data in this thesis is REM.

```
Breusch and Pagan Lagrangian multiplier test for random effects

        EXP[COUNTRY,t] = Xb + u[COUNTRY] + e[COUNTRY,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+------------------------------
                     EXP |   11.77944       3.432119
                       e |   3.096903       1.759802
                       u |    .255373       .5053444

        Test:   Var(u) = 0
                                 chibar2(01) =   178.73
                              Prob > chibar2 =   0.0000
```

Figure 4.2: Breusch-Pagan Lagrange Test (Stata 14.0 results, 2020)

b. Hausman Test

Next, the authors have utilized FEM (included in Appendix 3) and then employed the Hausman test, an accredited method to select the more optimal model between FEM and REM. In this test, the null hypothesis supposes that individual export turnover error components and independent variables are not correlated. The rejection of the null hypothesis indicates that the FEM is a more advisable one and vice versa.

```
                 ---- Coefficients ----
                    (b)          (B)            (b-B)     sqrt(diag(V_b-V_B))
                     fe           re         Difference          S.E.
------------------------------------------------------------------------------
       GDPVN    -.0666345     1.571382       -1.638017        .5199608
      LANDVN     10.67264     14.42744       -3.754801               .
       INFVN    -.0109567      .010626       -.0215827               .
       POPIM    -7.822295     1.413742       -9.236036        5.243503
        ERIM     .7843703    -.5643023        1.348673         1.71692
       GDPIM     2.463557    -1.306317        3.769874        .8121106
         WTO    -2.912415    -2.937295        .0248801               .
------------------------------------------------------------------------------
                           b = consistent under Ho and Ha; obtained from xtreg
        B = inconsistent under Ha, efficient under Ho; obtained from xtreg

    Test:  Ho:  difference in coefficients not systematic

                  chi2(7) = (b-B)'[(V_b-V_B)^(-1)](b-B)
                          =       10.17
                Prob>chi2 =      0.1793
                (V_b-V_B is not positive definite)
```

Figure 4.3: Hausman Test (Stata 14.0 results, 2020)

In the above figure, the outcome of this test shows the p-value of 0.1793, higher than 5%. As a result, the authors reject FEM and encourage REM in analyzing the data in this thesis.

c. REM analysis

In general, after conducting the two above tests, it is undoubted that REM should be utilized. The result of this model is shown in the figure below:

```
Random-effects GLS regression                   Number of obs     =       161
Group variable: COUNTRY                         Number of groups  =        11

R-sq:                                           Obs per group:
     within  = 0.0729                                         min =        13
     between = 0.6321                                         avg =      14.6
     overall = 0.4645                                         max =        15

                                                Wald chi2(8)      =     83.49
corr(u_i, X)   = 0 (assumed)                    Prob > chi2       =    0.0000
```

EXP	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
GDPVN	1.571382	.6164949	2.55	0.011	.3630744	2.77969
LANDVN	14.42744	9.174967	1.57	0.116	-3.555165	32.41004
INFVN	.010626	.0339942	0.31	0.755	-.0560013	.0772533
GDIS	4.039121	.7956038	5.08	0.000	2.479766	5.598476
POPIM	1.413742	.2923436	4.84	0.000	.8407587	1.986724
ERIM	-.5643023	.1004399	-5.62	0.000	-.7611609	-.3674437
GDPIM	-1.306317	.3460066	-3.78	0.000	-1.984477	-.6281562
WTO	-2.937295	1.084941	-2.71	0.007	-5.06374	-.8108503
_cons	-168.4748	73.4661	-2.29	0.022	-312.4657	-24.48391
sigma_u	.5053444					
sigma_e	1.759802					
rho	.07617898	(fraction of variance due to u_i)				

Figure 4.4: Random effect model (Stata 14.0 results, 2020)

It is visible that there are 161 observations in this model, including both the selected dependent variable and independent variables. Notably, the value of R-squared overall is 0.4645, which reveals 46.45% explanatory of the independent variables over the dependent variable.

4.3.1.4. Detection for REM

The selected model is likely to have defects including multicollinearity, autocorrelation and heteroskedasticity. Therefore, three tests below should be scrutinized to confirm that the chosen model is optimal.

a. Multicollinearity

Multicollinearity is the phenomenon when there are moderate or high correlations among predictor variables. Although the correlation matrix has already been utilized to ascertain the

existence of multicollinearity in this thesis, the authors continue to employ the VIF to detect the possible linear correspondence amongst independent variables.

Variable	VIF	1/VIF
GDPIM	9.42	0.106135
POPIM	5.79	0.172821
GDIS	3.46	0.288881
GDPVN	2.54	0.393900
LANDVN	2.04	0.491227
ERIM	1.70	0.587157
WTO	1.56	0.640019
INFVN	1.31	0.765723
Mean VIF	3.48	

Figure 4.5: Test for Multicollinearity (Stata 14.0 results, 2020)

Based on the figure above, all values still are all under 10.0, in which the highest VIF belongs to the lnGDPIM with a value of 9.42. Hence, it is considered that there is a sign of multicollinearity error in this model.

b. Autocorrelation

Autocorrelation can also be known as lagged or serial correlation, as it illustrates the connection of a variable's present value and its past values. In accordance with the result from the Wooldridge test below, it is witnessed that the null hypothesis is rejected with the p-value of 0.069. Consequently, the model is considered as not suffering from autocorrelation error.

```
Wooldridge test for autocorrelation in panel data
H0: no first order autocorrelation
    F(  1,      10) =      4.131
           Prob > F =      0.0695
```

Figure 4.6: Test for Autocorrelation (Stata 14.0 results, 2020)

c. Heteroskedasticity

Heteroskedasticity error commonly occurs when the volatility of a variable is not equivalent across the range of values of the variable anticipating it. In this thesis, the Breusch - Pagan Lagrange is employed to detect this error. With p-value < 0.05 as below, it is undeniable that heteroskedasticity is encountered in this model.

```
Breusch and Pagan Lagrangian multiplier test for random effects

        EXP[COUNTRY,t] = Xb + u[COUNTRY] + e[COUNTRY,t]

        Estimated results:
                         |       Var     sd = sqrt(Var)
                ---------+-----------------------------
                     EXP |    11.77944       3.432119
                       e |    3.096903       1.759802
                       u |     .255373       .5053444

        Test:   Var(u) = 0
                                 chibar2(01) =   178.73
                              Prob > chibar2 =   0.0000
```

Figure 4.7: Test for Heteroskedasticity (Stata 14.0 results, 2020)

4.3.1.5. The final model

a. Feasible Generalized Least Squares model

Finally, in order to control the possible existing errors in the model, the Feasible Generalized Least Squares (FGLS) model is utilized after choosing REM to examine the data of 161 observations, with a strong assumption that the model for within-cluster error correlation is correctly specified as following:

```
Cross-sectional time-series FGLS regression

Coefficients:  generalized least squares
Panels:        heteroskedastic
Correlation:   no autocorrelation

Estimated covariances      =        11          Number of obs     =        161
Estimated autocorrelations =         0          Number of groups  =         11
Estimated coefficients     =         9          Obs per group:
                                                            min =         13
                                                            avg =   14.63636
                                                            max =         15
                                                Wald chi2(8)      =     191.63
                                                Prob > chi2       =     0.0000

------------------------------------------------------------------------------
         EXP |      Coef.   Std. Err.      z    P>|z|     [95% Conf. Interval]
-------------+----------------------------------------------------------------
       GDPVN |    1.746459   .5630554     3.10   0.002     .6428909    2.850027
     LANDVN |    16.24153   8.574869     1.89   0.058      -.56491    33.04796
      INFVN |    .0077231   .0315482     0.24   0.807    -.0541102    .0695565
       GDIS |    5.429039   .5984938     9.07   0.000     4.256013    6.602065
      POPIM |    1.727149   .2082355     8.29   0.000     1.319015    2.135283
       ERIM |   -.6013675   .0663877    -9.06   0.000     -.731485   -.4712501
      GDPIM |   -1.655405   .2601564    -6.36   0.000    -2.165302   -1.145508
        WTO |   -4.862535    1.27322    -3.82   0.000       -7.358    -2.36707
      _cons |   -193.5071   68.50625    -2.82   0.005    -327.7769   -59.23732
------------------------------------------------------------------------------
```

Figure 4.8: Feasible Generalized Least Squares model (Stata 14.0 results, 2020)

b. Final results and Discussion

Overall, the authors conclude that the final regression model result as below:

$$lnEXP_{ijt} = -193.51 + 1.746*lnGDPVN_{it} + 16.241*lnLANDVN_{it} + 5.429*lnGDIS_{ij} - 1.655*lnGDPIM_{jt} + 1.727*lnPOPIM_{jt} - 0.601*lnERIM_{jt} - 4.863*WTO$$

In details:

GDPVN (+)

Regarding the variable GDPVN, coefficient 1.746 bears a positive sign as expected, showing the positive correlation between GDPVN and Vietnam's rice exports. Specifically, when Vietnam's GDP increased by 1%, the export turnover increased by about 1.746%. Indeed, it is entirely consistent with both given hypothesis and practice as GDP of the exporting country represents the size of the economy, thus showing the supply of goods. In other words, when the GDP of an exporter goes up, the supply of goods and services increases with more export opportunities. Besides, the uptrend in GDP means that Vietnam has conditions to invest more capital in seeds, techniques, and technologies to contribute to improving export turnover. This result is consistent with most previous studies such as Eita (2008), Zarenejad (2012), Khan et al. (2013), Weckström (2013), Elshehawy et al. (2014).

LANDVN (+)

As expected, the harvesting rice area is positively correlated with the export turnover with a significant level at 10% (0.0058). In particular, when the rice area decreased by 1%, the export turnover also decreased by 16.24% - a relatively high number. It is understandable as the harvesting area of rice is directly related to rice production. When the rice output is abundant, enterprises will be more convenient and proactive to export rice. This outcome is the same as some prior studies such as My (2016), Yen and Thao (2017). However, rice land in some localities is still small and not concentrated, making the harvesting process difficult and causing special effects on rice quality. Furthermore, the area under rice cultivation is inefficient causing rice to be replaced with other items such as maize, cassava and others. Specifically, rice production may be affected by saline intrusion, and flooding when most of the agricultural area is located in two lowland plains of only 2m above sea level (World Bank, 2016). Those problems will directly affect the rice export turnover of Viet Nam without appropriate measures.

GDIS (+)

Unpredictably, the regression results demonstrate that the distance variable has a positive association with the dependent variable: when the gap increases by 1%, the export value increases by 5.429% - this direction is different with the expectation. However, it can be understood in the case of ASEAN+3 market. Although the Philippines, Indonesia, Malaysia, and Japan are countries quite far from Vietnam, these nations do not have irrigation systems large enough to meet production. Thus, rice cannot be produced at a reasonable cost. Besides, every year these countries often suffer from severe consequences due to natural disasters resulting in obstacles to produce rice efficiently. In contrast, countries such as Thailand, Cambodia, and Laos, which are quite close to Vietnam and have similar natural conditions to Vietnam, are favorable for rice cultivation. Therefore, Vietnam's rice export turnover to these nations is relatively small. To conclude, this positive relationship is consistent with the previous research of Yen and Thao (2017) in analyzing the determinants of rice exportation from Vietnam into ASEAN markets.

GDPIM (-)

The outcome reveals that the nexus between GDPIM and rice export turnover is negative. When GDPIM increases by 1%, exports decrease by 1.655% - the opposite effect is uncontradictory to the study's expectation as well as logical in reality. According to the Vietnam Development Report 2016 (World Bank, 2016), rice consumption is declining among the urban population and higher-income groups in East and Southeast Asia as a whole. Indeed, most countries in ASEAN+3 have a high GDP as analyzed in descriptive statistics. When countries are developed, citizens tend to reduce the amount of rice consumed, at the same time, demand higher quality of the rice used. Therefore, GDPIM gets higher which can trigger a higher demand for high-qualified rice. In fact, Vietnam is still mainly exporting raw rice with medium-low quality and not various species. Consequently, it might lead to a decrease in export turnover. This inverse relationship is similar to previous studies such as Yang and Martínez (2014), My (2016).

POPIM (+)

It can be seen that the POPIM variable is positively associated with the dependent variable (the total rice export value of Vietnam) with a coefficient of 1.727. This can be explained as the larger importer population exhibits the import volume of the country and the demand for rice, thereby increasing the export turnover to partner countries in ASEAN+3. This result not only

asserts the hypothesis to be accurate but also shows conformity with the results of Bui and Chen (2017).

ERIM (-)

The exchange rate factor has a strong inverse effect on the dependent variable with the correlation coefficient of -0.601 and at a level of significance of 1%. This outcome is suitable for the given hypothesis, as well as economic theories. In fact, ASEAN+3 countries still use USD to import rice. Therefore, on the one hand, changing the exchange rate of the local currency with the US dollar is considered an export risk. Exporters will be wary of exporting goods abroad if the exchange rate between VND is not stable. On the other hand, when the higher real exchange rate might lead to a higher price of rice imported from Vietnam, making rice export price at that time was higher than before. For example, importing countries now need more local currencies to buy 1 ton of rice now. In short, if this exchange rate falls, the prices of rice export reduce too, which leads to the rise of demand and vice versa. Furthermore, there are still some problems leading to negative impacts on rice export value, such as the operating mechanism of the fixed exchange rate in USD, the narrow fluctuation range, and the undeveloped derivatives market in Vietnam. This result is consistent with the results of Bui and Chen (2017).

WTO (-)

The coefficient for WTO is not found to be positive as expected. In fact, this variable performs a negative correlation with rice export turnover during the study period contrasting to the aim of the organization. However, it could be acceptable in Vietnam’s rice commodities indeed. WTO members all give each other preferential treatment under the principle of "Most favored nation" (MFN). Therefore, when the countries in ASEAN+3 are members of the WTO, the import of Vietnam's rice or other rivals such as Thailand, Cambodia, and the like is generally equally favorable. As a result, Vietnam faces more fierce competition from these countries. In addition, rice quality reduces Vietnam's competitive advantage compared to other rivals as mentioned above. This inverse association is inconsistent with the empirical study of My (2016), which could be explained by the difference in the research scope of the two pieces of research. To sum up, Vietnam's rice export impact has many determinants, which can be positive or adverse effects. The results of the above quantitative analysis are relatively consistent with theory and practice in Vietnam during the study period.

4.3.2. Qualitative

Along with the above quantitative determinations, six qualitative factors, which are government policies; quality and price of exported rice; quality of labor resources; technology; infrastructure; tariff and non-tariff factors from importing countries, are scrutinized below to bring a more comprehensive and in-depth assessment in this thesis.

4.3.2.1. Government policies

a. Policy on conditions for rice exporting enterprise

First and foremost, the Government's policy on setting necessary conditions for rice exporting enterprises - a decisive factor in the volume of exported rice. To enhance the competitiveness of Vietnamese rice exporters in comparison to foreign competitors, Decree No. 109/2010/ND-CP was issued in November 2010 and regulated in which companies are allowed to export rice, depending on the warehouse and milling capacity requirements. It requires that traders have at least one specialized storage and one grinding rice factory following standards issued by the Ministry of Agriculture and rural development. At the same time, it must be located in the centrally-run cities where there exist international seaports. Consequently, many businesses have to leave this "play" because they cannot meet the conditions. Besides, it requires an exporting company to stockpile at least 10 percent of the volume of rice it has exported in the previous six months. This policy ensures that the Government will have enough stock to use in emergencies such as domestic natural disasters. However, implementing this policy often depletes the resources of rice-trading companies since rice stockpiling requires warehouses equipped to maintain the quality of stock, thus requires firms to have the financial capacity.

Due to inadequacies in Decree 109, the revised Decree 107/2018/ND-CP was issued in August 2018 to solve problems and reduce the bottleneck for exported rice companies. In particular, businesses now can rent rice milling plants and warehouses and are not required to own these facilities as they were under the old decree. That helps enterprises save resources and take advantage of the surplus facilities of other companies. The decree also reduced the stockpile requirement for rice exporters from 10 percent to 5 percent of export rice in the previous six months.

In short, Decree 107 has loosened, created more favorable conditions, but has not changed management thoughts to completely "untie" for rice exports. However, that may be acceptable due to the aim of ensuring food security and enhancing Vietnam's rice export competitiveness.

b. Policy on rice export quota

Similar to many other developing countries, Vietnam stands the policy dilemma of seeking to achieve food security for its population while also raising foreign exchange earnings by encouraging the export of food and agricultural products. Rice is at the crux of this dilemma for Vietnam since it is both the dominant staple food (accounting for ¾ of the caloric intake of the average Vietnamese household) and the second or third largest foreign exchange earning sector of the country. Thus, in the past, to ensure domestic consumptions and maintain stable rice prices, Vietnam's rice export volume was strictly controlled by export quotas, which have been allocated to two regionals: state-owned trading enterprises and some provincial enterprises. Take the world food price crisis in 2008 as an example, the price of rice reached a peak with 5% broken rice of Thailand at $1,090/ton and similar Vietnamese rice of $1,050/ton, three times higher than in 2007. There was a rice price spike due to export restrictions of major rice exporters such as India and Vietnam, and the panic purchase of significant importers such as the Philippines. In such a circumstance, the Indian Government decided to ban the exports of rice, resulting in a decrease in rice exports by 27% compared with that in 2007. Similarly, the Prime Minister in Vietnam had stopped signing new rice export contracts for three months which resulted in lowering rice export volumes to 2.5 - 4.0 million tons in 2008. In contrast, Thailand, another significant rice exporter, continuously exported with the condition that the partner had to pay half of the liquidation. At the end of 2008, when the main winter crop was harvested, the price of rice slipped consecutively to below $500/ton until 2009. The application of quota may be a reasonable tool, but to some extent, it hinders the development of export rice production. In particular, while the amount of rice in the country is abundant, the quota for rice export enterprises has not been established timely. That leads to missing export opportunities with high profits when world rice prices rise and fluctuate rapidly. Vietnam no longer applied quotas until April 2020, an outbreak of the COVID-19 pandemic occurred. To avoid missing opportunities as in 2008, the Prime Minister and the Government flexibly managed when directing strict rice export management and adopting a temporary rice export quota of 400,000 tons in April to make sure of food security amid the pandemic, according to the Decision No.1106/QD-BCT in April

2020. Then they agreed to resume the rice export in May because the epidemic had been put under control while the domestic supply increased. Thanks to the quota removal in May, Vietnam's rice exports increased by 11.8%, or 3.06 million tons in the first five months this year. Total revenues rose by 25.44% to US$1.48 billion, according to The Agricultural Product Processing and Market Development Department.

c. Policy on rice export tariff

Besides the quota policy, the Vietnamese Government also imposed tariffs on rice export (from 21 July 2008 to 19 December 2008). It is a measure to regulate the difference between export prices and domestic market prices to stabilize domestic rice prices. The Government may take some benefit through tariffs on the export enterprise to subsidize rice farmers. Despite that, the flip side of tariffs is to cause distortion and increase transactions in black markets. Both those sides can be clearly seen in rice export tariffs in 2008 when the global rice prices were a lot of volatile. Specifically, the starting point of tariffs applied to shipments valued $600/ton. The absolute rate will increase progressively with the increase in the export price of rice. The highest tariff-rate used for purchases valued exceeds $1300/ton. Specific tariffs in Article 1 of Decision No. 104/2008/QD-TTg on July 21, 2008 are shown in Table 4.3.1.

Level	FOB price range (USD/ton)	Tariffs (Thousand VND/ton)	Tariffs (USD/ton)
1	600-700	500	26.4
2	700-800	600	31.7
3	800-900	800	42.3
4	900-1000	1200	63.4
5	1000-1100	1500	79.3
6	1100-1200	1900	100.4
7	1200-1300	2300	121.6
8	More than 1300	2900	153.3

Table 4.2: Tariff on export rice 2008

(Decision 104/2008/QD-TTg)

Once Decision 104 was issued, one of the negative impacts was that rice traders maintain a lower price to avoid export tariffs. The pressure from traders forced farmers to sell at a lower price than it would be, and thus, the Government did not earn revenue through tariffs. As a result, on December 19, 2008, the Ministry of Industry and Trade has officially announced to stop applying tariffs on export rice.

In short, although the imposition of a rice export tariff may help increase revenues and reduce the Government budget deficit, it does not encourage businesses to produce and export rice, which affects Vietnam's total rice export volume. It is difficult for enterprises to decide to sign high-quality rice supply contracts with high prices. The reason is that the profits earned after-tariff deduction are not significant or even suffer losses due to the raw materials, input costs of rice production increased. Not only that, but the progressive rates on export prices also make the tariff-rate higher with the export rice kind of good quality and high cost. Thus, the rice export enterprises would miss the opportunity to penetrate fastidious top value-added markets, lose customers, and brand imprints in the formative stage. Since 2008, the Government has abolished tariffs on rice exports. Even so, in the future, it can be applied when markets fluctuate or due to disease.

d. Policy on supporting to maintain and develop paddy land

The harvesting area of rice plays a vital role in a country's agricultural production as mentioned above in quantitative analysis. Thanks to the fertile alluvial soil in the areas along the Red River, Mekong River, and the plains on the Central Coast, Vietnam has become one of the top five rice exporting economies in the world.

To support farmers to maintain and develop paddy land for rice production, the Government supports paddy farmers 500,000VND/ha/year for area specializing in paddy production and 100,000 VND/ha/year for another paddy land, according to the Decree No. 42/2012/ND-CP on 11th May 2012. However, during the implementation of Decree No. 42/2012/ND-CP, it is challenging to identify upland rice areas in land use planning. Moreover, in many households with a small farming area, the amount of support is not sufficient for reproduction, so the income of paddy farmers has not improved significantly. As a result, several farmers have switched to other crops or non-farm activities.

On 13th April 2015, the Government issued Decree No. 35/2015/ND-CP, replacing the above Decree and takes effect from 1st July 2015. Some new points are that the support policy increases to VND 1,000,000/ha/year for land specializing in paddy production, 500,000 VND/ha/year for another paddy land; supports agricultural supplies (from 50% -70% of the cost of fertilizers and plant protection drugs). Besides, this policy has supported not only 70% of reclamation costs but also new rice categories. However, Vietnam's rice cultivation area has

been decreasing year by year which was analyzed above in the LANDVN variable part. It means that the land support policy has not been effective in maintaining and developing rice cultivation land.

e. Policy on credit supporting for rice producers

Producing and exporting rice requires a huge source of capital. In the past, the ability to access bank loans for export enterprises and farmers was pretty limited due to high-interest rates in Vietnam, the lending mechanism was still inadequate. Thus, in recent years, the Government and the State Bank have issued many credit policies for agricultural and rural development such as: subsidizing interest rates for rice export enterprises, providing capital support for farmers and lending to reduce post-harvest losses. Notably, in 2017, the State Bank of Vietnam launched a credit program that amounted to VND 100 trillion (around USD 4.2 billion) to support high-tech and clean agriculture. These credits are distributed by eight commercial banks to lend at interest rates that are 0.5 to 1.5 percent lower than the market rates to high-tech agricultural enterprises, according to Decision no. 813/QD-NHHH on 24/4/2017 of the State Bank of Vietnam.

The significant positive impact on rice exports from the Government's support policy can be seen in the case of the Mekong Delta. Specifically, the effect of the Covid-19 epidemic, along with drought and saltwater intrusion lasting from December 2019 to early 2020, has affected the production activities of people in the Mekong Delta region. The State Bank of Vietnam promptly issued Document No. 1835/NHNN-TD dated March 18, 2020, requested banks to grasp the situation of production and business, the extent of the damage caused by droughts and saltwater intrusion to borrowers in the Mekong Delta to provide support measures. Specifically, it has to ensure the capital source for lending for poor households; actively coordinate with stakeholders in the implementation of clean water and rural sanitation projects, especially in areas affected by drought, saline intrusion. Thanks to the ample support of the Government, the negative impacts on agricultural production and daily life were minimized significantly. According to statistics from the Ministry of Agriculture and Rural Development, this year's winter-spring rice crop, the country harvested about 20.2 million tons; in particular, the Mekong Delta has an output of nearly 10.8 million tons, an impressive figure under drought conditions, widespread salinity. Thanks to credit capital, farmers and businesses have more resources to invest in

expanding production and export of rice, applying biotechnology into processing and post-harvest preservation to add the value of products in order to boost exports to potential and high-end markets.

In summary, Government policies play an important role in export activities, especially timely support of capital for production and export, and support for research and investment in high-quality rice varieties, improving the quality of exported rice. Therefore, to create favorable conditions for rice export in the coming time, the Government needs to have a solution to remove the above limitations.

4.3.2.2. Quality and price of exported rice

a. Quality of exported rice

For many years, the ASEAN+3 market has always accounted for a large proportion of Vietnam's rice export volume, even so, we have not yet met and fully exploited the opportunities of such a potential market. The main reason is that the quality of Vietnamese rice is unstable and lower than major competitors like Thailand and India. Vietnam's low-quality rice is due to the following reasons.

The first reason is failing to select suitable rice varieties with high quality. The farmers have to calculate by themselves which rice seed sowing will be harvested at the fastest and lowest cost, so there are many different varieties of rice in the same field. In the past, Vietnam mainly produced low-quality rice due to its high yield and suitability to the climate and farming practices of the farmers. In recent years, the Government has made great efforts in researching and investing in high-quality rice seeds that meet export standards, which has helped improve the quality of Vietnamese rice compared to before. In particular, Vietnam's ST25 rice has been named as the winner of the World's Best Rice 2019 award due to its outstanding qualities and delicious taste, according to the 11th Annual World's Best Rice Contest took place in the Philippines, on 12 November 2019. Even so, this rice can only be produced in certain areas, so the output is limited and insufficient to meet demand. Furthermore, there are still many shortcomings in the Government's investment in rice varieties, especially in the seed distribution stage. Specifically, the Government only invests in seed research institutes, after which the amount of seeds goes to state-owned seed companies, which eventually reaches farmers. As a result, new rice varieties are not widely planted.

The second reason is in the process of planting, tending, harvesting, and shipping to rice exporters. According to a survey of Hung et al. (2019), exported rice is mainly supplied by the following model:

Figure 4.9: Purchasing - Exporting Model - Vietnam's Rice Export Supply Chain (Hung et al., 2019)

According to this model, rice had to go through multiple intermediaries to be exported, which directly affects quality of rice. Firstly, in the process of rice farmers, it is difficult to control quality about the source of seeds and the amount of using pesticide or fertilization due to individual and non-concentrate production. Also, it would entirely depend on the weather because of the natural drying method such as solar energy leading cause of uneven rice quality. Next is the rice milling and preservation process which is hard to ensure the clean safety of the milling and storing area as rice would be inevitable to get dirty and humidity due to a low-quality storing system. After the rice milling process, it would be sold to rice export enterprises by transport modes. The presence of many intermediaries could lead to an increase in transport cost and time and a reduction in quality because of repackaging and redelivering by each actor. That makes the supply chain inefficient, does not meet the requirements of an adequate supply quantity and uniformity in quality. At the same time, it is difficult to trace the origin of rice and control food hygiene and safety due to the separation between intermediaries' capacity of technologies, finance, and business ethics.

The last is about the climate. Vietnam is located in the tropical monsoon climate, hot and humid, and high annual rainfall (1,800-2,000mm) is evenly distributed, creating favorable conditions for agricultural production. Besides, Vietnam has long hours of sunshine, abundant natural heat source, high humidity, so it is very beneficial for the growth and development of rice. However, Vietnam also often faces natural disasters, drought, and floods, causing quite a severe impact on rice production. Consequently, rice farmers are increasingly vulnerable to the impacts of climate change. For example, in 2016, an estimated 1.29 million tons of Vietnam's rice was lost to the country's biggest drought in 90 years. At least 221,000 hectares of rice paddies were hit

by the drought and related saltwater intrusion and the livelihoods of nearly 2 million smallholder farmers and poor households were affected, particularly in the Mekong Delta, Vietnam's "rice bowl".

b. Price of exported rice

For a country, high or low export prices not only affect exports but also reflect the level of development of the domestic manufacturing industry. According to Bui and Chen (2017), price is one of the leading factors to determine the competitiveness of products. Indeed, it represents the quality as well as the brand of the product. The same goes for rice, the quality of rice decides directly on the price of rice. Regarding Vietnam's rice price, despite always ranking high in turnover, our rice price has a relatively low value, sometimes the lowest among rice exporting countries in the world, specifically in 2014. The chart below would give an overview of Vietnam rice prices in the period 2005-2019. According to the General Department of Customs (2019), the average price of exported rice for 15 years was USD 429 /ton (FOB price).

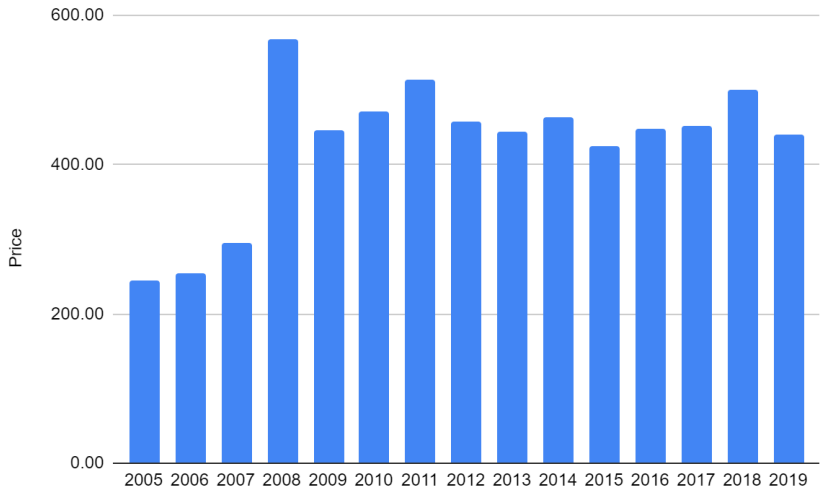

Chart 4.5: Vietnam's rice export prices, 2005-2019 (Unit: USD/tons) (USDA, 2020)

The first reason for low export prices is the low-quality of Vietnam's rice. In general, rice output exported to ASEAN+3 market is mostly raw rice with low value. Although Vietnam has some good and high-quality rice, its output is small, not enough to meet the ASEAN+3 market, such as ST25 and Japonica. According to the Vietnam Food Association, in 2008, Vietnam's rice exports reached prices up to USD 800/ton. It is Japonica rice, a Japanese rice variety, cultivated and produced in the provinces of the Mekong Delta. It proves that Vietnamese rice exporters

and farmers are fully capable of producing and exporting high-quality rice with high gain to many demanding markets around the world.

The second reason is it has not yet made a trademark for the world consumers. Thailand has high prices because of their good reputation and branding, creating trust in quality with customers. While Vietnam has not really invested to create a good branding strategy to enhance the image and reputation of Vietnamese rice in the world. However, Vietnam has paid more attention to building a brand image in recent years. Specifically, on 18th December 2018, the Ministry of Agriculture and Rural Development officially announced the Vietnamese Rice Brand logo as the following image:

Figure 4.10: Vietnamese rice logo
(Ministry of Agriculture and Rural Development, 2018)

This design is outstanding with the stylized rice flower image, the leaves of the rice variety were changed to shape as the Lac Viet bird spreading its wings. The green background brings the message that Vietnam is a country with clean, safe, and environmentally friendly agriculture. This is a remarkable event when Vietnam has the first national rice brand logo so that it can improve the awareness of Vietnamese rice products in the world. Along with that, the honor from the ST25 rice of Vietnam has changed the world view of Vietnamese rice products since it was the winner in “The best rice in the world” competition 2019.

Despite the low quality of rice in previous years, Vietnam is on the rise both in its rice export volume and its value. According to the Vietnam Food Association (2020), for many consecutive days, Vietnam's rice export prices have remained at high prices. Among the three largest rice exporters, including Thailand, Vietnam, and India, Vietnam's rice export prices are the highest

in August 2020. For the first time in the 30-year history, Vietnamese rice prices were 15-20 USD/ton higher than Thai rice, which is the second time Vietnam has risen to the number 1 position in the world in terms of rice export prices (the first time was in October 2012). Meanwhile, considering the period of the first five months of 2020, Thailand shipped 3.14 million tons of rice, down 32.7% from the same period last year, with an export value of USD 2.2 billion, down 12% year-on-year. According to the Ministry of Industry and Trade, Vietnam has beaten Thailand to become the second-biggest rice exporter in the world.

In short, there is a strong positive relationship between price and quality of rice. Price reflects the level of competitiveness of rice quality, while rice quality and brand directly affect the price of rice. In order to have high and stable export turnover and export value, one of the important conditions is to improve the quality of rice and product brands.

4.3.2.3. Quality of labor resources

In the current period of industrialization - modernization and international integration, human resource is a critical factor determining the development of the country and increasing the competitive advantage of export enterprises. The excellent quality of human capital helps increase labor productivity, promote commodity production, thereby economic growth. Although Vietnam is known as a country with an abundant agricultural labor force with low prices, labor productivity is not high. It has even ranked the lowest productivity within economic domestic sectors. In comparison with other countries in ASEAN+3, despite being a country with a high growth rate of labor productivity, Vietnam's labor productivity is still very low. In detail, if measured by purchasing power parity (PPP) value, Vietnam's labor productivity reached USD 11,142 in 2018, only 7.3 percent of Singapore, 19 percent of Malaysia, 37 percent of Thailand, 44.8 percent of Indonesia, and 55.9 percent of the Philippines. This means that Vietnam's economy is facing a huge challenge to catch up with other countries.

In other words, Vietnamese rice export enterprises have not invested adequately in facilities and technology, thus failing to offer laborers a conducive environment to promote their competence. Despite long-term experience in rice cultivation, Vietnamese farmers still face difficulties in applying science and technology to produce and improve rice quality, which has led to the unstable quality of rice and the low rice export value. In recent years, Vietnam has focused more on investing in human resource development. Specifically, in 2015, the Vietnam Sustainable

Agriculture Transformation Project (VnSAT) was initiated to improve farming practices and value chains. Besides, some productivity measures such as 5S (sort, set, shine, standardize and sustain) and Kaizen (changing for the better) have been tested at the enterprise level with the support of Japan International Cooperation Agency (JICA), but the scale is too small and only lasts a short time.

Generally, the quality of labor resources and labor productivity are the leading factors determining the competitiveness of the economy and each enterprise. Improving Vietnam's labor productivity is an urgent task, playing an essential role in promoting growth, overcoming the middle-income trap, avoiding falling behind, and narrowing the development gap with countries around the world.

4.3.2.4. Technology

According to the World Economic Forum (WEF) (2019), Vietnam has expressed as the Nascent in terms of production potential, which indicated that Vietnam maintains a weak production structure (48/100) and production motivation (53/100). In comparison with the ASEAN+3 region in terms of innovative technology, Vietnam ranks behind Malaysia (with the corresponding grade of 23) Thailand (41). Therefore, the development of technology is essential to overcome rice cultivation's significant challenges, especially in Vietnam.

a. Development in agricultural mechanization

Firstly, agricultural mechanization solves physical working issues, seasonality; promotes the process productivity; and saving budget as well as unnecessary damages. Accordingly, several achievements in applying technology can be mentioned as laser field leveling in Can Tho, which helps to increase rice yield, control weeds, and save water. Moreover, the system of tractors, harvesters, and threshers has been invested remarkably, especially in the Mekong Delta. Notably, the country has more than 600 thousand tractors of all kinds to serve farmers' demands (Ba and Hong, 2015). For seed delivery, Vietnam has applied new transplanting techniques using manual towing machines, but most commonly in the Central and the South of Vietnam. Whereas, the Red River Delta's farming households are mainly cultivated by hand due to their small harvest size. Eventually, applying technology in harvesting and separating seeds has optimized rice harvest costs from 5-6% to 2%. The application of this technology takes advantage of a large amount of straw, which reduces the burning of polluting straw.

However, rice cultivation mechanization has not changed severely due to the small scale and the inadequate adaptation of machinery from farmers, which is against productivity and economic efficiency in Vietnam. Compared to 2011, the number of tractors nationwide in 2019 increased by 48%, and combined harvesters increased by 79%, and agricultural dryers increased by 29%. Nevertheless, the mechanization level gap between Vietnam and other countries in the world is enormous. The Ministry of Industry and Trade (2019) estimated that the level of dynamical equipment for agriculture in Vietnam is only 1.4 horsepower (HP) for cultivation, much lower than that of countries such as Thailand of 4 HP/ha or China of 8 HP/ha. Besides, Vietnam has to import 70% of machinery and equipment for agriculture, mainly from China, Japan, and Korea, with only the remaining 30% of the market share for products manufactured in Vietnam. Therefore, Vietnamese agricultural machines' competitiveness is also quite low because of a higher price than imported products, especially Chinese products.

Moreover, the application of technology has a differentiation among regions, despite the importance of paddy drying, milling, and packaging. While investment enterprises can invest a specific budget for dryer technology, small-scale farmers mainly use the sun-drying method. Therefore, the lack of thorough industrial application is one of Vietnam's significant obstacles to improving productivity and product quality compared to other rice-producing countries, which harms significantly to the rice export quantity of Vietnam to ASEAN+3.

b. Changes in biotechnology

❖ *The application of biotechnology in fertilizers and pesticides*

Vietnam is gradually promoting biotechnology in rice cultivation, especially fertilizer. Regarding fertilizer, some projects encourage the use of environmental fertilizers such as chicken, pig, and microbiological fertilizers. For example, the PAMCI project of the Japan International Cooperation Agency (JICA) applied an organic rice production model in Dong Phu commune, Ha Noi (Long, 2019). In particular, this model employs 100% organic fertilizer, water sources to irrigate the Bui River and does not use chemicals.

However, the use of this compost has not been widespread yet. Most farmers choose chemical fertilizers and chemical pesticides to nourish the plants, directly affecting the environment and human health in the long run. Also, farmers still apply fertilizers according to custom and experience, which leads to the amount of manure being excess or too short, harming severely to

the yield and the quality of rice. From 2015 to 2019, Vietnam imported and consumed about 100,000 tons of pesticides each year (Ministry of Agriculture and Rural Development, 2020). On average, each Vietnamese person absorbs 1.1 kg of pesticides per year. Only in 8 months in 2020, the number of imported pesticides was 100,000 tons, and this number will continue to increase in the remaining four months of the year. It is an abuse of pesticides in agricultural products in general and rice in particular.

- *The innovation of genetically modified rice*

The development of genetically modified rice is essential to face climate change and the shortage of arable land. Genetic modification (GM) helps increase productivity and product quality and helps the rice become stronger to cope with unpredictable variables.

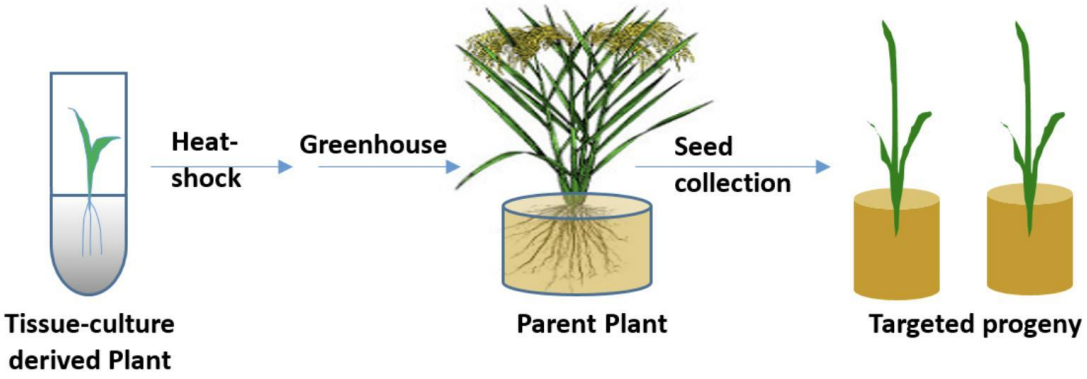

Figure 4.11: The application of the CRISPR/Cas system on the stem cells of the mother plant and passed onto offspring (Le et al., 2019)

In Vietnam, the National Institute of Agricultural Genetics reported successfully deciphering 36 indigenous rice varieties to blight resistance in the project "Decoding Genome of some indigenous rice varieties in Vietnam". Additionally, Ha et al. (2020) emphasized that the new CRISPR/Cas improves several commercial-oriented traits, including dominant agronomic characteristics, enhancing the quality of the crop, and improving stress tolerance. However, rice genetic modification is a controversial issue on a global scale, especially in fastidious markets like Japan. Therefore, GM technology still needs much time to prove its practicality for plants and human life in Vietnam and the world.

Overall, although the unpopularity of pesticides and organic fertilizers and the application of genetically modified rice, all of them have a positive impact on Vietnam's rice exports globally, particularly in ASEAN+3, because they make crops healthier and boost rice production.

4.3.2.5. Infrastructure

a. The innovations in irrigation systems

First of all, irrigation systems play an essential role in ensuring national food availability and export to foreign countries. Therefore, Vietnam always pays excellent attention to the improvement of irrigation systems. In 2019, Vietnam had built 904 irrigation systems serving irrigation, 6,336 reservoirs, nearly 16,000 solid dams, almost 12,000 electric pumping stations. Furthermore, the application of advanced irrigation and water-saving measures for rice as the System of Rice Improvement (SRI) model has been implemented in 40 provinces and cities nationwide.

Subsequently, the advanced irrigation system has shown a considerable improvement compared to other growing rice countries due to its seasonal watering system. Thanks to the efforts to prevent saline water from storing freshwater to regulate water sources for growing crops, residents in Long An are assured of increasing production and earning high profits in three months of drought. However, the tropical climate in Vietnam leads to unevenly distributed rainfall. Therefore, having sufficient water resources for production is one of Vietnam's challenges. Besides, clean water security is a concern. In detail, rural craft villages produce an alarming amount of waste, including iron, metal, rice noodles, pre-starch, which have long-lasting effects on people's health, affecting crop yield and water security.

Generally, Vietnam's irrigation system has actively developed and contributed to the growth of Vietnam's rice export turnover in ASEAN+3 despite the challenges in the climate conditions and the quality of water sources.

b. Transportation system and export rice supply chain

According to the 2019 Global Competitiveness report of the WEF, Vietnam ranks 67th/141, which is higher than the number of 2018 (77th/140). However, it is not an outstanding number, while Vietnam left behind considerably neighboring rivalries such as Thai Lan (40th/141). Over the years, various traffic works, transport stations, warehouses, wharves were built and completed. Accordingly, many national highways have been completed, many roads and bridges

have been practical such as Hanoi - Lao Cai, Hanoi - Hai Phong, Ho Chi Minh City - Vung Tau, Nhat Tan Bridge, Can Tho Bridge. In terms of the sea road systems, the 2019 report of the Vietnam Maritime Administration shows that the entire country has 281 ports with a total capacity of over 550 million tons/year. The seaport system is invested synchronously in infrastructure: wharves, buoys, loading and unloading equipment, and is widely distributed by region. In the first six months of 2019, cargo throughput through Vietnam's seaport system is estimated at 308.8 million tons, up 13% over the same period in 2018.

Regarding transport modes, Vietnamese agricultural products have been delivered through the sea and waterway due to the Vietnamese natural conditions, which requires systematic integration of all types of transportation. Meanwhile, Vietnam's seaport system has only a Hai Phong port connected with rail, but its efficiency is negligible. Additionally, Vietnam's river system is small and interlaced, which is not easy to transport large quantities even though it has recently gained positive growth and movement. In terms of rail and air transportation, these transporting systems have not been able to support the circulation of goods. While railway technology in Vietnam falls behind modern technology globally, the aviation industry shows a relatively small scale, unable to ensure the movement of large quantities of goods. Therefore, the energy in transporting goods has not been optimized in terms of time and transportation costs.

In fact, Vietnam's supply chain models are divided into two types, one for intermediate markets such as the Philippines and Indonesia and one for more advanced markets such as Japan and South Korea. In particular, the first model's characteristic is to transport through many complicated intermediary steps, difficult to trace the origin and unstable quality. On the contrary, the high-end market model ensures a standard and advantageous supply chain, which requires substantial investment costs for warehousing, transportation systems, machinery, and equipment, which are Vietnam's biggest stumbling obstacles. Along with the difficulties in the mechanization and transportation system mentioned above, the warehousing system is also a big problem. Their major characteristics are small and limited capacity. Many warehouses do not have concrete floors, which is accessible to damaged goods because small and medium-sized export enterprises in Vietnam have mainly temporary storage at shared warehouse systems for many types of goods. Additionally, the warehouse's temperature and humidity are not stable, affecting the quality of products if stored for a long time. Furthermore, the absence of logistics

centers located in convenient locations are also the obstacles in Vietnamese infrastructure development.

Compared to competitors in the same region such as Thailand, Vietnam's infrastructure system remains quite a distance, thereby reducing the possibility of Vietnamese agrarian products against neighboring rivals of exporting rice to the ASEAN+3 market.

4.3.2.6. Tariff and non-tariff factors from importing countries

Obviously, participation in agreements will have a positive effect on nations' export activities, when tariffs are mitigated to encourage trade, commodity exchange. In terms of Vietnam, entering the agreements plays a vital role in encouraging Vietnam's rice export products to international markets, especially ASEAN+3.

a. Influence of integration and free trade agreements on trade exchanges among countries in the ASEAN+3 market

Accordingly, the trade agreement between Vietnam and ASEAN countries (AFTA) was signed in 1993 to remove trade barriers and develop together. In 2010, a new trade agreement called the ASEAN Trade in Goods Agreement (ATIGA), supplemented and finalized the earlier agreement's provisions. According to ATIGA, the import tariff has been eliminated for 100% of tariff lines on the ordinary list. In particular, Vietnam belonging to the CLMV group (including Cambodia, Laos, Myanmar, and Vietnam) has a more extended roadmap to eliminate all import duties on the Normal List by 2015. Thanks to AEC's opportunities, Vietnam's products quickly caught up with the trend and level of development of the world but also has advantages when AEC signs FTAs with other partners. According to the Ministry of Industry and Trade (MOIT), Vietnam is heading to other markets, such as the Philippines, which ease rice imports after two decades. Recently, the Philippines- one of the facile rice export markets of Vietnam has changed the rice importing policies. In detail, the tariff applied to ASEAN countries into the Philippines is lower than that of other countries, 35% compared to 180%. However, the Philippines' new rice import rules allow for special safeguard duties on rice when necessary.

It is well-known that participation in the ASEAN - China Free Trade Area (ACFTA) agreement brings many advantages to Vietnam when China applies tariffs on agricultural products such as rice at 0%. However, China has introduced stricter regulations on rice products' duties recently,

which indicates that Vietnamese rice has been suffering from an import tariff of up to 50%. Therefore, China is no longer a fertile market for Vietnam.

In terms of Japan, Vietnam, and this country have officially had the private trade agreement named Vietnam Japan Economic Partnership Agreement (VJEPA) after the cooperation between ASEAN and Japan signed in 2008. In detail, the tariff applied to Vietnamese rice products will gradually decrease to only 5% by 2023. Additionally, the recent settlement, Comprehensive and Progressive Agreement for Trans-Pacific Partnership (CTCPP), had promised to bring many opportunities when Japan decided to reduce tariffs on nearly 93.6% of Vietnam's exports. Although rice products, such as brown rice, are subject to tariff quotas as committed by Japan in the WTO, the Ministry of Agriculture and Rural Development of Vietnam and the Ministry of Agriculture signed an Agreement on the Development of the Rice Value Chain to improve the possibility of Vietnamese rice.

Regarding Korea, Vietnam-Korea FTA demonstrates the high level of commitment of both Vietnam and South Korea in the areas of mutual interest. Despite the application of preferential tariffs on various products, it did not include rice products. However, a prevailing announcement from MOIT stated that South Korea has committed to applying a preferential tariff rate of 5% to the quota volume of 408,700 tons of rice imported for ten years, starting from 2020, including rice imported from Vietnam.

Simultaneously, significant rice exporters in the world, such as Pakistan, also have favorable benefits gained from FTA in the ASEAN+3 area. Notably, Pakistan signed with China a free trade agreement in the second phase and officially came into effect on January 1, 2020. Although there is no rice preference in the second phase of the deal, Pakistan will be a significant competitor of Vietnam after Thailand. Besides, Thailand intends to join the CPTPP agreement, which will directly affect Vietnam's rice exports. Indeed, Vietnam has a potential risk of losing the Vietnamese market share in the potential markets, particularly Japan.

Under the encouragement of commercial trade, Vietnam has signed many valuable trade agreements, bringing many incentives for export markets. Regarding the rice product, it has also significantly benefited from the impulses of international trade agreements. Some demanding markets like Korea have also gradually facilitated Vietnamese rice. However, it has not conquered the fastidious markets yet due to the rice product's absence on the list of special

preferential rates compared to other Vietnamese agricultural products. Additionally, neighboring competitors enjoy the same privileges as Vietnam, which directly affects Vietnam's rice exports to ASEAN+3. It is a considerable challenge for Vietnam to improve its competitive advantages against neighboring rivals such as Thailand.

b. Influence of non-tariff barriers on trade exchanges among countries in the ASEAN+3 market.

Along with incentives from FTAs, exporting enterprises also face the following types of non-tariff barriers, which are quantitative restrictions, technical measures, and temporary trade protection measures.

To begin with, the packaging is an integral part of consumers' purchasing decisions. Despite the outstanding packing designs from Thai or Japan, Vietnamese companies still provide entirely arbitrary and sloppy designs. Accordingly, South Korea is fond of Vietnamese goods, but they assumed that products, including rice products, have demand-free packaging, not careful in providing information to consumers. Besides, China has also mentioned strict requirements on the packaging. In detail, packing and labeling must contain all information on the origin of goods according to international practices and must be under precise scrutiny by its testing agency. Regarding Indonesia, it stated the compulsory use of ocean shipping and insurance services of Indonesian companies in rice import and export activities.

Additionally, some countries take advantage of the Technical Barriers in Trade (TBT) and Sanitary and Phytosanitary (SPS) agreements' provisions to create barriers to imported goods, typically in Japan. Furthermore, Japan introduced its private system for agricultural and forestry products, called the Japanese Agricultural Standard (JAS). In detail, JAS standards are criteria for agroforestry quality, such as classification, composition, characteristics, or production methods. Simultaneously, Japan strictly controls the origin of the product, which indicates that Japan prohibits importing goods such as the foods that cannot prove their origins. In terms of the Philippines, the Ministry of Agriculture conducted a "Reassessment of the Food Safety Management System for milled rice imported into the Philippines" in 2019. Accordingly, the Philippines required Vietnam to provide documents related to Vietnam's food safety control process, such as a Sanitary and Phytosanitary Import Clearance certificate before exporting. Consequently, besides the importing country's quotas, technical barriers are Vietnam's most

significant obstacle to being welcomed in international markets, especially Japan, Korea, and China.

Currently, the context of the China-US trade war has become much more intense led to the devalue of renminbi. Moreover, China has provided several demanding requirements for Vietnam products besides the packing standards mentioned previously. Notably, Vietnamese rice must ensure the regulations, such as sterilization time, must reach 120 hours, or the test sample must be under the Chinese base for testing. In addition to the high standards, there is also a list that only specific enterprises are allowed to export rice to China, limiting the opportunities of many potential Vietnamese enterprises. As a result, China is no longer the largest rice import market in Vietnam when its rice export turnover to this country has decreased significantly.

At the same time, Vietnam's rice market surprisingly shows steady growth in the context of Covid-19, particularly in ASEAN+3 market. The demand for rice increases sharply due to the restriction of movement, leading to an increase in rice export. Thanks to this advantage, Vietnam has surpassed Thailand and became the second-largest exporter in the world, although the declining Thai rice price offers hope for prosperous rice export.

In general, the rice market still has many limitations in processing and packaging to promote export turnover growth. The growth of rice exports during the time of COVID-19 has shown a temporary sign if Vietnamese products had not had a long-term plan to improve quality and packaging, and the transparent origin of each rice product. Consequently, the non-tariff barriers negatively impact the Vietnamese rice import situation in terms of ASEAN+3.

4.4. Conclusion

In this chapter, the authors provided Vietnam's rice export situation in general and Vietnam's rice export situation to ASEAN+3 market in particular from 2005-2019. After that, the data was collected and analyzed by both qualitative and quantitative techniques to find out how given factors influence the revenue of Vietnam's rice export to the ASEAN+3 countries in the research time. From then, the authors would give the answers for research questions and provide effective recommendations to improve each factor in Chapter 5.

05

CONCLUSION & RECOMMENDATIONS

In the last chapter, the authors answer the research questions by summarizing the findings and suggesting recommendations for improving the total of Vietnam's rice export volume. Moreover, this chapter also indicates the rice export policy of the Vietnamese government and forecasts Vietnam's rice export trend to the ASEAN+3 market during the research time.

CHAPTER 5: CONCLUSION AND RECOMMENDATIONS

5.1. Summary of findings - answer the research questions

In this chapter, the authors mainly focus on answering the research questions from the beginning of this paper, then present the recommendations for improving the total of Vietnam's rice export volume and finally indicate limitations and suggestions for further research.

As mentioned in Chapter 1, there are four questions and they are examined as following:

Question 1. What is the situation of rice production and export of Vietnam to ASEAN+3 countries in the period of 2005 - 2019?

In general, Vietnam's rice export turnover to the ASEAN+3 market fluctuated sharply from 2005 to 2019. This fluctuation came from many circumstances: the global debt crisis in 2012, the increase in the conditions of quarantine of importing countries, or the stiff competition from the rivals and the like. The detailed export analysis was mentioned carefully in Chapter 4.

Question 2. Based on the gravity model of international trade and the actual situation in Vietnam, what are the main factors affecting Vietnam's rice exports to ASEAN+3 countries?

In accordance with the gravity model of the authors' analysis, there are 7 quantitative determinants that have effects on Vietnam's total value of rice export. These are Gross Domestic Product of Vietnam (GDPVN); Harvesting area of rice in Vietnam (LANDVN); Geographical distance between two countries (GDIS), Gross Domestic Product of importing countries (GDPIM); Population of importing country (POPIM); the exchange rate of importing country (ERIM, local currency unit - LCU/USD) and the dummy variable WTO.

In terms of qualitative analysis, there are 6 qualitative factors that also perform correlation with rice export turnover including: government policies; quality and price of exported rice; quality of labor resources; technology; infrastructure; and tariff and non-tariff factors from importing countries.

Question 3. How are these factors correlated with Vietnam's rice export to ASEAN+3 countries?

Based on results revealed in Chapter 4, the correlation of each quantitative factor to Vietnam's rice export illustrates in the table below:

Hypothesis	Results	P-value	Coefficient
H1: GDP of Vietnam has a positive correlation with Vietnam's rice exports (+)	Accepted	0.002	+1.746
H2: Harvesting area of rice in Vietnam is positively associated with Vietnam's rice exports (+)	Accepted	0.058	+16.241
H3: Inflation negatively correlates with Vietnam's rice exports (-)	Rejected	0.807	
H4: The geographical distance is negatively correlated with Vietnam's rice exports (-)	Rejected	0.000	+5.429
H5: GDP of importing country is negatively correlated with Vietnam's rice exports (-)	Accepted	0.000	-1.655
H6: Import country's population has a positive association with Vietnam's rice exports (+)	Accepted	0.000	+1.727
H7: Exchange rate of importing country is negatively correlated with Vietnam's rice exports (-)	Accepted	0.000	-0.601
H8: WTO is positively correlated with Vietnam's rice exports (+)	Rejected	0.005	-4.863

Table 5.1: Summary of results for hypotheses (Authors, 2020)

Accordingly, GDPVN, LANDVN, GDIS, POPIM bear positive coefficients, meaning that these factors correlate positively with the total export value of Vietnam's rice export. Meanwhile, GDPIM, ERIM, and WTO express strongly inverse effects on the dependent variable.

In terms of qualitative factors, government policies, technology and infrastructure are three determinants that affect both positively and negatively on the rice export. Specifically, policy on conditions for exporting enterprise and policy on credit supporting for rice producers are on the positive side, whereas policy on rice export quota, policy on rice export tariff, and policy on supporting to maintain and develop paddy land are on the opposite one. Next, "Changes in biotechnology" is the only component in technology that performs a positive effect while "development in agricultural mechanization" and "the innovation of genetically modified rice" cause negatively. Then, while the innovation in irrigation systems of infrastructure has a positive impact on Vietnam's rice export, transportation system and export rice supply chain has a negative one. The three remaining factors including quality and price of exported rice, quality of labor resources, and tariff and non-tariff factors from importing countries have mainly negative association with Vietnam's rice export to ASEAN+3 during the research time.

Question 4. How to boost Vietnam's rice export to ASEAN+3 countries in the term of 2021-2030?

The answer of this question will be presented in the following part of Chapter 5.

5.2. Context of rice commodity and Vietnam's rice export target to 2030

5.2.1. International and domestic context of rice commodity

5.2.1.1. International context

According to the United States Department of Agriculture's forecast (USDA, 2020), world rice volume in 2020 is estimated at 496 million tons, down 0.6% under the strong impact of the Covid-19 epidemic, while world rice consumption reaches 490 million tons, an increase of 0.9% as opposed to 2019.

Global rice trade in 2021 foresees 45.2 million tons, a rise of more than 5% as opposed to 2020. Forecast, the rankings of countries' rice exports may change in the next few years. In the first 5 months of 2020, Covid-19 pandemic has posed negative impacts on rice exporters in general. Demand from China is likely to increase due to major floods in the nation. Also, the outbreak in India – the largest rice exporter has caused logistical obstacles, while floods in another rival of Vietnam - Bangladesh have severely damaged crops. As a result, Vietnam with certain competitive advantage has recently beaten Thailand to become the second biggest rice exporter in the world after the latter decided to slash rice exports due to prolonged drought and strong baht (UN Comtrade, 2020).

5.2.1.2. Domestic context

Despite a solid effect of Covid-19 on the economy of the whole world, the Vietnamese Government has still allowed rice exports to resume since May 1, 2020. In detail, MOIT (2020) estimates that Vietnam's rice export in May 2020 increased pointedly by 47% in volume and 55.3% in value compared to April 2020. However, saline intrusion may affect the export volume, which is a noticeable matter.

5.2.2. Vietnam's rice export target to 2030

According to Decision No.942/QD-TTg dated July 03, 2017 approval for rice export market development strategy of Vietnam for the period of 2017-2020 with vision towards 2030 by the Prime Minister, Vietnam's rice export target to 2030 is as follows:

5.2.2.1. Overall objectives

The overall objectives of the Decision No.942/QD-TTg dated July 03, 2017 are to endorse the prestige and brand of Vietnamese rice in the market, develop rice export markets with reasonable, stable, sustainable and effective scale and/or market and exported product structure. Vietnam vows to develop rice value by improving the quality, increasing the value and restructuring products (the Prime Minster, 2019). From then on, Vietnamese rice can meet the needs of the global market.

5.2.2.2. Particular objectives

According to the major content of Decision No.942/QD-TTg (2017), in the period of 2021-2030, the target of annual export of rice is expected to reach 4 million tons by 2030 and the export value of rice remains stable and rises to USD 2.3 – 2.5 billion per year. The Government also expects to enhance the proportion of high-qualified rice by 2030 and reduce that of low-quality rice. In particular, the proportion of export of ordinary white rice only hope to account for only 25% including low and average-quality rice making up not more than 10% of total rice export.

For ASEAN countries, the Government aims to strengthen and maintain the share of medium-quality rice in key markets (e.g. the Philippines, Indonesia, and Malaysia). In Chinese market, the Government concentrates on placing high-quality, branded, valued rice products in official and direct distribution channels. Simultaneously, the Prime Minister awaits improving high-quality rice products promotion, closely cooperating with countries like Korea and Japan to increase the market share of Vietnamese rice compared with the total rice import turnover of Korea and Japan to 4 – 5% by 2030.

5.3. Recommendations

The thesis results have clarified the situation and determinants affecting Vietnam's rice export turnover to 11 ASEAN+3 countries in the period 2005-2019. In-depth analysis of the correlation of variables and qualitative analysis in chapter 4 is an essential basis for proposing appropriate suggestions to boost rice exports turnover sustainably in this section.

5.3.1. Improving the GDP and Vietnamese's living standard

First of all, it is necessary to concentrate on increasing the value of Vietnam's GDP and promoting economic growth, aiming to increase exports in general and rice exports in particular.

Based on research results, Vietnam's GDP factor has a positive association with rice exports. IMF (2020) indicates that Vietnam's economic growth rate in 2020 may be reduced to 2.7% due to the impact of the Covid-19 epidemic but will increase to 7% by 2021. Similarly, global GDP growth will decrease by 3% in 2020 but will recover to 5.8% in 2021. The global economy is gradually making positive changes, opening up new opportunities for goods exchange between nations.

Thus, Vietnam can raise GDP through specific measures such as continuing to consistently implement the goal of stabilizing macroeconomic growth, controlling the inflation rate, maintaining stable politics as well as operating proactively and flexibly monetary policy tools, coordinating closely and synchronously with fiscal policy. Additionally, the government needs to focus on expelling obstacles for enterprises to create a healthy and attractive business environment for domestic and foreign investors. As a result, this will motivate the export of goods in general and rice in particular.

5.3.2. Exploiting the rice land utilization efficiency

Secondly, Vietnam should exploit the rice land utilization efficiency as rice cultivation's land area has a positive correlation on the rice export turnover, according to the research results.

In the coming time, Vietnam needs to take specific actions to exploit the land utilization efficiency. It is pivotal to zone rice harvesting areas into specialized rice areas, large-scale production, and reduce small acreage to achieve economies of scale. Indeed, Vietnam needs centralized and inter-regional rice cultivation in coordination with agriculture, industry, and residential planning. Notably, planning areas must be large enough to facilitate the application of scientific and technical advances and clean farming, provide clean water supply and wastewater treatment, and control environmental pollution.

Then, doing thorough studies on the soil matter is also indispensable. The characteristics of each rice variety are different, suiting different production conditions. Therefore, the government and related departments need to do these studies to have a zoning production strategy. Furthermore, it is imperative to have intensive measures and suitable crop conversion policies on the basis of sustainable land exploitation. Rice cultivation must be linked to climate change response, employ the comparative advantages of each region, and each province to have an optimal

production plan. From there, farmers can calculate how much rice production is sufficient or switch to other crops and livestock more appropriately.

5.3.3. Promoting smart strategies in some special markets

5.3.3.1. Nations with unfavorable natural conditions

As analyzed in chapter 4, while island countries have unfavorable natural conditions to produce rice to meet domestic demand, Vietnam has the advantages of rice production for domestic consumption and export. Therefore, developing rice export in these markets is considered as the right direction for Vietnam's rice export.

There are specific measures that can be taken to implement this solution. Firstly, Vietnam can build credibility in international trade with customers. Specifically, Vietnam should develop a rice market development program to link directly with large enterprises of these remote geographic countries as well as transnational enterprises intending to invest in Vietnam. At the same time, businesses should produce rice according to orders from partners instead of finishing production and then finding customers. Based on them, enterprises can actively control all stages in the supply chain, according to SRP-Sustainable Rice Platform, or by a process requested by the customer. Gradually, it might turn the short-term trading relationship into a long-term investment relationship. As a result, Vietnam can eventually boost rice exports to dominate these markets.

5.3.3.2. Nations with large populations

Promoting rice export in large populations in ASEAN+3 is also important as analyzed in Chapter 4. The more the population is, the more diverse the tastes, needs, consumer behaviors, and cultures are. Consequently, it is a chance to enhance rice export value as well as a challenge for Vietnam to determine the right direction for its rice export.

Hence, we need to have particular solutions such as market penetration strategy to exploit the full potential of these markets. On the one hand, the Vietnam Food Association (VFA) needs to enhance the role of conducting regularly updated studies related to rice markets in these nations, providing reliable information and data about quality standards, prices, partners, policies, and the like. By determining the import market's real needs, enterprises will be more proactive in rice production and export. Simultaneously, it allows timely warnings before the imbalance between supply and demand, convenient to plan production for each crop, standardize

production processes, and attract long-term investment. Undoubtedly, it will reduce risks as well as encourage Vietnamese enterprises to step up rice export to these markets.

On the other hand, it is fundamental to establish a network of relationships with Vietnamese businesses in these populous importers by expanding the distribution channel. For example, enterprises might establish representative offices in import markets to easily get insights of these markets to propose best-fit strategies then. Thus, they can offer adaptive rice products for each market as well as enhance Vietnam's rice brand name.

5.3.4. Limiting the risks of importers' exchange rate

The fourth is limiting the impact of importers' exchange rate (LCU/USD) on Vietnam's rice export turnover to ASEAN+3 markets. According to the research results, ERIM has a negative correlation with the value of rice exports. Although Vietnam cannot control importing countries' exchange rates (LCU/USD), it is still possible to take several practical measures to reduce the risks partly due to exchange rates.

Firstly, the government needs to focus on exchange rate forecasting which might affect the exchange rates of importers in ASEAN+3. Next, the government should increase the national foreign exchange reserves fund with various strong foreign currencies such as USD, Euro, Japanese Yen. The reason is that it not only helps the State Bank intervene in the short term when the exchange rate fluctuates dramatically but also helps the exchange rate be more stable. Likewise, the domestic exchange rate policy (VND/USD) also needs to be flexibly implemented so as not to affect Vietnam's competitive advantage compared to other competitors.

Then, export enterprises should focus on selecting other foreign currencies to use in rice export contracts. They can discuss with importers to consider which currency to use in payment to bring the highest efficiency while limiting the political risks of the USD. At the same time, enterprises need to actively coordinate with commercial banks to implement derivative tools such as forward, future, and swap contracts to limit exchange rate fluctuations. In the long term, the fluctuations in exchange rates will lead to changes in goods production prices, affecting the competitiveness of enterprises and long-term profits. Therefore, businesses also need to develop a strategy to manage foreign exchange risk, reserve foreign currencies, consider insurance contracts together with strategies such as marketing, production, and appropriate financial management to deal with these fluctuations.

5.3.5. Boosting the quality and strengthening the sustainable brand

Fifthly, as the research results have been analyzed above, improving the quality of rice and enhancing the brand awareness of Vietnamese rice to the world market are so vital to change the negative nexus of GDPIM as well as WTO with Vietnamese rice export.

First and foremost, the government urgently needs to develop a national standard system for exported rice products and processes. The production also needs to comply with international standards such as The Sustainable Rice Platform (SRP), Global GAP, and the like to enhance the value of Vietnam's rice brand and assert its position in the world market. Additionally, it is necessary to register trademark protection for kinds of high-quality rice. No sooner has ST25 gotten the reward than it is forged and blended, which might reduce its reputation in both domestic and export markets. Therefore, in order to protect the creativity of scientists and farmers, the Government needs strict penalties for copyright infringement.

Next, the Government should promulgate preferential policies for enterprises to invest in the production of organic rice, clean and nutritious rice, etc. in accordance with international practices and WTO rules. The reason is that consumers around the world are increasingly paying attention to the quality standards, nutritional content of rice and environmentally friendly products, which means limiting the use of chemical fertilizers, pesticides, and toxic herbicides. Therefore, the Government needs to have strict regulations and punishments so that farmers will limit the excessive dependence on these chemicals and require regular monitoring and supervision. At the same time, the international standard certification and the achievements should be shown on the packaging to maintain the reputation and create confidence for Vietnam's rice brand. Notably, local languages also should be added for product information.

Last but not least, the Vietnam rice brand's image and value will be improved through marketing programs to promote and introduce to businesses and consumers in both domestic and international markets. Likewise, it is necessary to develop and implement a joint cooperation plan between trade promotion agencies and enterprises, actively participate in agricultural fairs to increase customer engagement and build brand awareness.

5.3.6. Promulgating policies to ensure benefits for farmers and enterprises

Sixthly, it is undeniable that Government policies directly influence the volume of Vietnam's rice exports. Therefore, in order to create favorable conditions for rice exports in the coming

time, the Government should be flexible in supplementing and finalizing policies suitable to reality, ensuring the interests of the people and the enterprise.

To begin with, the policy in controlling the volume of rice export must be issued promptly, appropriately, and flexibly managed. Specifically, it is essential to be careful in calculating the amount of exported rice, especially in the context of disease and climate change, which has been taking place very complicated and unpredictable. Obviously, it must ensure national food security, at the same time, minimize the disruption of the rice production chain and ensure harmonization of interests between the Government, rice export enterprises, and farmers.

Secondly, policy on credit support for rice producers is also a significant factor determinant of exported rice volumes. The Government and the State Bank of Vietnam should continue implementing support policies for farmers and enterprises while calling on credit organizations to provide optimal support to their borrowers. In addition, to create favorable conditions for farmers and enterprises to access credit easily and quickly, commercial banks, apart from simplifying their lending procedures, should diversify credit products and make credit terms flexible.

Last but not least, the Government should issue a policy of supporting export enterprises to enter the new market. Specifically, focusing on building agriculture associations and fairs, which are places for people to contribute to agricultural initiatives and learn from each other's experiences.

5.3.7. Building high quality human resources

Seventhly, as human resources play an essential factor in determining the quality and productivity of rice production, both the Government and export enterprises need to build up a system of high-quality labor resources.

To ensure international rules and regulations are well implemented, the Government firstly needs to have a specific plan to organize training programs on critical knowledge about globalization, integration trends, and technology for all relevant subjects to domestic rice production and export activities. Additionally, the Government should promptly add the system of agricultural officials in the districts, especially in specialized rice areas, to provide the best support to farmers.

Regarding rice export enterprises, they also need to train the labor force and technical staff regularly in the process of rice production and preservation. Professional training courses should

be opened to guide how to operate a modern equipment system. Moreover, to have appropriate training directions, qualifications of technical workers should be inspected regularly and periodically.

5.3.8. Enhancing the application of technology in Vietnam's rice production

Eighthly, it is necessary to enhance the application of technology in these stages to improve productivity and product packaging to attract consumers as mentioned above.

In detail, spraying, fertilizer applications and dryers should also be implemented actively and systematically in the process of growing rice. Besides, taking advantage of technology in preserving post-harvest products is essential to reduce losses and improve the quality of rice products. Additionally, scientists need to study more advanced methods and models of crop cultivation as well as research new and disease-resistant rice varieties to combat the unpredictable changes in natural conditions. Along with that, the national rice breeding centers need to be renovated into separate biotechnology zones to specialize in rice varieties and genetic storage, which will support the scientists' access resources to manage and focus research.

Currently, the use of e-commerce platforms performs widely in both domestic and foreign trade. Businesses can take advantage of reputable commercial sites like Amazon to bring Vietnamese products to consumers worldwide. Additionally, businesses can fully explore new markets through e-commerce sites and take advantage of the warehouse system and professional transport services provided by international trading sites.

Accordingly, making use of rice production waste such as straw or rice husks are vital to keep the purity of the environment and the production purpose, such as fertilizer, to save costs and support for efficient rice farming.

5.3.9. Upgrading the infrastructure system

Ninthly, although the irrigation system of Vietnam has been well invested, ensuring clean water is not a facile task. Therefore, wastewater and waste from residential areas, industrial, and agriculture parks need to be strictly controlled to ensure an adequate supply of water for rice cultivation.

Thus, the government needs to have specific strategies in the maintenance of infrastructure, such as storage, to cope with natural disasters, especially in the Mekong Delta. Besides, a relatively complete silo warehouse system must be built with the participation of large enterprises'

partnerships in ASEAN+3. Furthermore, the investment plan to improve logistics services, including piers, and the formation of a container seaport needs to be taken into action so that it can be exported directly without passing the intermediate steps of hassle. Moreover, the transport system also needs to pay attention and strengthen. Along with roads, sea and air routes need to be further developed as these are two convenient routes in exporting rice to other countries. Accordingly, Vietnam should focus on investing in modern vehicles to save fuel, reduce transportation costs. The government may also consider cutting fees on transportation to reduce freight costs. Due to the current uneven distribution of logistics services in Vietnam, it is essential to systematically develop it to improve the rice export's effectiveness in general.

5.3.10. Optimizing FTAs together with efficiently overcoming non-tariff barriers

Tenthly, Vietnam should take full advantage of the incentives from trade agreements already signed in the ASEAN+3. Indeed, this region is one of the most massive rice consumptions in the world. Notably, rice significantly contributed to Vietnam's export turnover to international markets.

The first should emphasize the importance of promoting relationships with partners in the ASEAN+3 market. Accordingly, these relationships attract investment capital from developed markets such as Korea and Japan, allowing Vietnam to enjoy technological incentives such as machines in rice cultivation and processing. Finally, these opportunities help boost the export of rice-processed products to these markets.

Simultaneously, to overcome the non-tariff challenges, Vietnam needs to update information more intensively on trade agreements, export contracts, export preferences, and tariff and non-tariff adjustments. Besides, transactions that are being negotiated or newly signed should also be promptly notified. Additionally, the State's training and dissemination activities promote enterprises, and farmers have a better understanding of non-tariff barriers issues.

Overall, there must be a close cooperation and coordination among the government and varieties of the Ministry and associations such as Ministry of Agriculture and Rural Development, Ministry of Finance, Ministry of Transport, Vietnam Food Association, People's Committees of provinces and cities directly under the Central Government, universities, institutes, research centers, businesses, and farmers. Since then, Vietnam's rice industry in general and rice exports to the ASEAN+3 market in particular might be sustainably developed in the coming years.

5.4. Limitations and suggestions for further research

Although this research has acknowledged the importance of the findings, there are some limitations to the topic that should be noticed. This is because the data was collected only in 11 countries in ASEAN+3 from 2005 to 2019, resulting in the representative of the study. Thus, future research might expand the observations to increase the reliability of the study, if possible. Also, due to the yearly collected data, the analysis might ignore the seasonal factor regarding rice items. Subsequent studies might analyze quarterly data so that results would be more comprehensive. On the whole, the conclusion validity might be a topic of discussion as the research has undertaken during a specific period and no comparisons with past and future.

5.5. Conclusion

In general, this study examines the factors affecting the situation of Vietnam's rice export in the ASEAN+3 market from 2005 to 2019, then provides recommendations for sustainable development. Accordingly, the author has conducted a combination of both quantitative and qualitative methods. The specific results and explanations for each determinant has been under a precise analysis in Chapter 4. Subsequently, several recommendations are provided to enhance the situation. In particular, the Government plays a vital role in delivering the appropriate policies, strategies, and approaches that support the rice export activities of enterprises and farming households. In terms of associations, it is vital to invest more in equipment, information systems, evaluation systems, strengthen the personnel organization apparatus, and develop practical action programs to serve businesses. According to entrepreneurs, it is necessary for the implementation of technology, the scrutiny of specific markets, and the utilization of the trade agreements' favorable recessions to boost the rice export turnover to ASEAN+3. Finally, each farming household should improve their understanding of laws and policies, associate with scientists, the state, and businesses to bring quality rice products to foreign consumers.

In conclusion, this paper contributes as a reference document for future research to create sustainable development in both quality and quantity for one of the strategic export commodities of Vietnam - rice in the international market, especially in potential and competitive one as ASEAN+3.

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APPENDICES

Appendix 1: Data

COUNTRY	YEAR	EXP (USD)	GDPVN (USD)	LANDVN (thousand hectare)	INFVN (%)	GDIS (km)	GDPIM (USD)	POPIM (people)	ERIM (LCU/USD)	WTO
JAPAN	2005	53,467,663	57,633,255,618	7,329.20	8.29	3668	4,755,410,630,912	127,773,000	110.22	1
JAPAN	2006	43,095,501	66,371,664,817	7,324.80	7.42	3668	4,530,377,224,970	127,854,000	116.30	1
JAPAN	2007	18,718,676	77,414,425,532	7,207.40	8.34	3668	4,515,264,514,431	128,001,000	117.75	1
JAPAN	2008	6,065,861	99,130,304,099	7,400.20	23.12	3668	5,037,908,465,114	128,063,000	103.36	1
JAPAN	2009	1,725,516	106,014,659,770	7,437.20	6.72	3668	5,231,382,674,594	128,047,000	93.57	1
JAPAN	2010	2,201	115,931,749,697	7,489.40	9.21	3668	5,700,098,114,744	128,070,000	87.78	1
JAPAN	2011		135,539,438,559	7,655.40	18.68	3668	6,157,459,594,824	127,833,000	79.81	1
JAPAN	2012	13,832,707	155,820,001,920	7,761.20	9.09	3668	6,203,213,121,334	127,629,000	79.79	1
JAPAN	2013	393,340	171,222,025,117	7,902.50	6.59	3668	5,155,717,056,271	127,445,000	97.60	1
JAPAN	2014	5,332,317	186,204,652,922	7,816.20	4.08	3668	4,850,413,536,038	127,276,000	105.94	1
JAPAN	2015	2,186,562	193,241,108,709	7,828.00	0.63	3668	4,389,475,622,589	127,141,000	121.04	1
JAPAN	2016	411,972	205,276,172,135	7,737.10	2.67	3668	4,922,538,141,455	126,994,511	108.79	1
JAPAN	2017	116,586	223,779,865,815	7,705.20	3.52	3668	4,866,864,409,658	126,785,797	112.17	1
JAPAN	2018	84,776	245,213,686,369	7,570.40	3.54	3668	4,954,806,619,995	126,529,100	110.42	1
JAPAN	2019	191,834	261,921,244,843	7,470.00	2.80	3668	5,081,769,542,380	126,264,931	109.01	1
CHINA	2005	12,586,974	57,633,255,618	7,329.20	8.29	2321	2,285,965,892,361	1,303,720,000	8.19	1
CHINA	2006	12,442,030	66,371,664,817	7,324.80	7.42	2321	2,752,131,773,355	1,311,020,000	7.97	1
CHINA	2007	15,957,594	77,414,425,532	7,207.40	8.34	2321	3,550,342,425,238	1,317,885,000	7.61	1
CHINA	2008	1,426,333	99,130,304,099	7,400.20	23.12	2321	4,594,306,848,763	1,324,655,000	6.95	1
CHINA	2009	8,296,894	106,014,659,770	7,437.20	6.72	2321	5,101,702,432,883	1,331,260,000	6.83	1
CHINA	2010	55,568,650	115,931,749,697	7,489.40	9.21	2321	6,087,164,527,421	1,337,705,000	6.77	1
CHINA	2011	160,688,540	135,539,438,559	7,655.40	18.68	2321	7,551,500,425,598	1,344,130,000	6.46	1
CHINA	2012	902,291,021	155,820,001,920	7,761.20	9.09	2321	8,532,230,724,142	1,350,695,000	6.31	1
CHINA	2013	903,708,908	171,222,025,117	7,902.50	6.59	2321	9,570,405,758,740	1,357,380,000	6.20	1

CHINA	2014	892,604,071	186,204,652,922	7,816.20	4.08	2321	10,475,682,846,632	1,364,270,000	6.14	1
CHINA	2015	866,550,722	193,241,108,709	7,828.00	0.63	2321	11,061,552,790,044	1,371,220,000	6.23	1
CHINA	2016	782,106,655	205,276,172,135	7,737.10	2.67	2321	11,233,277,146,512	1,378,665,000	6.64	1
CHINA	2017	1,026,502,649	223,779,865,815	7,705.20	3.52	2321	12,310,408,652,424	1,386,395,000	6.76	1
CHINA	2018	683,363,161	245,213,686,369	7,570.40	3.54	2321	13,894,817,110,036	1,392,730,000	6.62	1
CHINA	2019	240,392,436	261,921,244,843	7,470.00	2.80	2321	14,342,902,842,916	1,397,715,000	6.91	1
SOUTH KOREA	2005	17,659	57,633,255,618	7,329.20	8.29	2739	934,901,071,333	48,184,561	1024.12	1
SOUTH KOREA	2006	35,855	66,371,664,817	7,324.80	7.42	2739	1,053,216,909,888	48,438,292	954.79	1
SOUTH KOREA	2007	26,828	77,414,425,532	7,207.40	8.34	2739	1,172,614,086,540	48,683,638	929.26	1
SOUTH KOREA	2008	34,113	99,130,304,099	7,400.20	23.12	2739	1,047,339,010,225	49,054,708	1102.05	1
SOUTH KOREA	2009	357,194	106,014,659,770	7,437.20	6.72	2739	943,941,876,219	49,307,835	1276.93	1
SOUTH KOREA	2010	1,851,168	115,931,749,697	7,489.40	9.21	2739	1,144,066,965,324	49,554,112	1156.06	1
SOUTH KOREA	2011	6,475,755	135,539,438,559	7,655.40	18.68	2739	1,253,223,044,719	49,936,638	1108.29	1
SOUTH KOREA	2012	21,856,753	155,820,001,920	7,761.20	9.09	2739	1,278,427,634,343	50,199,853	1126.47	1
SOUTH KOREA	2013	2,383,201	171,222,025,117	7,902.50	6.59	2739	1,370,795,199,976	50,428,893	1094.85	1
SOUTH KOREA	2014	19,050,923	186,204,652,922	7,816.20	4.08	2739	1,484,318,219,634	50,746,659	1052.96	1
SOUTH KOREA	2015	15,381,659	193,241,108,709	7,828.00	0.63	2739	1,465,773,245,547	51,014,947	1131.16	1
SOUTH KOREA	2016	6,559,393	205,276,172,135	7,737.10	2.67	2739	1,500,111,596,236	51,217,803	1160.43	1
SOUTH KOREA	2017	40,234,690	223,779,865,815	7,705.20	3.52	2739	1,623,901,496,836	51,361,911	1130.42	1
SOUTH KOREA	2018	85,601,576	245,213,686,369	7,570.40	3.54	2739	1,720,578,827,806	51,606,633	1100.50	1
SOUTH KOREA	2019	28,938,311	261,921,244,843	7,470.00	2.80	2739	1,642,383,217,167	51,709,098	1165.36	1
INDONESIA	2005	27,307,672	57,633,255,618	7,329.20	8.29	3008	285,868,618,224	226,289,470	9704.74	1
INDONESIA	2006	104,616,910	66,371,664,817	7,324.80	7.42	3008	364,570,514,305	229,318,262	9159.32	1
INDONESIA	2007	378,979,955	77,414,425,532	7,207.40	8.34	3008	432,216,737,775	232,374,245	9141.00	1
INDONESIA	2008	34,823,460	99,130,304,099	7,400.20	23.12	3008	510,228,634,992	235,469,762	9698.96	1
INDONESIA	2009	7,214,255	106,014,659,770	7,437.20	6.72	3008	539,580,085,612	238,620,563	10389.94	1
INDONESIA	2010	346,017,268	115,931,749,697	7,489.40	9.21	3008	755,094,160,363	241,834,215	9090.43	1
INDONESIA	2011	1,019,301,068	135,539,438,559	7,655.40	18.68	3008	892,969,107,923	245,116,206	8770.43	1
INDONESIA	2012	458,392,226	155,820,001,920	7,761.20	9.09	3008	917,869,910,106	248,452,413	9386.63	1
INDONESIA	2013	91,324,867	171,222,025,117	7,902.50	6.59	3008	912,524,136,718	251,806,402	10461.24	1

INDONESIA	2014	150,617,866	186,204,652,922	7,816.20	4.08	3008	890,814,755,233	255,129,004	11865.21	1
INDONESIA	2015	266,721,365	193,241,108,709	7,828.00	0.63	3008	860,854,235,065	258,383,256	13389.41	1
INDONESIA	2016	128,570,832	205,276,172,135	7,737.10	2.67	3008	931,877,364,178	261,554,226	13308.33	1
INDONESIA	2017	5,883,313	223,779,865,815	7,705.20	3.52	3008	1,015,618,742,566	264,645,886	13380.83	1
INDONESIA	2018	362,663,037	245,213,686,369	7,570.40	3.54	3008	1,042,240,309,413	267,663,435	14236.94	1
INDONESIA	2019	18,396,076	261,921,244,843	7,470.00	2.80	3008	1,119,190,780,753	270,625,568	14147.67	1
PHILIPPINES	2005	462,381,902	57,633,255,618	7,329.20	8.29	1754	107,419,986,400	86,326,250	55.09	1
PHILIPPINES	2006	429,249,015	66,371,664,817	7,324.80	7.42	1754	127,652,908,955	87,888,675	51.31	1
PHILIPPINES	2007	468,157,023	77,414,425,532	7,207.40	8.34	1754	155,980,408,072	89,405,482	46.15	1
PHILIPPINES	2008	1,178,032,196	99,130,304,099	7,400.20	23.12	1754	181,006,859,907	90,901,965	44.32	1
PHILIPPINES	2009	917,227,456	106,014,659,770	7,437.20	6.72	1754	176,131,654,910	92,414,158	47.68	1
PHILIPPINES	2010	947,378,774	115,931,749,697	7,489.40	9.21	1754	208,368,892,319	93,966,780	45.11	1
PHILIPPINES	2011	478,279,142	135,539,438,559	7,655.40	18.68	1754	234,216,730,703	95,570,047	43.31	1
PHILIPPINES	2012	475,264,484	155,820,001,920	7,761.20	9.09	1754	261,920,542,606	97,212,638	42.23	1
PHILIPPINES	2013	225,122,184	171,222,025,117	7,902.50	6.59	1754	283,902,829,720	98,871,552	42.45	1
PHILIPPINES	2014	598,649,058	186,204,652,922	7,816.20	4.08	1754	297,483,553,299	100,513,138	44.40	1
PHILIPPINES	2015	467,553,484	193,241,108,709	7,828.00	0.63	1754	306,445,871,631	102,113,212	45.50	1
PHILIPPINES	2016	167,660,482	205,276,172,135	7,737.10	2.67	1754	318,627,003,965	103,663,927	47.49	1
PHILIPPINES	2017	223,525,294	223,779,865,815	7,705.20	3.52	1754	328,480,738,148	105,173,264	50.40	1
PHILIPPINES	2018	458,121,870	245,213,686,369	7,570.40	3.54	1754	346,841,896,890	106,651,922	52.66	1
PHILIPPINES	2019	888,224,337	261,921,244,843	7,470.00	2.80	1754	376,795,508,680	108,116,615	51.80	1
MALAYSIA	2005	116,401,177	57,633,255,618	7,329.20	8.29	2028	143,534,102,611	25,690,611	3.79	1
MALAYSIA	2006	139,550,798	66,371,664,817	7,324.80	7.42	2028	162,691,238,209	26,201,961	3.67	1
MALAYSIA	2007	116,683,893	77,414,425,532	7,207.40	8.34	2028	193,547,824,063	26,720,370	3.44	1
MALAYSIA	2008	271,426,345	99,130,304,099	7,400.20	23.12	2028	230,813,897,716	27,236,006	3.34	1
MALAYSIA	2009	272,193,107	106,014,659,770	7,437.20	6.72	2028	202,257,625,195	27,735,040	3.52	1
MALAYSIA	2010	177,688,707	115,931,749,697	7,489.40	9.21	2028	255,016,609,233	28,208,035	3.22	1
MALAYSIA	2011	292,092,027	135,539,438,559	7,655.40	18.68	2028	297,951,960,784	28,650,955	3.06	1
MALAYSIA	2012	403,308,555	155,820,001,920	7,761.20	9.09	2028	314,443,149,443	29,068,159	3.09	1
MALAYSIA	2013	231,433,189	171,222,025,117	7,902.50	6.59	2028	323,277,158,907	29,468,872	3.15	1

MALAYSIA	2014	216,002,921	186,204,652,922	7,816.20	4.08	2028	338,061,963,396	29,866,559	3.27	1
MALAYSIA	2015	214,916,417	193,241,108,709	7,828.00	0.63	2028	301,354,756,113	30,270,962	3.91	1
MALAYSIA	2016	117,079,414	205,276,172,135	7,737.10	2.67	2028	301,255,454,041	30,684,804	4.15	1
MALAYSIA	2017	210,154,651	223,779,865,815	7,705.20	3.52	2028	318,958,236,443	31,105,028	4.30	1
MALAYSIA	2018	216,833,380	245,213,686,369	7,570.40	3.54	2028	358,581,943,446	31,528,585	4.04	1
MALAYSIA	2019	218,798,985	261,921,244,843	7,470.00	2.80	2028	364,701,517,788	31,949,777	4.14	1
CAMBODIA	2005	3,153	57,633,255,618	7,329.20	8.29	1052	6,293,046,162	13,273,354	4092.50	1
CAMBODIA	2006	813	66,371,664,817	7,324.80	7.42	1052	7,274,595,707	13,477,709	4103.25	1
CAMBODIA	2007	119,306	77,414,425,532	7,207.40	8.34	1052	8,639,235,842	13,679,962	4056.17	1
CAMBODIA	2008	40,079	99,130,304,099	7,400.20	23.12	1052	10,351,914,093	13,883,834	4054.17	1
CAMBODIA	2009	1,079,501	106,014,659,770	7,437.20	6.72	1052	10,401,851,851	14,093,604	4139.33	1
CAMBODIA	2010	46,164	115,931,749,697	7,489.40	9.21	1052	11,242,275,199	14,312,212	4184.92	1
CAMBODIA	2011	1,680,383	135,539,438,559	7,655.40	18.68	1052	12,829,541,141	14,541,423	4058.50	1
CAMBODIA	2012	2,092,185	155,820,001,920	7,761.20	9.09	1052	14,054,443,213	14,780,454	4033.00	1
CAMBODIA	2013		171,222,025,117	7,902.50	6.59	1052	15,227,991,395	15,026,332	4027.25	1
CAMBODIA	2014	13,000	186,204,652,922	7,816.20	4.08	1052	16,702,610,842	15,274,503	4037.50	1
CAMBODIA	2015	101,100	193,241,108,709	7,828.00	0.63	1052	18,049,954,289	15,521,436	4067.75	1
CAMBODIA	2016	113,523	205,276,172,135	7,737.10	2.67	1052	20,016,747,754	15,766,293	4058.69	1
CAMBODIA	2017	128,099	223,779,865,815	7,705.20	3.52	1052	22,177,200,512	16,009,414	4050.58	1
CAMBODIA	2018	166,898	245,213,686,369	7,570.40	3.54	1052	24,571,753,583	16,249,798	4051.17	1
CAMBODIA	2019	449,192	261,921,244,843	7,470.00	2.80	1052	27,089,389,787	16,486,542	4061.15	1
LAOS	2005	421,114	57,633,255,618	7,329.20	8.29	481	2,735,558,726	5,751,676	10655.17	0
LAOS	2006	666,420	66,371,664,817	7,324.80	7.42	481	3,452,882,514	5,846,074	10153.62	0
LAOS	2007	228,060	77,414,425,532	7,207.40	8.34	481	4,222,962,988	5,944,948	9602.73	0
LAOS	2008	505,925	99,130,304,099	7,400.20	23.12	481	5,443,915,121	6,046,620	8740.18	0
LAOS	2009	610,860	106,014,659,770	7,437.20	6.72	481	5,832,915,387	6,148,623	8511.35	0
LAOS	2010	3,079,204	115,931,749,697	7,489.40	9.21	481	7,127,792,630	6,249,165	8254.16	0
LAOS	2011	1,432,500	135,539,438,559	7,655.40	18.68	481	8,749,241,114	6,347,567	8029.26	0
LAOS	2012	801,575	155,820,001,920	7,761.20	9.09	481	10,191,350,120	6,444,530	8006.58	0
LAOS	2013	1,894,908	171,222,025,117	7,902.50	6.59	481	11,942,230,508	6,541,304	7833.23	1

LAOS	2014	220,921	186,204,652,922	7,816.20	4.08	481	13,268,458,232	6,639,756	8042.42	1
LAOS	2015	587,543	193,241,108,709	7,828.00	0.63	481	14,390,442,307	6,741,164	8127.61	1
LAOS	2016	145,218	205,276,172,135	7,737.10	2.67	481	15,805,692,546	6,845,846	8124.37	1
LAOS	2017	663	223,779,865,815	7,705.20	3.52	481	16,853,087,485	6,953,035	8244.84	1
LAOS	2018	380,616	245,213,686,369	7,570.40	3.54	481	17,953,786,416	7,061,507	8401.33	1
LAOS	2019	14,650,216	261,921,244,843	7,470.00	2.80	481	18,173,839,128	7,169,455	8679.41	1
SINGAPORE	2005	10,509,024	57,633,255,618	7,329.20	8.29	2196	127,807,618,361	4,265,762	1.66	1
SINGAPORE	2006	26,752,978	66,371,664,817	7,324.80	7.42	2196	148,630,373,214	4,401,365	1.59	1
SINGAPORE	2007	25,911,742	77,414,425,532	7,207.40	8.34	2196	180,941,941,477	4,588,599	1.51	1
SINGAPORE	2008	41,222,299	99,130,304,099	7,400.20	23.12	2196	193,611,986,713	4,839,396	1.41	1
SINGAPORE	2009	134,936,118	106,014,659,770	7,437.20	6.72	2196	194,152,286,009	4,987,573	1.45	1
SINGAPORE	2010	227,810,106	115,931,749,697	7,489.40	9.21	2196	239,809,387,605	5,076,732	1.36	1
SINGAPORE	2011	197,938,112	135,539,438,559	7,655.40	18.68	2196	279,351,168,707	5,183,688	1.26	1
SINGAPORE	2012	131,359,973	155,820,001,920	7,761.20	9.09	2196	295,087,220,933	5,312,437	1.25	1
SINGAPORE	2013	162,024,270	171,222,025,117	7,902.50	6.59	2196	307,576,360,585	5,399,162	1.25	1
SINGAPORE	2014	91,431,944	186,204,652,922	7,816.20	4.08	2196	314,851,156,183	5,469,724	1.27	1
SINGAPORE	2015	62,296,088	193,241,108,709	7,828.00	0.63	2196	308,004,146,058	5,535,002	1.37	1
SINGAPORE	2016	43,090,213	205,276,172,135	7,737.10	2.67	2196	318,652,334,419	5,607,283	1.38	1
SINGAPORE	2017	52,918,912	223,779,865,815	7,705.20	3.52	2196	341,863,349,989	5,612,253	1.38	1
SINGAPORE	2018	46,605,593	245,213,686,369	7,570.40	3.54	2196	373,217,081,851	5,638,676	1.35	1
SINGAPORE	2019	53,390,628	261,921,244,843	7,470.00	2.80	2196	372,062,527,489	5,703,569	1.36	1
THAILAND	2005	105,386	57,633,255,618	7,329.20	8.29	989	189,318,549,680	65,416,189	40.22	1
THAILAND	2006	248,043	66,371,664,817	7,324.80	7.42	989	221,758,196,505	65,812,536	37.88	1
THAILAND	2007	1,502	77,414,425,532	7,207.40	8.34	989	262,942,476,722	66,182,067	34.52	1
THAILAND	2008	87,833	99,130,304,099	7,400.20	23.12	989	291,382,991,178	66,530,984	33.31	1
THAILAND	2009	280,458	106,014,659,770	7,437.20	6.72	989	281,710,416,557	66,866,839	34.29	1
THAILAND	2010	93,080	115,931,749,697	7,489.40	9.21	989	341,104,820,155	67,195,028	31.69	1
THAILAND	2011	126,250	135,539,438,559	7,655.40	18.68	989	370,819,140,947	67,518,382	30.49	1
THAILAND	2012	76,473	155,820,001,920	7,761.20	9.09	989	397,558,222,957	67,835,957	31.08	1
THAILAND	2013	1,094,409	171,222,025,117	7,902.50	6.59	989	420,333,203,150	68,144,501	30.73	1

THAILAND	2014	342,560	186,204,652,922	7,816.20	4.08	989	407,339,361,696	68,438,730	32.48	1
THAILAND	2015	1,870,322	193,241,108,709	7,828.00	0.63	989	401,295,941,041	68,714,511	34.25	1
THAILAND	2016	211,274	205,276,172,135	7,737.10	2.67	989	413,430,123,185	68,971,331	35.30	1
THAILAND	2017	724,623	223,779,865,815	7,705.20	3.52	989	456,294,704,153	69,209,858	33.94	1
THAILAND	2018	630,464	245,213,686,369	7,570.40	3.54	989	506,514,103,905	69,428,524	32.31	1
THAILAND	2019	3,582,627	261,921,244,843	7,470.00	2.80	989	543,649,976,166	69,625,582	31.05	1
BRUNEI	2005		57,633,255,618	7,329.20	8.29	2039	9,531,402,848	365,114	1.66	1
BRUNEI	2006	2,783,288	66,371,664,817	7,324.80	7.42	2039	11,470,703,002	370,263	1.59	1
BRUNEI	2007		77,414,425,532	7,207.40	8.34	2039	12,247,694,247	374,965	1.51	1
BRUNEI	2008	622,690	99,130,304,099	7,400.20	23.12	2039	14,393,099,069	379,421	1.42	1
BRUNEI	2009	2,877,491	106,014,659,770	7,437.20	6.72	2039	10,732,366,286	383,906	1.45	1
BRUNEI	2010	7,658,566	115,931,749,697	7,489.40	9.21	2039	13,707,370,737	388,646	1.36	1
BRUNEI	2011	9,649,986	135,539,438,559	7,655.40	18.68	2039	18,525,319,978	393,688	1.26	1
BRUNEI	2012	8,696,610	155,820,001,920	7,761.20	9.09	2039	19,047,940,300	398,989	1.25	1
BRUNEI	2013	6,985,670	171,222,025,117	7,902.50	6.59	2039	18,093,829,923	404,421	1.25	1
BRUNEI	2014	7,551,968	186,204,652,922	7,816.20	4.08	2039	17,098,342,541	409,769	1.27	1
BRUNEI	2015	6,866,727	193,241,108,709	7,828.00	0.63	2039	12,930,394,938	414,907	1.37	1
BRUNEI	2016	12,756,272	205,276,172,135	7,737.10	2.67	2039	11,400,854,268	419,800	1.38	1
BRUNEI	2017	6,827,967	223,779,865,815	7,705.20	3.52	2039	12,128,104,859	424,473	1.38	1
BRUNEI	2018	2,512,513	245,213,686,369	7,570.40	3.54	2039	13,567,351,175	428,962	1.35	1
BRUNEI	2019	3,284,190	261,921,244,843	7,470.00	2.80	2039	13,469,422,941	433,285	1.36	1

Appendix 2: Regression result - Pooled OLS model

Source	SS	df	MS	Number of obs	=	161
				F(8, 152)	=	17.01
Model	890.167537	8	111.270942	Prob > F	=	0.0000
Residual	994.542938	152	6.54304565	R-squared	=	0.4723
				Adj R-squared	=	0.4445
Total	1884.71048	160	11.7794405	Root MSE	=	2.5579

EXP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
GDPVN	1.814234	.6943875	2.61	0.010	.442337	3.186131
LANDVN	15.84341	10.64125	1.49	0.139	-5.180442	36.86727
INFVN	.0097176	.0393686	0.25	0.805	-.0680627	.087498
GDIS	4.847693	.6652259	7.29	0.000	3.53341	6.161976
POPIM	1.65714	.2371068	6.99	0.000	1.188689	2.12559
ERIM	-.6221167	.0804334	-7.73	0.000	-.7810285	-.4632049
GDPIM	-1.634356	.2832653	-5.77	0.000	-2.194001	-1.07471
WTO	-4.438086	1.15962	-3.83	0.000	-6.729141	-2.147032
_cons	-187.2937	84.91005	-2.21	0.029	-355.05	-19.53746

Pooled OLS (Stata 14.0 results, 2020)

Appendix 3: Regression result – FEM

note: GDIS omitted because of collinearity

Fixed-effects (within) regression — Number of obs = 161
Group variable: COUNTRY — Number of groups = 11

R-sq:
within = 0.1706
between = 0.1224
overall = 0.0826

Obs per group:
min = 13
avg = 14.6
max = 15

F(7,143) = 4.20
corr(u_i, Xb) = -0.9762 — Prob > F = 0.0003

EXP	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
GDPVN	-.0666345	.8064895	-0.08	0.934	-1.660816	1.527547
LANDVN	10.67264	7.734613	1.38	0.170	-4.616311	25.96159
INFVN	-.0109567	.0292	-0.38	0.708	-.068676	.0467627
GDIS	0	(omitted)				
POPIM	-7.822295	5.251646	-1.49	0.139	-18.20318	2.558593
ERIM	.7843703	1.719855	0.46	0.649	-2.615254	4.183995
GDPIM	2.463557	.8827481	2.79	0.006	.7186358	4.208478
WTO	-2.912415	1.042211	-2.79	0.006	-4.972546	-.852284
_cons	-7.016783	103.0714	-0.07	0.946	-210.7573	196.7237
sigma_u	13.804235					
sigma_e	1.759802					
rho	.98400805	(fraction of variance due to u_i)				

F test that all u_i=0: F(10, 143) = 29.03 — Prob > F = 0.0000

FEM (Stata 14.0 results, 2020)