THE IMPACT OF LOGISTICS PERFORMANCE AND FREE TRADE AGREEMENTS ON TRADE FLOW

GOITOM KIBROM GEBREMICHAEL

AN INDEPENDENT STUDY REPORT SUBMITTED IN PARTIAL FULFILLMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
MASTER OF SCIENCE IN LOGISTICS AND SUPPLY CHAIN
MANAGEMENT
INTERNATIONAL COLLEGE
KING MONGKUT'S INSTITUTE OF TECHNOLOGY LADKRABANG
2018
KMITL-2018-IC-M-002-010

THE IMPACT OF LOGISTICS PERFORMANCE AND FREE TRADE AGREEMENTS ON TRADE FLOW

GOITOM KIBROM GEBREMICHAEL

AN INDEPENDENT STUDY REPORT SUBMITTED IN PARTIAL FULFILLMENT

OF THE REQUIREMENTS FOR THE DEGREE OF

MASTER OF SCIENCE IN LOGISTICS AND SUPPLY CHAIN MANAGEMENT

INTERNATIONAL COLLEGE

KING MONGKUT'S INSTITUTE OF TECHNOLOGY LADKRABANG

2018

KMITL-2018-IC-M-002-010

THESIS TITLE	The Impact of Logistics Performance and Free Trade Agreements on Trade Flow
STUDENT NAME	Mr. Goitom Kibrom Gebremichael
STUDENT ID	59610050
DEGREE	Master of Science
PROGRAMME	Logistics and Supply Chain Management
ADVISOR	Dr. Vithaya Suharitdamrong

ABSTRACT

Logistics performance includes logistics parameters; customs, infrastructure and transportation, international shipment, tracing and tracking, logistics quality, and timeline that explicitly aims at reducing trade-related barriers and foster countries trade flow. On the other hand, Free Trade Agreements help to reduce trade barriers related to tariffs and customs procedure between members. Beside creating economic integrations, FTAs could improve trade facilitations relating to logistics performance. This study is built upon this argument and determined the triangular relationship between logistic performance, Free Trade Agreements, and trade flow by taking Thailand and 75 trading countries as a case study. The study employed an augmented gravity model by considering different trade and logistics related explanatory variables. The result showed that there is a strong impact of logistics performance and FTAs on countries trade flow. Furthermore, the study found that there is a positive relationship between the number of FTAs and countries logistics performance. The study concluded that FTAs and logistics performance sub-components are supplementary to reduce trade-related barriers and increase countries trade flow.

Keywords: Logistics Performance, Free Trade Agreements, Gravity Model, Bilateral Trade Flow

ACKNOWLEDGMENT

First and foremost, praises to Almighty God for his blessing throughout my study program and to complete this research paper successfully.

I would like to convey my deepest and sincere gratitude to my research advisor Dr. Vithaya Suharidamrong, for his inspiration and motivational supports. His broad and insightful knowledge about the research area helped me to be up to date on my work. Without his professional guidance and effort, this could not be done.

This research paper is the product of a cumulative knowledge I have acquired from all the course I have taken from International College. So, I would like to express my gratitude to Asst. Prof. Dr. Ronnachai Tiyarattanachai, Asst. Prof. Dr. Jaruwith Prabnasak, Asst. Prof. Dr. Phaophak Sirisuk, Asst. Prof. Dr. Chivalai Temiyasathit, Dr. Wichisawat Na Ayudhya and other instructors and staffs of International College, King Mongkut's Institute of Technology Ladkrabang (KMITL).

My Master's program could not be achieved without the help of the scholarship providers, Thailand International Cooperation Agency (TICA). I would like to thank for their financial and moral support throughout my study.

Finally, this work is built upon my respected parents since my childhood. I would like to thank my lovely parents, Mr. Kibrom Gebremichael, and Mrs. Biri Keleta for their unwavering parental support. Furthermore, all my family, friends and colleagues contributed to my success.

Goitom Kibrom Gebremichael

TABLE OF CONTENTS

Chapter **Page**

TABLE OF CONTENTS

(Continued)

Chapter **Page**

TABLE OF CONTENTS

(Continued)

Chapter **Page**

LIST OF TABLES

Table **Page**

LIST OF FIGURES

Figure **Page**

LIST OF EQUATIONS

CHAPTER 1

INTRODUCTION

1.1 Research Background

Logistics Performance was previously considered only at an organizational level. The World Bank initiative on collecting data regarding countries performance regarding logistics was the first contribution in this area. Logistics Performance Index (LPI) consists of 6 sub-components that are crucial as a benchmark to compare countries in terms of trade facilitation. Focusing on these logistics components plays a key role in facilitating trade between nations.

A number of regional and bilateral Free Trade Agreements (FTAs) have been enforced between nations in the recent years. The primary objective of FTAs or Customs Union (CU) is to increase freedom of trade between members. According to World Trade Organization (WTO), Thailand is a member of 13 active FTAs which are already signed and in to force. There are also many agreements under negotiations and waiting to be launched as of 2018. Having these agreements, Thailand expect to gain trade expansion and investment. More specifically, these agreements are expected to increase Thailand's export and import.

Several studies investigated the relationship between FTAs and members trade, but only a few papers studied the impact of logistics performance on trade flow. To the knowledge of the researcher, there is a research limitation on linking FTAs and logistics performance. This study intends to fill this gap by focusing the triangular relationship between logistic performance, FTAs, and trade flow considering Thailand and 75 trade partners as a case study.

1.1.1 Thailand Trade Patterns

Thailand is a successful nation with an export-oriented economic strategy. According to Trading Economics (TE) database, Thailand's export accounts for about 65 percent of the total national Gross Domestic Products (GDP). The country exports agricultural products, foodstuff, electronics, vehicles, machinery, and equipment. Thailand's top export trade partners are China, Japan, the United States, Hong Kong and Singapore. Top 20 Thailand product importers for the past ten years can be shown in Figure 1.1. The country imports raw materials and intermediate goods, fuel, electronic components, chemicals, machinery, equipment and supplies from Japan, China, United Arab Emirates, Malaysia, United States and others. Based on the report of Observatory of Economic Complexity (OEC) 2017, Thailand ranked 20th and 22nd largest world exporter and importer respectively.

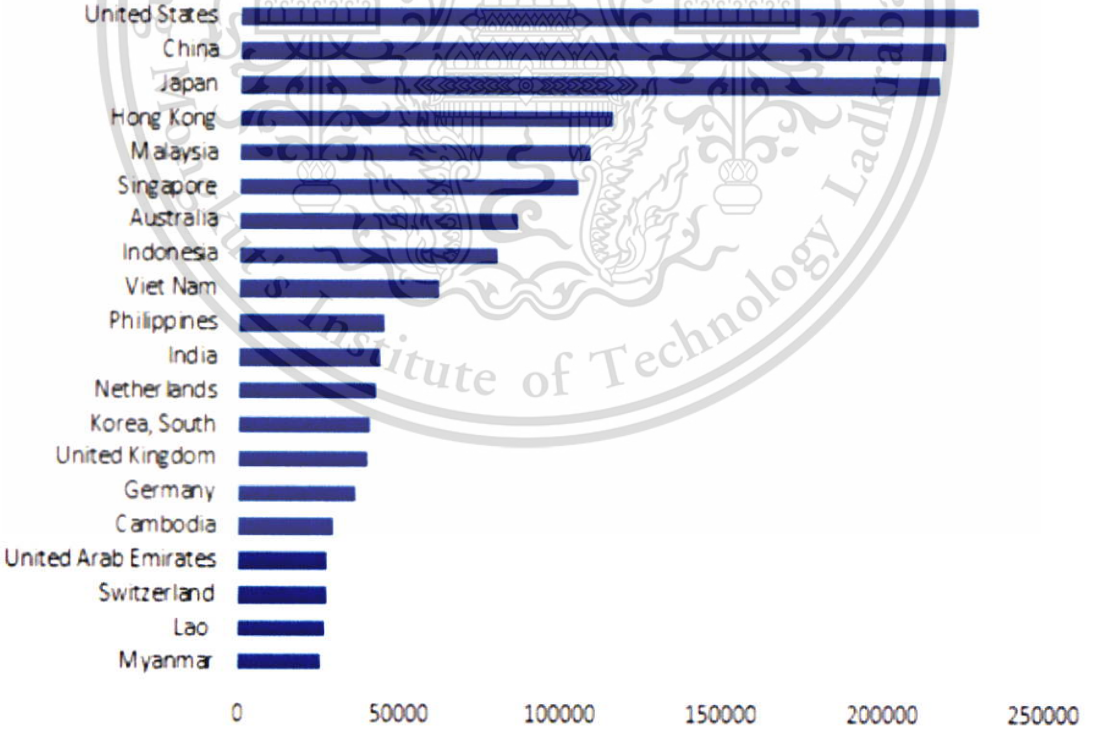

Figure 1.1 Thailand Top Exporting Partners 2005-2015 (Millions USD)

Source: Bank of Thailand, 2017

Thailand exports and imports are characterized by uneven trends affected by more external economic fluctuations. These variations affect the countries balance of trade. Figure 1.2 shows the trends of Thailand balance of trade the past ten years. This figure shows unusual patterns of trade flow comparing to exports and imports. From the year 2011 to 2015, Thailand's imports exceeded exports which resulted in a trade deficit.

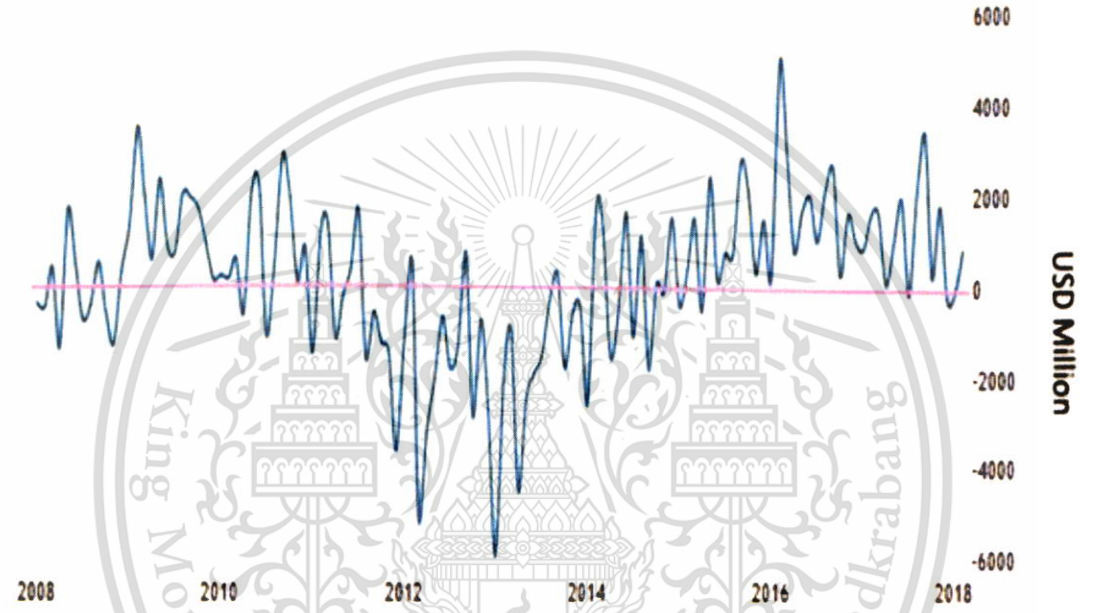

Figure 1.2 Thailand Balance of Trade, 2008-2018 (USD)

Source: TRADINGECONOMICS.COM, Ministry of Commerce, Thailand

1.1.2 Logistics Performance Index

Cross-country logistics data was a major obstacle for many researchers to compare countries in terms of logistics and supply chain parameters. The first logistics performance related data was published by Arvis et al. (2007). Since 2007, the World Bank started to publish several countries domestics and international LPI for every two years. It is based on aggregate and individual score relating to trade facilitation measures of 6 logistics sub-components. These sub-components are the efficiency of customs procedure, quality of infrastructure and transportation, shipment timeline on

schedule, quality of logistics service, ability to track and trace shipments and competitive price of international shipments. LPI is a survey-based result on logistics related measure worldwide for more than 160 countries. The report is based on more than 5000 country-specific assessments comprising several qualitative and quantitative indicators of domestic and international logistics that targets logistics providers and freight forwarders. It is conducted by 1000 logistic professionals on 5-point scale 1 (low) to 5 (high). So far, the LPI data of 2007, 2010, 2012, 2014, 2016 are available at World Bank database. For policymakers and leaders, LPI is a benchmarking tool to understand the position of their logistics performance related to trading partners. Therefore, the contribution of logistics performance in international trade is very crucial.

Thailand has been promoting to be a hub of logistics in Southeast Asia the past few years. According to the World Bank report, Thailand's LPI ranked 33rd in 2007 and 45th in 2016 out of 160 countries. From the aggregate LPI of ASEAN member countries, Thailand ranked 3rd following to Singapore and Malaysia. Laos and Myanmar are the least scorers of these countries, respectively. The list of individual and aggregate LPI scores of ASEAN countries in 2016 is shown in Appendix C.

Figure 1.3 shows Thailand's LPI score and rank for the five years. The figure depicts that Thailand shows a relative improvement in its score in 2014, but very less improvement comparing to the world ranking. This is due to other countries effort in improving their logistics performance at a greater pace than Thailand. Overall, Thailand does not show improvements over these five years. Limcharoen et al., (2017) emphasized that Thailand needs to make more improvements in logistics performance to compete in the global supply chain.

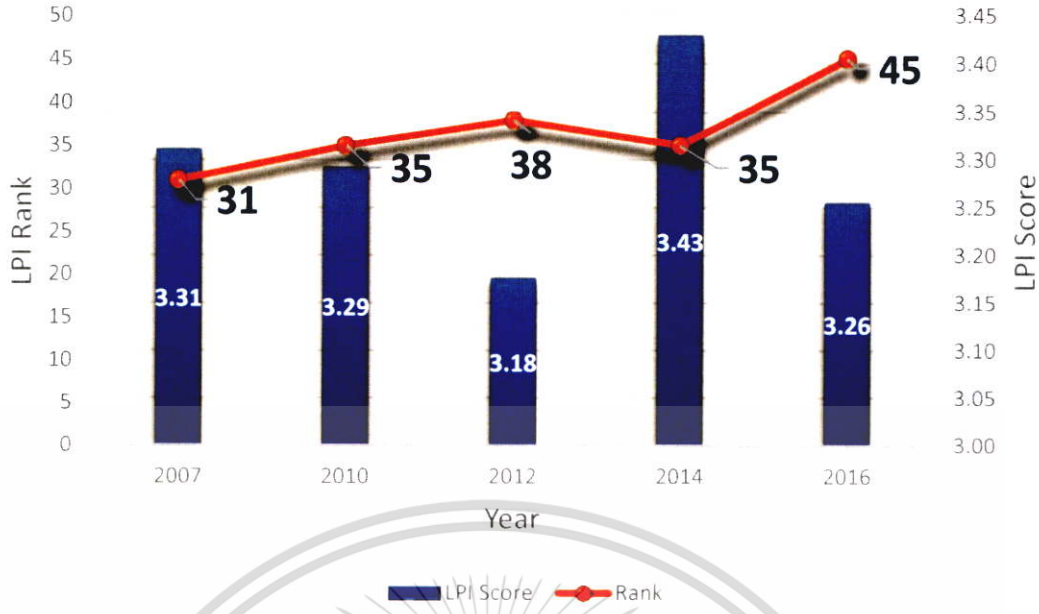

Figure 1.3 Logistics Performance Index and Rank of Thailand

Source: Summary from World Bank database

Figure 1.4 depicts Thailand's score in terms of individual logistics performance components. Compared to these logistics parameters, customs showed a slight improvement over these five years. This is an indication that Thailand shows some progress regarding customs clearance procedure for facilitating trade. As explained by Limcharoen et al. (2017), an improvement of Thailand's customs could be due to an in implementation of e-customs on government service. Overall, the figure shows that Thailand did not improve in terms of infrastructure, timelines, logistics quality competence, and tracking and tracing. International shipments showed a slight improvement over the period of 5 years. As explained by Limcharoen et al. (2017), this improvement could be due to Thailand's competitive domestics and international logistics service providers.

Thailand's ability to reach the product to consignees within the desired timeline contributes the highest score of all these six sub-components. Tracking and tracing

accounted the second highest individual score followed by international shipments, infrastructure, and logistics quality, respectively. Despite Thailand's improvements in customs clearance, customs procedure has the least score of Thailand's individual LPI. This score reminds that Thailand is required more attention on these areas to compete in the global supply chain.

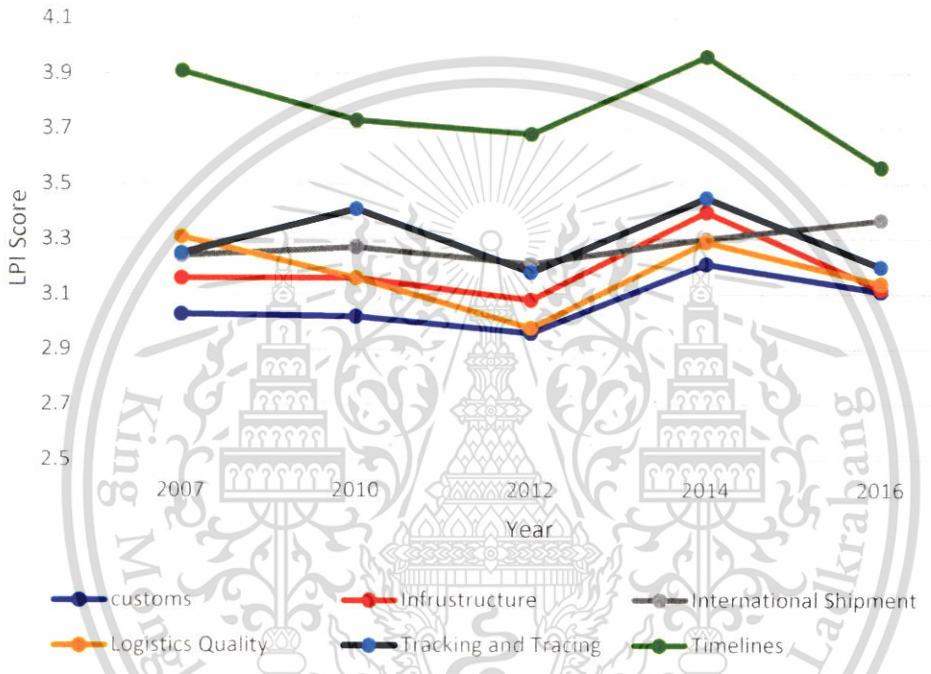

Figure 1.4 Thailand's Individual Logistics Performance Index, 2007-2016

Source: World Bank Logistics Performance Index, 2007-2016

Since cross-country data on LPI is very recent, there are only a few papers studied the link between logistics performance and trade flow. With the ever-increasing countries participation in the global supply chain, data on LPI components are expected to be more comprehensive. Furthermore, empirical studies concerning the link between logistics performance and countries trade are highly required. Therefore, how countries logistics performance affects trade flow is part of this study.

1.1.3 Free Trade Agreements

In the recent years, FTAs have been enforced at a higher rate than before. According to WTO (2017), trade agreements have been increased by over 330% since the formation of the WTO in 1995. This increment is due to countries lofty expectations to get trade freedom and expand their trade globally.

Thailand has FTAs with many trading partners recently. Association of Southeast Asian Nations Free Trade Agreement (AFTA) is among the world's significant trade agreement signed in 1992 between ten Southeast Asian countries including Thailand. The country also has a bilateral trade agreement with world's most influential countries like Japan, China, India, Australia, New Zealand, and South Korea. Figure 1.4 shows the patterns of Thailand trade agreements the past 70 years. The figure depicts that Thailand's showed recent increase on its trade agreements.

As explained by Komolavanij et al. (2008), Thailand has four main expectations from trade agreements. These are maintaining and increasing the existing trade with partners, exploring new market shares, finding a gateway to neighboring countries and penetrating a new potential market for its products. As mentioned in Chaipan et al. (2006), Thailand's FTAs have a great contributions in getting competitive raw materials, components and other inputs from new markets.

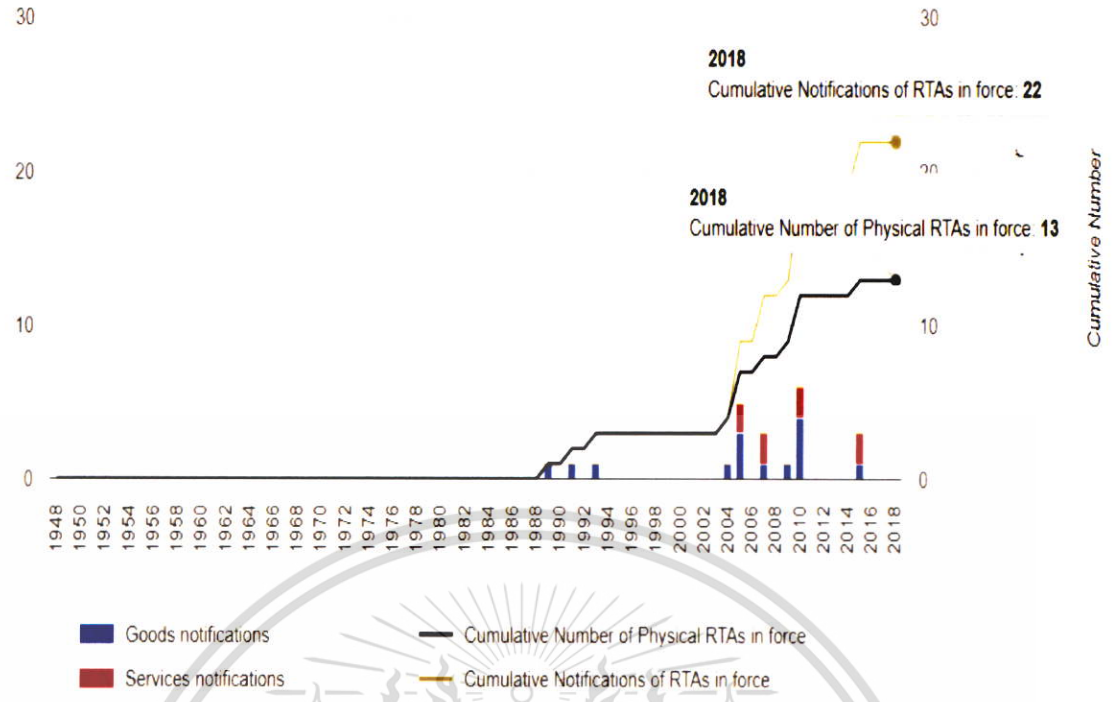

Figure 1.5 Patterns of Thailand Regional Trade Agreements, 1948-2017

Source: World Trade Organization, 2017

In general, Thailand is expected to increase trade flow and investment through these agreements. Thailand as an export-oriented country, FTAs are more important. Policymakers always seek an ex-post evaluation of FTAs whether these agreements impacted trade or not. The importance of ex-post analysis marked to the second key objective of this study.

1.2 Statement of the Problem

Countries decide to have FTAs for the expectation of trade gain from the agreements. FTAs help to reduce trade cost and customs processing time. The overall expected outcome of trade agreements is to increase partners trade flow. Despite this expectation, the real outcome of these agreements on members trade is a key to investigate.

On the other hand, LPI is a recent trade facilitation tool that measures countries logistics performance in the international trade. Better logistics performance is expected to reduce trade-related obstacles and increase country's trade.

Both FTAs and logistics performance aim for a common purpose differently. FTAs help to boost member's trade and investment by gaining the advantage of trade freedom. On the other hand, superior logistics performance is a key factor for competing in the global supply chain and international trade. Therefore, poor logistics performance and lack of mutual trade agreements may hamper a country's trade flow due to high trading costs and complex customs procedures. This study intends to examine how logistics performance and FTAs affect trade flow. Moreover, the study determines how FTAs affect logistics performance of a country.

1.3 Objectives of the Study

The study is designed based on three interlinked main objectives. These objectives are constructed to answer three different questions. How FTAs affect member's bilateral trade? How logistics performance affects trade flow? And what is the relationship between FTAs and logistics performance? More specifically, the objectives of the study are

1. To investigate the impact of logistics performance on trade flow.
2. To determine the impact of FTAs on bilateral trade.
3. To determine the relationship between a number of FTAs and logistic performance.

1.4 Scope of the Study

This study focuses on the impact of logistics performance and FTAs on trade flow, a case study of Thailand and trade partners. Thailand's top 75 trading countries

from North American Free Trade Agreement (NAFTA), European Union (EU), Association of Southeast Asian Nations (ASEAN), Middle East, and other partners are selected for this study. Thailands bilateral and regional FTAs are considered separately. A Partial Scope (PS) is an agreement that covers only certain products. Such agreements are excluded from this study because product specific agreement may not determine a complete impact of partner's trade.

The study focuses a panel data for the year 2007, 2010, 2012, 2014 and 2016. These years are choosen due to the data of LPI is available for these specified years. The study covers bilateral trade (exports and imports) between Thailand and trade partners as a dependent variable.

1.5 Significance of the Study

Logistics performance is a contemporary supply chain dimension tool that determines countries ability to deal with international trade. An empirical study on how logistics performance affects countries trade is limited. Therefore, this study will contribute to the literature concerning the link between logistics performance and trade.

Thailand's FTAs have been increased recently, while several agreements are under negotiations. Policymakers require the ex-post evaluation of such agreements on trade to make further trade negotiations. Despite an increase of Thailand's FTAs, the study on the impact of these agreements are little in the literature. This research is helpful for policymakers to determine the impact of these agreements on Thailand trade.

If both logistic performance and FTAs increase a country's trade, there could be a relationship between these variables. However, studies regarding such relationship are limited in the literature. Therefore, this research also determines how the number of FTAs affect logistics performance.

CHAPTER 2

LITERATURE REVIEW

This chapter is organized into three parts. The first part explains logistics performance and previous studies concerning logistics performance and trade flow. The second part discusses a general overview of FTAs and studies related to FTAs and bilateral trade. The last part of this chapter clarifies the popular gravity model used in this study.

2.1 Logistics Performance and Trade Facilitation

2.1.1 Overview of Logistics Performance

According to Arvis et al. (2007), LPI is a comprehensive supply chain performance measure that focuses customs procedure, logistics costs, and quality of infrastructure to the ability of tracking and tracing shipments, the reliability of timeliness, and the competence of international shipments. The explanation of each of the six components is as follows:

1. **Customs:** measures countries customs procedure regarding speed, ease of processing and efficiency. This indicator includes imports and exports taxes on different goods and services. This parameter is critical for smooth trade facilitation.
2. **Infrastructure:** this sub-component measures the quality of infrastructure and transportation system of a country. It evaluates how easy goods can move from origin to destination. The cost and delivery time of traded item highly influence by the quality and availability of infrastructure. Transportation affects countries trade flow positively or negatively.

3. **Logistics service quality**: it is the competency of logistics service of a country related to other countries. This indicator measures the competitiveness of logistics service providers in delivering a competitive logistic service through the chain. Logistics quality is a very important parameter that affects the other sub-components and the whole supply chain.
4. **International shipments:** it is a country's ability to arrange international shipments at a competitive price. In addition to effective customs procedure and competitive means of transportation, shippers and consignees also concern about shipping costs. This parameter is also critical for countries to compete with the global shipping price.
5. **Tracking and tracing:** it is the ability of a country to trace and track the route and location of the product up to the end user. This is an outcome of the other LPI sub-components. This parameter is important in managing the product across the supply chain.
6. **Timeliness**: it measures the frequency and punctuality of shipments to reach consignees within scheduled delivery timelines. This parameter is also a result of the other components. To comply with the promised timelines, quality of logistics, customs, and transportation and communication are highly required.

According to Arvis et al. (2014), customs, infrastructure, and quality of logistics are considered as inputs that policymakers need to emphasize. While, ease of international shipments, tracking and tracing, and timelines are the outcome that can be measured in terms of time, cost and reliability. Figure 2.1 shows the input and output of the logistics and supply chain components.

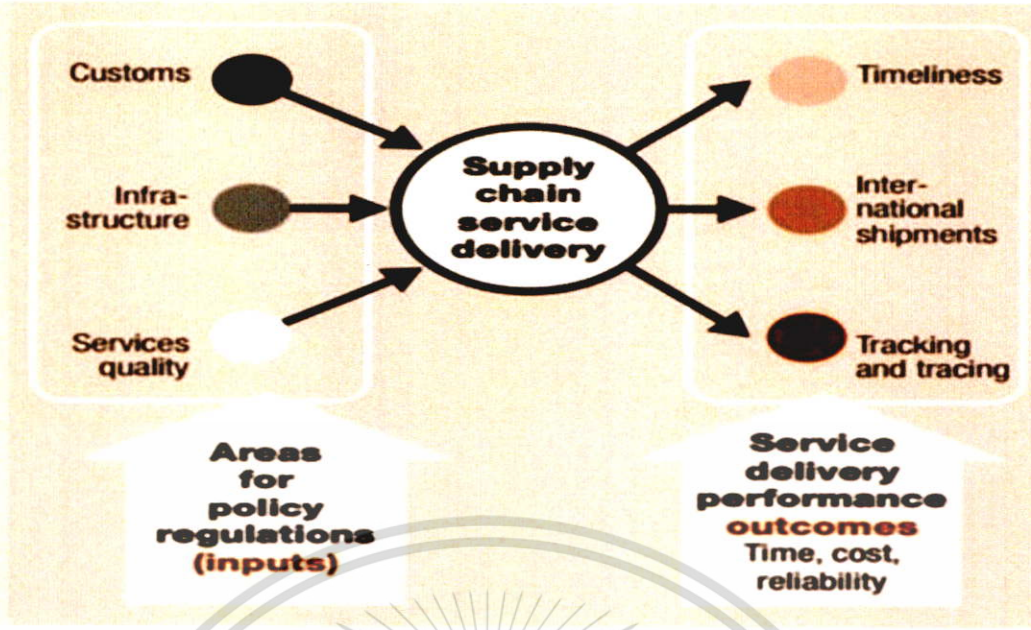

Figure 2.1 Input and Output Sub-components of LPI

Source: Arvis et al. (2014) Connecting to Compete: Trade Logistics in the Global Economy. *The World Bank, Washington, DC.*

According to Arvis et al. (2007), developed countries are the top players of LPI comparing to developing countries. Another important findings of the survey were a huge LPI gap between two developing countries even if they had similar levels of development.

2.1.2 The Relationship between Logistics Performance and Trade

An empirical study on the link between logistics performance and trade flow is very limited in the literature. This is due to the absence of cross-country logistics related measures. Gani (2017) reminded that research related to the relationship between countries logistics performance and trade deserves more future studies.

World Bank data conducted by Arvis et al. (2007) is the first attempt at determining and comparing different countries in terms of logistics performance. The study explained that good logistics performance is a means to increase country's trade and FDI. The study concluded that logistically well-equipped countries involve in

more global trade. On the other hand, increased trade of a country demands a good logistics performance for better trade facilitation.

The subsequent publication of LPI by the World Bank continued to analyze different countries logistics performance in terms of trade facilitation. They indicated that countries with lower logistics performance required more time for customs and physical inspections that increase lead time of imports and exports. Therefore, countries effort to improve LPI would reduce cost and shorten the required lead time. Imports require slightly more procedures than exports, so that, it need more processing time (Arvis et al., 2010; Arvis et al., 2012; Arvis et al., 2014; Arvis et al., 2016).

Felipe & Kumar (2010) studied the impact of trade facilitation on bilateral trade using gravity model for Central Asian countries. The result revealed that a significant trade gain had been achieved from improvements in LPI for these countries. Infrastructure, quality of logistics service and efficiency of customs are found to be more significant than the other sub-components. The study found that 1% improvement in logistics performance increases export and import by 5.5% and 2.8%, respectively.

Martí et al. (2014) studied the impact of logistics performance on exporting and importing countries separately using gravity model for the year 2005 and 2010. The result showed that an improvement of logistics performance indicators leads to a significant increase of trade flow more specifically to countries export. Furthermore, the study found that countries effort in improving their LPI increase trade relations with other countries.

Bensassi et al. (2015) studied the impact of logistics and infrastructure on trade flow at a regional level for 19 Spanish regions and 45 countries destinations. The result showed that logistics performance is an important variable for determining bilateral trade flow.

The recent study by Gani (2017) focused on the impact of aggregate and individual LPI components on trade. The result revealed that all the LPI components positively affect both export and import with slightly favored to exports. The study concluded that a continuous achievement of logistics performance positively influences international trade.

The overall study in the literature regarding the link between logistics performance and trade facilitation concludes that, logistics performance is an important determinant of trade. Table 2.1 is a summary of studies and major findings regarding logistics performance and trade.

Table 2.1 Studies on Logistics Performance and Trade Flow

Author	Study	Methodology	Key Findings
Felipe & Kumar (2010)	Trade facilitation-Bilateral trade	Gravity equation OLS	1% improvement of LPI increases exports by 5.5% and imports by 2.8%. LPI Inputs have more impact on trade flow than LPI outcome.
Martí et al. (2014)	LPI – Import LPI – Export	Gravity equations Heckman two-step procedure	Improvements of any LPI significantly grow trade flow more specifically for exporters than importers. Improvement of LPI increase countries trade relations.
Bensassi et al.(2015)	LPI & transport-Trade flow	Gravity model	Significant impact of logistics performance on Trade flow.
Gani (2017)	LPI – Import LPI – Export	Gravity Model Pooled OLS	Positive impact of aggregate LPI on exports and imports. Individual LPI is more significant for exporters than importers.

2.2 Free Trade Agreements and Trade

2.2.1 Overview of Free Trade Agreements

Traditionally, FTAs were considered as CU, and it was not analyzed until the start of NAFTA (Krueger, 1997). According to WTO, Regional Trade Agreements (RTAs) can be FTAs, CU, Economic Integration Agreement (EIA), and PS. EIA focuses on service agreements, while FTA concerns goods. PS is an agreement covers only certain products and not referred under WTO. Trade agreements, whether bilateral trade or multilateral agreement is intended to reduce trade barriers and increase economic collaboration between partners (Smith, Sumner, & Rosson, 2001).

The recent propagation of FTAs between nations demanded an extensive study on several agreements. According to WTO (2018), there were only 124 regional trade agreements before 1995. But, after the formation of WTO in 1995, notifications of FTAs increased to over 540 by 2017. The report showed that there were 285 active cumulative physical FTAs in to force up to 2017. All WTO member countries have at least one RTAs (WTO, 2018). Figure 2.2 shows a dramatic increase of FTAs after 1995. Countries make trade agreements to gain the advantage of trade freedom. But, as Baier & Bergstrand (2005) argued, countries may not have FTAs randomly, rather, they may endogenously select their FTAs due to many unobservable reasons related to trade level.

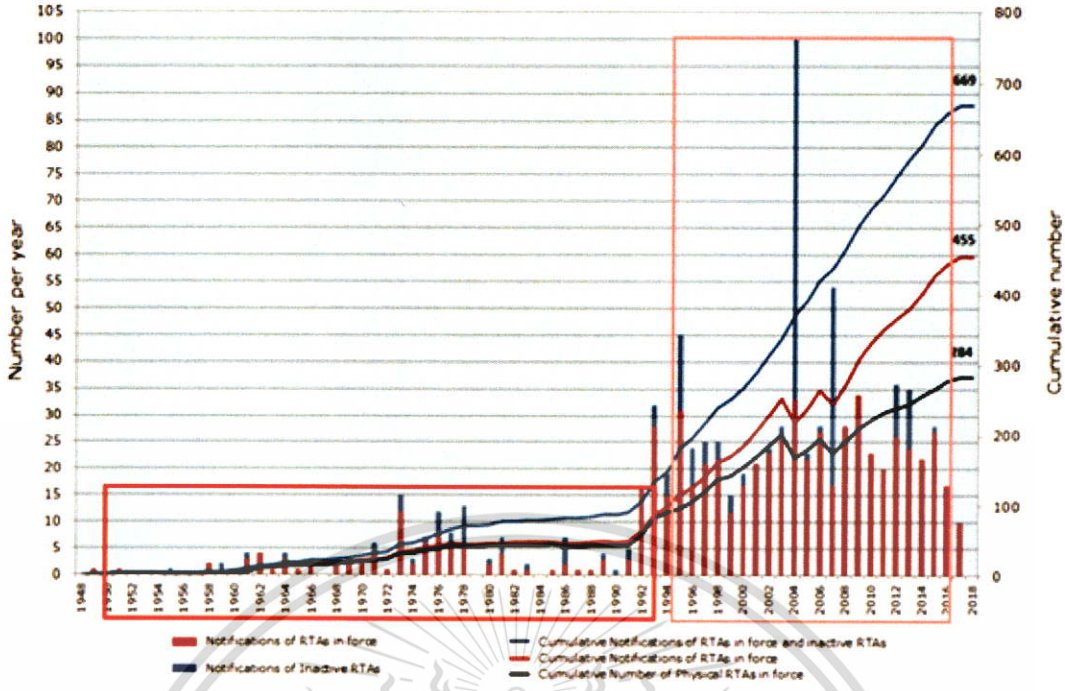

Figure 2.2 Evolution of Regional Trade Agreements, 1948-2018

Source: WTO, Regional Trade Agreement Section, 2018

2.2.2 Free Trade Agreements and Bilateral Trade

The studies on FTAs and bilateral trade became a very popular subject for the past few decades. These studies are either ex-ante (a predictive analysis for entering FTAs), or ex-post (analysis after the enforcement of FTAs). Most of the studies in the literature focus on an ex-post analysis of trade creation and trade diversion effect between the members. Chaney (2008) explained that a change in trade flow due to a reduction of trade barriers can be described through the intensive and extensive margin of trades. The intensive margin explains how much the size of export changed after the agreement, while the extensive margin examines how much a country exports to new market.

Khurana & Nauriyal (2017) studied an aggregate ex-post trade creation and diversion effect of ASEAN-India FTAs using gravity model. The results revealed that, all the gravity variables are significant, but a trade diversion effect that reduced export

occurred following the agreement. Table 2.2 is summarized from the recent studies compiled by Khurana & Nauriyal (2017) and other researches related to FTAs and trade flow. Further studies on this topic is also explained in the gravity model, section 2.3.

Table 2.2 Summarized Study of Free Trade Agreement and Trade

Author	Sample	Methodology	Key Findings
Haveman & Hummels (1996)	EU EFTA	Standard Gravity model	EC increased trade both with members and non-members.
Endoh (1999)	EEC LAFTA CMEA	Panel and cross-sectional using OLS	EECs trade has increased within and outside members. LAFTA has stagnated TC and negative TD. CMEA has positive TC and negative TD.
Elliott & Ikemoto (2004)	AFTA	Log-form OLS triple-indexed.	ASEAN increased trade with members and non-members. ASEAN retained openness despite AFTA and Asian economic crisis.
Hapsari & Mangunsong (2006)	AFTA	OLS	Trade diverting results for AFTA for 1993–2003
Baier & Bergstrand, (2007)	96 world trade partners	OLS Fixed effects, random effects	FTAs double two members' bilateral trade after ten years.
Caporale et al. (2008)	EU and Non-members	Fixed Effect and Hausman test	EU trading member countries trade 14.0% more than non-members.
Baier & Bergstrand (2009)	EEC CACM	OLS, Fixed Effects with Matching Econometrics	Long-run effects of FTAs increase trade of members by 100%.
Kainulainen (2011)	FTA impact on Brazil, India, and China	Instrumental variable and OLS	A significant increase in trade flows, but at the cost of large TD

Author	Sample	Methodology	Key Findings
Sen et al. (2015)	Impact of 11 FTA on India and China	Poisson and zero-inflated negative binomial	India recorded net TD effect on its exports and insignificant effect on imports. China gain on both imports and exports.
Anderson & Yotov (2015)	41 trading partners and rest of the world	OLS estimates	Some countries gain over 5% trade, a few lose less than 0.3%, and global efficiency rises 0.9%

Note. OLS = Ordinary Least Squares; TD = Trade Diversion; TC = Trade Creation; EEC = European Economic Community; EFTA = European Free Trade Agreement; CMEA = Council for Mutual Economic Assistance; LAFTA = Latin America Free Trade Agreement; CACM = Central American Common Market

2.2.3 Thailand Free Trade Agreements and Trade

The main reasons for Thailand's recent interest on FTAs are to get trade freedom and creates economic aliens with different countries to expand trade and investment (Komolavanij et al., 2008). As mentioned by Komolavanij et al. (2008), FTAs is very crucial to get market for Thai products and make Thailand an attractive place for FDI.

Chaipan et al. (2006) studied the impact of regional economic integration on Thailand's economy specifically on growth, poverty and income distribution with six trading partners using a global Computable General Equilibrium (CGE) model. The result found a positive impact on output, welfare, and foreign investment, but income distribution varies on different trade sectors and FTAs. The study suggested that Thailand needs to boost economic integration with East Asia to gain potential trade.

Athukorala & Kohpaiboon (2011) studied the impact of Thailand–Australia Free Trade Agreement (TAFTA) on bilateral trade. It is found that Australian–Thailand bilateral trade has expanded faster since TAFTA came into force in 2005. Comparing to country specific trade flow, the study found that Thailand's exports to Australia

sharply increased after TAFTA. However, there was no deviation in Australia's exports to Thailand after the agreement.

Hayakawa (2014) studied the impact of bilateral and multilateral FTAs between Japan and Thailand using diagonal cumulation rule. The study used diagonal cumulation to distinguish between multilateral FTAs and multiple bilateral FTAs. The study argued that, regarding trade creation effects, a multilateral FTA with the diagonal cumulation rule is different from multiple bilateral FTAs. The study found 4% trade creation of the agreement although it is much smaller than previous estimates.

Jongwattanakul (2014) studied the impact of tariff between Most Favored Nations (MFN) and preferential tariffs between Thailand and 173 trade partners using gravity model. The study focused on the AFTA, Japan-Thailand, Thailand-Australia, Thailand-New Zealand, and ASEAN-China FTAs. It is found that zero-one dummy variable has different results from calculating the gap between MFN and preferential FTAs.

2.3 Gravity Model and Trade Variables

To determine the ex-post impact of FTAs on members trade, the gravity model is the most successful and popular model since its first application by Tinbergen in 1962. It has been augmented with different trade determinant variables and applied in several areas for the past five decades. The model is popular due to its ability to constantly apply for a set of variables. As its name indicates, the concept of the gravity model emerged from Newtonian universal law of gravitational force. The force of attraction between two objects is proportional to their masses and inversely related to the square of their distance. Equation 2.1 shows the initial concept of newton's gravity model.

$$F_{ij} = G\frac{M_i M_j}{D_{ij}^{\ 2}} \qquad (2.1)$$

Where, F_{ij}= Gravitational attraction

M_iM_j = The mass of two objects

D_{ij} = The distance between the two objects

G = Constant term

Its first application in the international trade appeared in 1962 by Tinbergen. Derived from Newton model, the first gravity equation assumed trade between two nations is positively related to their Gross Domestic Products (GDP) and inversely related to the geographic distance between them. Tinbergen proved that countries with large economic size and geographically close have more trade between them. Since then, many researchers followed gravity model to analyze the impact of FTAs on bilateral trade, FDI and other dependent variables. Equation 2.2 represents the first traditional gravity model appeared in international trade.

$$T_{ij} = K\frac{Y_i Y_j}{D_{ij}} \qquad (2.2)$$

Where, T_{ij}= Total trade flow from country i to country j

Y_iY_j = Gross Domestic Product or Gross National Product

D_{ij} = The distance between two countries i and j

K = Constant term

The first empirical research regarding the impact of FTAs using the gravity model studied by Aitken (1973). This study analyzed the effect of EEC and EFTA on trade flow of the member countries using least squares regression method from 1951-

1967. This study considered export as a dependent variable and income of exporting countries, income of importing countries and distance as independent variables. Since then, many researchers tested different variables to determine the effect of trade agreements on member's trade using gravity model. From review of the literature, the following variables are commonly used as dependent and independent variables in the gravity model.

2.3.1 Trade Flow

From the study of the literature, the dependent variables for gravity model relating to trade flow are export, import, or trade volume. The choice, whether to use export, import or total trade as a dependent variable is a question of many researchers. As mentioned in Jongwattanakul (2014), a partial analysis is to study either import or export as a dependent variable while total analysis considers countries total bilateral trade. Unidirectional analysis either export or import is commonly used in the literature by the traditional assumption that the impact of gravity model on export and import is similar although it might not be the same. Baldwin & Taglioni, (2006) suggested that gravity equation is a unidirectional trade flow because averaging bilateral trade might make it difficult to distinguish between the country of origin and the country of destination. Rahman (2003) used a generalized gravity model considering total trade as a dependent variable to analyses Bangladesh's trade with its major trading partners. Do (2006) applied bilateral trade using gravity model to analysis trade between Vietnam and twenty-three European countries from 1993 to 2004. Therefore, the dependent variable in the literature is either unidirectional trade or bilateral trade.

2.3.2 Gross Domestic Product, GDP per Capita, and Population

To measure the economic mass of trade partners, GDP, GDP per capita, or/and the number of populations are mostly used in the literature. GDP of destination

determines the amount of expense on tradable goods while GDP of the origin determines the amount of tradable production (Baldwin & Taglioni, 2006). GDP indicates the economic size, demand level and consumption of the country.

GDP per capita is GDP divided by the number of population in a specific year. In the gravity model, either population or GDP per capita is used to measure the market size of a country. Countries of high GDP per capita are expected to have more trade transactions than the lower income.

From the summary of the literature, either separate or aggregate product of GDP or GDP per capita of the trading countries is used as an independent variable. According to Jongwattanakul (2014), the choice of using aggregate or separate GDP depends on the choice of the dependent variable either partial or total analysis. When bilateral trade is considered as a dependent variable, the product of GDP is used as a independent variable. On the other hand, partial analysis considers GDP of both nations separately. Baldwin & Taglioni (2006) suggested that, examining the product of two nations' GDP rather than separate gives the complete bilateral results.

2.3.3 Distance

Distance is the most commonly used variable in the gravity model. In most studies, it is inversely related to trade flow. The greater the distance between two countries economic centers, the higher the transportation costs and the less the transaction between them. Distance is measured between two capital cities of the trading partners. In some cases, two capital cities might be geographically close, but a country might have many alternative trading countries nearby. Do (2006) also explained that distance might not be very accurate measure in case a country may have many economic centers.

2.3.4 Membership of Free Trade Agreements

Many research papers included FTA as a determinant for bilateral trade flow. This variable is represented by binary number 1 and 0 between country *i* and *j* in year *t*. If two countries have FTAs, the variable takes the value of 1, otherwise 0. Yang & Martinez-Zarzoso (2014) explained that trade agreements depend on unobservable heterogeneity because there might be another reason for a country to enter into an agreement. These factors are difficult to trace, and it may lead to an endogeneity bias due to an omission of some variables. The study suggested that countries specific year effect of the agreement can reduce this problem. Jongwattanakul (2014) argued using one and zero to indicate countries FTAs may not properly capture the impact of these agreements across the different period as more years into the agreement may have more impact on the FTA. Khurana & Nauriyal (2017) also suggested using time-varying country dummies and time-invariant pair dummies determine the real impact of FTAs on trade flow.

As explained in the FTAs section 2.2, many researchers studied the impact of FTAs on trade flow applying different trade variables. Do (2006) found that GDP, population, and real exchange rate positive impact, while distance and common history no effect on Vietnam and twenty-three European countries.

Nguyen (2010) studied the determinants of Vietnam exports using gravity model for a period of 20 years. The study found a positive relationship between exports and GDP, exchange rate and membership of AFTA and a negative relationship with geographic distance.

Khurana & Nauriyal (2017) examined the impact of ASEAN-India FTAs on exports for a sample of 33 countries from 2000 to 2015. The sample includes both members and non-members nations to determine if the trade is created at the expense

non-member nations. The results revealed that GDP and sharing common border positively, while distance negatively affects export flows. Historical colonial ties had insignificant impact on the trade flow.

2.3.5 Real Effective Exchange Rate

Real Effective Exchange Rate (REER) is another variable added recently in the gravity model to control the impact of partners' exchange rate fluctuation on trade flow. As explained in Hoai & Huy (2015), the assumption of this variable is that the exchange rate influences price between two trading partners. When REER is high for the exporting country, the products price may be high and leads to lower trade flow. When the exporter's currency depreciated, the commodity of that country relatively becomes cheaper and leads to more trade flow. According to Darvas (2012), REER between two countries currency is calculated using the formula represented by Equation 2.3.

$$\mathrm{REER}_t^{\mathrm{d}} = \mathrm{NEER}_t^{\mathrm{d}} \frac{\mathrm{CPI}_t^{\mathrm{d}}}{\mathrm{CPI}_t^{f}} \qquad (2.3)$$

Where, REER=Real Effective Exchange Rate of domestic country in year t

NEER=Nominal Effective Exchange Rate of domestic country in year t

$\mathrm{CPI}^{\mathrm{d}}$ = consumer price index of domestic country in year t

$\mathrm{CPI}^{\mathrm{f}}$ = consumer price index of a foreign country in year t

Rose & Wincoop (2001) studied the effect of Economic and Monetary Union (EMU) currency as a trade barrier of European countries. The study found EMU increase trade by 50% for eurolands. Do (2006) found a negative impact of exchange rate on Vietnam's trade with 23 European countries. The study found that 1% appreciation of Vietnam's currency reduces trade by 0.03%. The impact of this variable might be positive, negative or no effect.

2.3.6 Remoteness

Multilateral trade resistance term is a recent argument appeared in the gravity model that measures the remoteness of the trading partners from the rest of the world. According to Anderson and Wincoop (2003) cited in Hannan (2016), "the propensity of country *j* to import from country *i* is determined by country's trade cost toward *i* relative to its overall resistance to imports (weighted average trade costs) and the average resistance facing exporters in country *i*". This variable measures a country's average weighted distance from its trading partners considering the shares of world GDP. This explanatory variable is created to overcome the shortcoming of the distance measure between two countries.

2.3.7 Logistics Performance Index

LPI is a recent variable appeared in the gravity model to determine the impact of logistics performance in international trade. As explained in section 2.1, this variable is only considered recently due to unavailability of data. Hertel & Mirza (2009) first analyzed the role of trade facilitation on trade flow using gravity model. The result reviled that, trade facilitation is an important determinant of global trade. Felipe & Kumar (2010) studied LPI of 2007 as an independent variable to determine the impact of the individual sub-components on trade flow. The result showed that, LPI plays a significant role in enhancing trade between partners. Recent researches of Martí et al. (2014), Bensassi et al. (2015), and Gani (2017) also found a positive relationship between LPI and trade flow using gravity model.

2.3.8 Other Dummy Variables

Other dummy variables always included in the gravity model to analyze the effect of qualitative variables such as border, languages, colonial history, number of

ports, and others. These explanatory variables use binary numbers 1 and 0 and are expected to have a positive impact on bilateral trade.

Equation 2.4 represents a summary of the main and explanatory variables used in the gravity model. This research paper follows a bilateral effect of the gravity model for a total of imports and exports of trade partners.

$$\ln(T_{ijt}) = \beta_0 + \beta_1 \ln(GDP_{ijt}) + \beta_2 \ln(GDPPC_{ijt}) + \beta_3 \ln(Distance_{ij}) + \beta_4 FTA_{ijt} + \beta_5 REER_{ijt} + \beta_6 LPI_{ijt} + \beta_7 Border_{ij} \quad (2.4)$$

Where, ln= Natural logarithm

T_{ijt} = Trade between two trade countries in year *t*

GDP_{ijt} = Product of GDP of two trading partners in year *t*

$GDPPC_{ijt}$ = Product of GDP per capita of two trading partners in year *t*

$Distance_{ij}$ = Distance from trade center of country *i* to *j*

FTA_{ijt} = Membership of Free Trade Agreement in year *t*

$REER_{ijt}$ = Real Effective Exchange Rate between partners in year *t*

LPI_{ijt} = Logistics Performance Index of trade partners in year *t*

$Border_{ij}$ = Common border between trading partners

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

Research can be classified as descriptive, correlational, explanatory or exploratory based on its intended objectives (Kumar, 2011). This research paper is correlational that investigates a quantitative relationship between logistics performance, FTAs and trade flow. This chapter is organized into four parts. First, the hypothesis for this study is formulated followed by the study sample. Then, data collection methods and source of the data is explained in detail. Finally, this chapter explains the model and how the data is analyzed.

3.2 Research Hypothesis

Before explaining about sample and data collection, the null hypothesis and the alternative hypothesis are chosen. The null hypothesis is represented by H0, while the alternative hypothesis (opposite of the null hypothesis) is H1. Based on the objectives of this study, the research paper explores the following research hypotheses

Hypothesis 1:

H0: There is no relationship between logistics performance and trade flow.

H1: There is a relationship between logistics performance and trade flow.

The argument for this hypothesis is good logistics performance can boost trade between trading partners. Trade with logistics advanced countries require less processing time and cost. This logistics advancement might lead trade with these countries to be preferable.

Hypothesis 2:

H0: Free Trade Agreements cannot increase member's trade.

H1: Free Trade Agreements increase member's trade.

The second objective of the study determines the impact of FTAs on bilateral trade flow. The argument for this hypothesis is how FTAs affect member's bilateral trade comparing to non-FTA members.

Hypothesis 3:

H0: There is no relationship between FTAs and logistics performance.

H1: There is a relationship between FTAs and logistics performance.

Beside creating economic integrations, FTAs could improve trade facilitations relating to logistics performance. Therefore, the third hypothesis determine how the number of FTAs affect logistics performance.

Furthermore, all the explanatory variables are tested its significance to the dependent variables.

3.3 Sampling Design

To get a sample out of the whole, the population being studied needs to be defined. As explained in Zikmund et al. (2009), a population is any complete group that shares some common set of characteristics. The population for this study is Thailand's world trading partners. From this population, Thailand's top 75 trading partners are selected as a sample for the study. The sample countries are categorized into 5 groups by the Bank of Thailand; NAFTA members (3), EU members (28), ASEAN members (9), Middle East countries (9) and other partners (26). Figure 3.1 displays the grouping and percentage of Thailand's top 75 trading partners based on the Bank of Thailand. The list of countries in the study is in Appendix A.

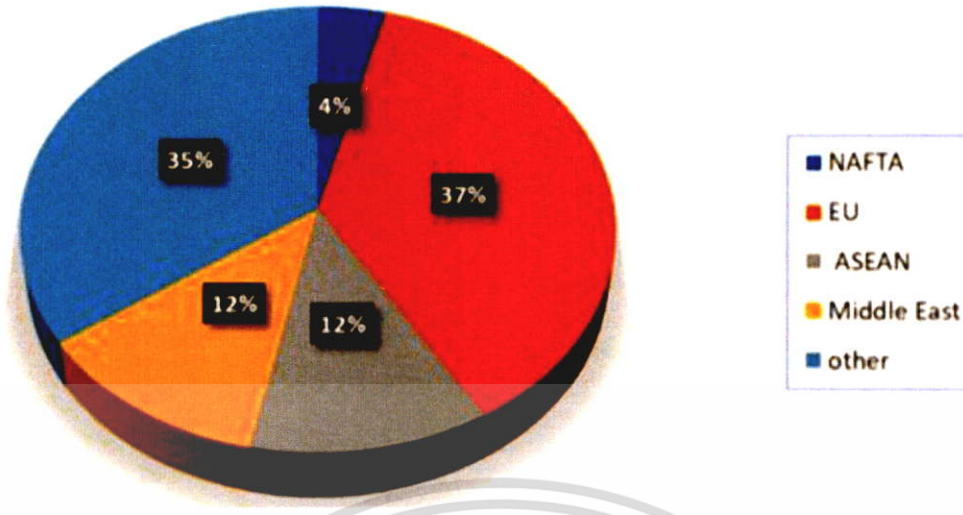

Figure 3.1 Thailand's Group of 75 Trading Partners

Source: Bank of Thailand, 2018

This sample represents both Thailand FTA members and non-members to determine the difference between them. This is important to appropriately estimate whether the created trade comes at the expense of the non-member nations as explained by Khurana & Nauriyal (2017).

This research followed a purposive sampling which represents non-probability sampling techniques as the researcher choose these countries. These countries are selected because of availability of the required data for this study. Taiwan is excluded from this study due to incomplete data.

3.4 Data Collection Methods

This research paper used secondary data from different data sources. To get more information about the topic, different literature related to the research area has been reviewed. The actual data is gathered from Bank of Thailand, World Bank, GeoDist database, Bruegel database and WTO. Data is collected for the period of 5

years, 2007, 2010, 2012, 2014, and 2016. These years are selected due to World Bank data publication for LPI.

The nature of the study is cross-sectional time series data, which is characterized by time fixed and variable data. This study used a panel data to capture the relationship between variables over an extended period. Using panel data also helps to monitor unobservable pair individual effects of trading partners. As Do (2006) explained, panel data offer more variability, more degree of freedom and reduce the collinearity among explanatory variables.

The dependent variable of this study is a bilateral trade (export plus import) denoted by T_{ijt} which indicates trades from country i to country j in period t at current USD. The data of Thailand bilateral trade with partners is extracted from Bank of Thailand in US Dollar.

The data of GDP and GDP per capita is based on constant US 2010 from World Bank indicators. The distance between partners' capital cities is extracted from CEPII database in kilometers (km). REER is gathered from Bruegel database indexed based on the year 2010. The ratio of Thailand's REER and trade partners is calculated. The aggregate data of LPI are collected from World Bank indicators for 2007, 2010, 2012, 2014 and 2016.

FTAs are constructed into two data sets. The first FTA is an agreement between Thailand and trade partners in year t. This data is denoted by binary number 1 and 0. This variable takes the value of 1 if the country has FTAs with Thailand, otherwise 0. To show the specific effect, bilateral FTAs and AFTA are treated separately. The second FTA data is the number of trade agreements (excluding PS) for the selected countries. Data for the number of FTAs are collected from RTAs, WTO database, 2018.

The dummy variables of language and colonial history are excluded from this study. This is because there is no country which has a common language and colonial history with Thailand. Common border is considered for this model and represented by binary numbers 1 and 0. If Thailand and trade partners have a common border, the variable takes 1, otherwise 0. Remoteness is calculated based on the data of countries GDP, world GDP, and distance.

3.5 Data Analysis

As explained in the literature review section, the most popular and powerful tool to measure the impact of FTAs and logistics performance on bilateral trade is the gravity model. This research follows an augmented gravity model constructed into three equations based on the research hypotheses. The explanation of each variable in the equation is explained in section 2.3.

$$\ln(T_{ijt}) = \beta_0 + \beta_1 \ln(GDP_{ijt}) + \beta_2 \ln(GDPPC_{ijt}) + \beta_3 LPI_{ijt} + \beta_4 \ln(Distance_{ij}) + \beta_5 REER_{ijt} + \beta_6 Border_{ij} + e_{ijt} \quad (3.1)$$

Equation 3.1 determines the effect of logistics performance on trade flow. This equation tests how countries logistics performance affects the trade between them. In this model, LPI is a main variable, while other explanatory variables that determine trade between two countries are considered.

$$\ln(T_{ijt}) = \beta_0 + \beta_1 \ln(GDP_{ijt}) + \beta_2 \ln(GDPPC_{ijt}) + \beta_3 FTA_{ijt} + \beta_4 \ln(Distance_{ij}) + \beta_5 REER_{ijt} + \beta_6 AFTA_{ij} + \beta_7 Border_{ij} + e_{ijt} \quad (3.2)$$

Equation 3.2 determines the effect of FTAs on bilateral trade considering different explanatory variables. In this equation, Thailand bilateral trade is represented by β_3 while AFTA represents ASEAN Free Trade Agreement denoted by β_6. These trade agreements are expected to have a positive impact on Thailand's trade with members.

$$\ln(LPI_{ijt}) = \beta_0 + \beta_1 \ln(GDP_{ijt}) + \beta_2 \ln(GDPPC_{ijt}) + \beta_3 NFTA_{ijt} + \beta_4 Rem_{ijt} + \beta_5 REER_{ijt} + \beta_6 FTA_{ijt} + e_{ijt} \quad (3.3)$$

Equation 3.3 determines the relationship between logistics performance and number of FTAs. In this model, LPI is a dependent variable. This model tests how the number of FTAs affect countries logistics performance. It is based on an argument that countries with many FTAs get more trade freedom. As a result, their logistics performance can be improved. In summary, this model proves how FTAs supplement countries logistics performance.

These equations are analyzed using STATA 13.0 software due to its access and convenience to run panel data. Based on the literature, pooled Ordinary Least Square (OLS) is the most commonly used method of gravity model. This estimator is simple and best fit if the data is complete. But it has been criticized due to variable correlation and heteroscedasticity problem. Fixed effect estimator is recommended as it accounts for unobserved individual fixed effect on each country. But this model cannot work for variables that are constant over time. Therefore, this estimator cannot be considered for this study due to the nature of the data. Random Effect estimator assumes unobserved heterogeneous components are randomly distributed across observations. This method helps to overcome the problem of fixed effect, but it is criticized due to a correlation between the explanatory variables. Poisson Pseudo Maximum Likelihood (PPML) is a

recent gravity estimator that assumes variables have a generalized linear Poisson distribution. This estimator is good for incomplete or zero data in observation, but it is also criticized due to its overestimation of the coefficient of variables. Therefore, considering the nature of the data, this research paper used pooled OLS estimator to analyze the model.

CHAPTER 4

RESULTS AND DISCUSSION

This chapter explains the main findings of this study supported by detailed discussion. The chapter is organized into two parts. The first part explains Thailand logistics performance comparing to balance of trade. The second part discusses the regression results organized based on the three-basic hypothesis of this study. The first regression equation determines the impact of logistics performance on bilateral trade followed by the impact of FTAs on trade flow. Finally, the relationship between these two variables is discussed in detail.

4.1 Thailand's Logistics Performance and Trade Flow

Figure 4.3 shows Thailand balance of trade and LPI for the five years period. The figure depicts that Thailand's export outweighs import for these specified years. When the LPI reduced between 2007 and 2010, the same rate of reduction in the balance of trade is recorded. In 2012, Thailand's LPI reduced to its lowest margin. At the same time, balance of trade decrease dramatically. As explained in the literature review section, an improvement in LPI leads to an increase of export more than import. This could be a reason that a reduction in logistics performance reduced Thailand's balance of trade. For the year 2014, the figure depicts that Thailand improved in its logistics performance. This also shows an increase in terms of trade flow of Thailand. The figure simply shows that, a reduction of LPI decreases countries trade balance. However, the years 2016 did not support this relationship. Despite a reduction in LPI, Thailand's balance of trade increased. In general, this figure illustrates that there is a positive

relationship between logistics performance and Thailand's trade flow. However, further statically regression is analyzed in the next section.

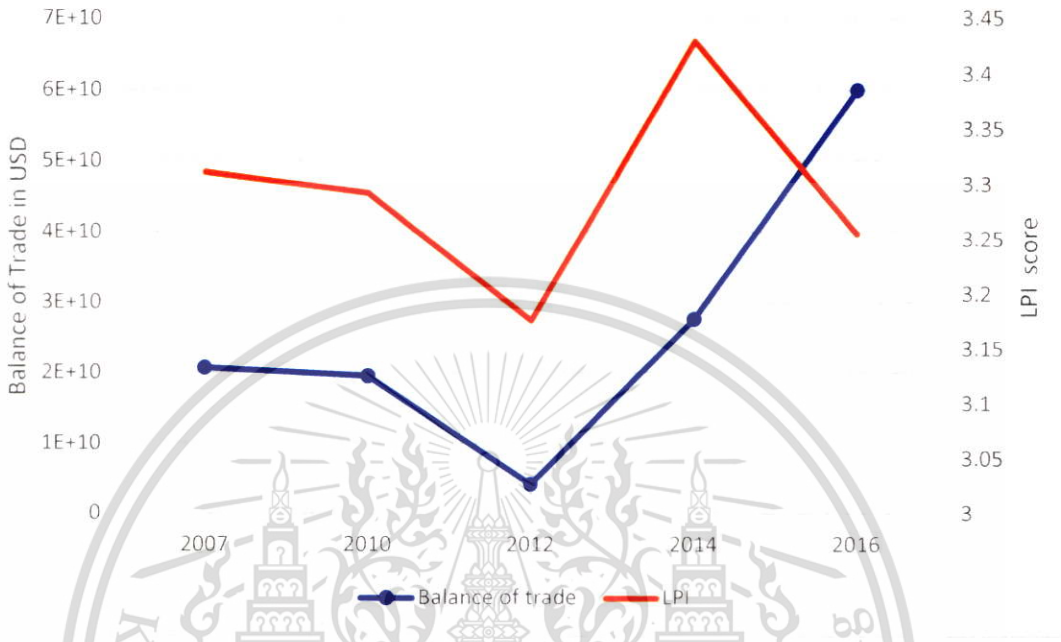

Figure 4.1 Thailand's LPI and Balance of Trade, 2007-2016

Source: World Bank indicators trade and Logistics Performance Index, 2007-2016

4.2 Regression Analysis

The study considered 95% confidence level to test the model. This regression consists of three model tests based on the hypothesis. The results and discussions of each model is explained in detail.

4.2.1 Logistics Performance and Trade Flow

Table 4.2 summarizes the regression result of pooled OLS estimator for the impact of logistics performance on trade flow. From this result, bilateral trade between Thailand and trade partners is explained by 71% of the independent variables. The F-statics result is significant that indicates at least one variable affects trade flow from the

list of independent variables. So, the overall regression test indicates that there is a strong relationship between trade flow and the independent variables.

GDP is significant at 5% that indicates a 1% increase in partners GDP results to an increase of 0.84% trade between partners. This supports the previous gravity theory that economic size between two countries is a key determinant of trade. GDP per capita determines the impact of market size between the trading countries and is expected to be positive or negative. As explained by Rahman (2003), if trade partners have high per capita income, it might lead more demand and trade flow. But, absorption effect may happen if the countries trade less due to economic of scale. In this study, an increase of GDP per capita by 1% decrease trade flow by 0.13%. This shows that the higher the GDP per capita between Thailand and partners, the less the trade between them.

The main concern of equation 3.1 is to determine the impact of logistic performance on bilateral trade flow. The argument is, an improvement in logistics performance could result to an increase of countries trade flow. Trading partners with high LPI are also expected to trade more than the countries with low. The result shows that, a 1% improvement of countries LPI increases trade flow by 1.72%. It is also evidenced that, Thailand trade 5.5 ($e^{1.72} = 5.5$) times more with a country of high LPI than a country with poor logistics performance. This indicates that the higher the LPI score between Thailand and trading partner, the more the trade between them. This supports that, when a country has superior logistics performance, trade facilitation becomes smooth that helps the country to gain more trade.

Distance is significant at 5% indicating that an increase of 1% distance between Thailand and trade partner decrease trade flow by 0.97%. This supports the previous

result of the gravity model that trade between two countries inversely related to the distance between them.

REER is not statically significant for this study demonstrating that there is no impact of exchange rate on bilateral trade between Thailand and partners. This might be due to the time interval of two years for this study could not determine exchange rate. Therefore, REER is not powerful determinant for the specified years.

Common border is another explanatory variable that expected to yield a positive impact on trade flow. This variable is significant at 5% that shows countries with common border trade 55% higher compared to countries without common border. If Thailand has a common border with a trading partner, the trade between them is 1.7 times more than countries without common border ($e^{0.553}$=1.7). This result empirically supports the traditional concept of trade that countries with common border have more transactions between them.

Table 4.1 Regression Results of LPI and Trade Flow

	Pooled Ordinary Least Square	
Variables	**Coefficient**	**P-value**
ln_gdp	.837509	0.000***
ln gdppc	-.137598	0.028**
ln lpi	1.719837	0.002***
ln_distance	-.974413	0.000***
reer	.060967	0.503
border	.553654	0.000***
_cons	-13.224113	0.000***
N	375	
R-squared	0.7122	
F (7, 368)	51.81	
Prob > F	0.000	
Mean VIF	2.05	

Dependent variable = bilateral trade flow

The symbols *, **, and *** denote significance level at 10%, 5%, and 1%, respectively.

Table 4.1 summarizes the regression result of equation 3.1 using an augmented gravity model. From this result, GDP, LPI and common border have a positive, while distance and GDP per capita a negative impact on trade flow. However, REER does not determine bilateral trade for this study. Multicollinearity is expected to occur when Variance Inflation Factor (VIF) test is more than 10. In this regression, the average VIF is 2.05 that shows there is no serious multicollinearity problem between the variable of this study. The individual variable test of multicollinearity can be shown in Appendix D. Test for heteroscedasticity shows the variables are heteroscedastic. However, this issue is common in testing through gravity model equation.

Considering these explanatory variables, LPI shows a positive impact on member's trade. This can be explained that an improvement of logistics performance increases countries bilateral trade. Therefore, the result of this regression supports the first hypothesis that there is a positive relationship between logistics performance and trade flow.

4.2.2 Free Trade Agreements and Trade Flow

The second hypothesis of this research paper tests the impact of FTAs on trade flow. All the explanatory variables of the gravity model used in hypothesis one are also considered for this mode. Table 4.2 shows the regression result of pooled OLS method. The result shows that the independent variables explained bilateral trade by 73.74%. The F-statistics result is less than 0.05 that indicates there is at least one variable that affects bilateral trade between Thailand and partners. So, the overall regression test indicates a strong relationship between trade flow and the independent variables.

GDP is significant at 5% that a 1% increase in partners GDP results to an increase of trade by 0.86%. This supports the gravity model that trade between countries is proportional to their GDP. GDP per capita is not significant at 5% for this model.

This means an increase of GDP per capita does not necessarily increase bilateral trade between Thailand and trade partners.

FTAs are the main variables for equation 2.2. The result of this regression shows that FTAs significantly increase member's bilateral trade. On average, if Thailand and trade partner have FTAs, total bilateral trade is 1.41 ($e^{0.3485}$=1.41) times more than non-members. This result supports that FTAs can be a means of trade expansion between the member countries.

Distance is significant at 5% that denotes an increase of 1% distance between trading partners decrease trade by 0.7%. This also supports the assumption of gravity model that distance inversely related to bilateral trade. REER is not statically significant at 5%. This indicates that REER cannot determine trade flow between Thailand and its partners.

AFTA is tested separately on this equation to show the effect of this influential trade agreement between Thailand and other members. This variable is significant at 5% that signifies membership of AFTA increase trade between Thailand and member countries 1.28 times more than non-member countries ($e^{0.2487}$ = 1.28). This is an evidence that Thailand gain more trade being the member of AFTA. The result supports the previous studies regarding the contribution of this powerful regional agreement to member countries.

Common border is also significant at 5% for this study that implies Thailand trade 1.34 times more with bordering countries comparing to countries without common border ($e^{0.2955}$=1.34).

Table 4.2 Regression Results for the Impact of FTAs on Trade Flow

	Pooled Ordinary Least Square	
Variables	**Coefficient**	**P-value**
ln gdp	.839781	0.000***
ln gdppc	.012030	0.770
fta	.348511	0.000***
reer	.033966	0.696
ln distance	-.680609	0.000***
afta	.248745	0.045**
border	.295553	0.027**
_cons	-13.859561	0.000***
N	375	
R-squared	0.7374	
F (7, 367)	147.25	
Prob > F	0.000	
Mean VIF	2.02	

Dependent variable = bilateral trade flow
The symbols *, **, and *** denote significance level at 10%, 5%, and 1%, respectively.

Equation 3.2 is intended to determine the impact of FTAs on bilateral trade against a set of gravity model variables. From the regression result, GDP, FTA, AFTA and common border have a positive impact, while distance negatively impacts bilateral trade. GDP per capita and REER have no impact on bilateral trade for this study. This regression proved that Thailand gain trade from both bilateral and ASEAN FTAs for the selected years. Therefore, the results of this regression strongly support hypothesis two that there is a positive relationship between FTAs and bilateral trade. Comparing the result of regression one and regression two, all the variables have similar impact and coefficient for determining bilateral trade.

4.2.3 Free Trade Agreements and Logistics Performance

Trade barriers relating to customs, tariffs, and quotas can be eliminated or reduced through trade agreements with trade partners. Moreover, an improvement of logistics and trade facilitation factors reduce these barriers. Table 4.3 is a summary of

the third hypothesis to determine the relationship between FTAs and logistics performance. LPI is considered as a dependent variable for this equation to show how the number of FTAs can affect logistics performance of a country. The assumption is countries with more FTAs could have better logistics performance due to a reduction of these trade obstacles. In return, improved countries logistics performance can help for an effective FTA between members. The impact of logistics performance on an effective FTAs is beyond the scope of this study.

From this regression, LPI can be explained by 70% of the independent variables. The F-statistics is also significant for the overall model. An individual variable test shows that partners GDP and GDP per capita positively impact logistics performance. A 1% increase of GDP and GDPPC between members increase logistics performance by 0.025% and 0.074%, respectively. Although the coefficient for this test seems small, it indicates a positive impact of economic parameters on countries logistics performance.

The main concern of the third model is to determine the relationship between the number of FTAs and LPI. The result shows that number of FTAs positively impact members logistics performance by 0.021%. This means that countries which have more FTAs improve their logistics performance 1.02 times more than countries with less. On average, an increase of 1 FTA improves LPI by 0.022 points. This indicates that countries with more number of FTAs have better LPI comparing to countries with less. Having several FTAs help a country to have more trade freedom. Hence, the country ranks high in terms of the six logistics components. Therefore, FTAs could reduce international trade barriers and improve logistics performance.

Remoteness and REER are statically insignificant for this model, which is logistics performance between two countries cannot be determined by the relative trade

resistance and exchange rate. The result also shows that countries which have FTAs with Thailand have 0.02% higher LPI than non-FTA members.

Table 4.3 Regression Results for the Relationship between LPI and FTAs

	Pooled Ordinary Least Square	
Variables	**Coefficient**	**P-value**
ln gdp	.0258434	0.000***
ln gdppc	.0740021	0.000***
nfta	.0215958	0.000***
reer	.0030199	0.354
rem	.0017524	0.500
fta	.0161992	0.002**
_cons	-.2033865	0.025*
N	375	
R-squared	0.6971	
F (6, 368)	147.25	
Prob > F	0.0000	
Mean VIF	1.51	

Dependent variable = Logistics Performance Index
The symbols *, **, and *** denote significance level at 10%, 5%, and 1%, respectively.

The equation 3.3 aimed to determine the relationship between FTAs and logistics performance. The argument for this hypothesis is that if both variables aim to facilitate trade, these variables might be supplementary to foster countries trade. The result of this regression proves the third hypothesis that there is a positive relationship between a number of FTAs and logistics performance.

CHAPTER 5

CONCLUSIONS AND RECOMMENDATIONS

LPI is a recent cross-country data compiled by the World Bank. It consists of 6 sub-components that help a country to compare with others in terms of logistics and trade facilitation. These parameters are customs, infrastructure, logistics quality, international shipments, tracking and tracing, and timeliness. An improvement of these components helps countries to reduce trade barriers and increase access to the global market. Since the first publication of LPI by the World Bank in 2007, only a few papers studied the link between logistic performance and trade. Most of these papers used gravity model, the most powerful and popular trade model. Since its first application in international trade, the gravity model has been augmented and applied in several areas. Its popularity and convenience also helped researchers to test LPI in the gravity model. These papers prove that logistic performance is a means of trade facilitation and significantly impact countries trade.

On the other hand, FTAs have been increased dramatically since the formation of WTO in 1995. The primary objective of FTA is to reduce trade barriers between member countries. These agreements are expected to create trade expansion for trading partners. Although the concept of FTAs is old, a recent proliferation fascinated many researchers to investigate the real impact of these agreements. Many of the studies found a positive impact of trade agreements on member's trade while few papers found unbalance effect of trade agreements between partners. These papers used the gravity model to test the ex-post effect of trade agreements considering other trade determinant variables.

This study focusses on the impact of the logistic performance and FTAs on trade flow of Thailand and 75 trade partners as a case study. The study intended to determine the triangular relationship between FTAs, logistics performance and trade flow. It is organized to achieve three main objectives.

The first objective is to determine the impact of logistics performance on bilateral trade between Thailand and partners. Trade with logistics advanced country requires less processing time and cost, therefore good logistics performance can increase trade between trading partners. The result of this hypothesis shows that there is a strong relationship between logistics performance and bilateral trade. The higher the LPI score between Thailand and partners, the more the trade between them. The study reveals that Thailand trade more with logistics powerful countries comparing to those with poor logistics performance. This is an evidence that Thailand prefers these logistics sophisticated countries due to their convenience to trade. In summary, when a country is good in terms of the six logistics performance parameters, it gains more trade flow.

The second objective of this study determines the impact of FTAs on bilateral trade flow. This objective determines how FTAs affect member's bilateral trade comparing to non-FTA members. The result shows that there is a positive relationship between Thailand's FTAs and bilateral trade. Assuming the other determinants constant, Thailand and FTA member's trade 1.41 times more than the non-FTA member countries. This result supports that FTAs is a means of trade expansion between member countries.

The third objective of this study is based on objective one and two. Logistics performance is a benchmarking tool for countries international trade and aims to boost countries trade. On the other hand, FTAs aim to reduce trade barriers relating to customs

and tariffs and increase economic integration. FTAs could also improve trade facilitations relating to logistics performance. Therefore, the third objective determines how the number of FTAs affect logistics performance. The result shows that number of FTAs positively impact countries logistics performance. This indicates that having several FTAs helps a country to get more trade freedom, reduce trade costs, and processing time. Hence, the country improves its score in terms of the six logistics sub-components.

The study concludes that FTAs and logistics performance positively affect trade flow. Furthermore, the number of FTAs increase countries logistics performance. FTAs and trade facilitation are complementary to reduce trade-related barriers like customs procedure. In summary, countries trade can be increased through trade agreements and improvement on logistics performance. Thailand as an export-driven country, FTAs helps to get a potential marker for its exports. This also strengthen Thailand's economic interaction with trading partners, hence increase trade facilitation. Improvement of logistics performance is also very crucial for Thailand as these sub-components affect exports more than imports. Therefore, this result is important for policymakers to take steps in improving logistics performance and make trade negotiations.

This study used total bilateral trade instead of the unilateral trade flow to determine the impact of both partners. Using unilateral may determine the specific impact either exports or imports on one side. Further studies need to investigate the impact of such variables separately on export or import.

Although aggregate LPI represents each sub-component, countries may have different score on each parameter. In this paper, the total LPI is considered due to multicollinearity between the sub-components. Further studies need to determine the impact of each of the six parameters on trade flow.

FTAs may differ in terms of coverage, time and impact. Specific products or service may be affected because of trade agreements. This research recommends further studies to focus on a specific country and agreement on bilateral trade.

The study found that number of FTAs positively affects logistics performance of a country. However, these six logistics sub-components can be affected differently by the FTAs. Further studies also need to determine which specific logistics performance can be improved after the enforcement of FTAs.

REFERENCES

Aitken, N. D. (1973). The Effect European of the Trade: EEC on Temporal Cross-Section Analysis. *American Economic Association*, *63*(5), 881–892.

Anderson, J. E., & Yotov, Y. V. (2015). Terms of trade and global efficiency effects of free trade agreements, 1990 – 2002. *Journal of International Economics*, 20. https://doi.org/10.1016/j.jinteco.2015.10.006

Arvis, J.-F., Mustra, M. A., Ojala, L., Shepherd, B., & Saslavsky, D. (2007). Connecting to Compete: Trade Logistics in the Global Economy. *The World Bank, Washington, DC.*

Arvis, J.-F., Mustra, M. A., Ojala, L., Shepherd, B., & Saslavsky, D. (2010). Connecting to Compete: Trade Logistics in the Global Economy. *The World Bank, Washington, DC.*

Arvis, J.-F., Mustra, M. A., Ojala, L., Shepherd, B., & Saslavsky, D. (2012). Connecting to Compete: Trade Logistics in the Global Economy. *The World Bank, Washington, DC.*

Arvis, J.-F., Saslavsky, D., Ojala, L., Shepherd, B., Busch, C., Raj, A., & Naula, T. (2014). Connecting to Compete: Trade Logistics in the Global Economy. *The World Bank, Washington, DC.*

Arvis, J.-F., Saslavsky, D., Ojala, L., Shepherd, B., Busch, C., Raj, A., & Naula, T. (2016). Connecting to Compete: Trade Logistics in the Global Economy. *The World Bank, Washington, DC.*

Athukorala, P., & Kohpaiboon, A. (2011). Australian – Thai Trade : Has the Free Trade Agreement Made a Difference? *The Australian Economic Review*, *44*(4), 457–67.

Baier, S. L., & Bergstrand, J. H. (2005). Do free trade agreements actually increase members' international trade? Working? *Working Paper, Federal Reserve Bank of Atlanta*, *2005–3*. https://doi.org/10.1111/j.1467-629X.1980.tb00220.x

Baier, S. L., & Bergstrand, J. H. (2007). Do free trade agreements actually increase members international trade? *Journal of International Economics*, *71*, 72–95. https://doi.org/10.1016/j.jinteco.2006.02.005

Baier, S. L., & Bergstrand, J. H. (2009). Estimating the effects of free trade agreements on international trade flows using matching econometrics. *Journal of International Economics*, *77*(1), 63–76. https://doi.org/10.1016/j.jinteco.2008.09.006

Baldwin, R., & Taglioni, D. (2006). Gravity for Dummies and Dummies for Gravity Equations. *National Bureau of Economic Research, Cambridge, MA.*, *12516*. http://www.nber.org/papers/w12516

Bensassi, S., Márquez-Ramos, L., Martínez-Zarzoso, I., & Suárez-Burguet, C. (2015). Relationship between logistics infrastructure and trade : Evidence from Spanish regional exports. *Transportation Research Part A*, *72*, 47–61. https://doi.org/10.1016/j.tra.2014.11.007

Caporale, G. M., Rault, C., Sova, R., & Sova, A. (2008). On the bilateral trade effects of free trade agreements between the EU-15 and the CEEC-4 countries. *CESifo Working Paper*, *2419*.

Chaipan, C., Nguyen, T. D., & Ezaki, M. (2006). Regional Economic Integration and its Impacts on Growth, Poverty and Income Distribution: The Case of Thailand. *Discussion Paper*, (147), 1–44.

Chaney, T. (2008). Distorted Gravity: The Intensive and Extensive Margins of International Trade. *American Economic Review*, *984*, 1707–1721. https://doi.org/10.1257/aer.98.4.1707

Darvas, Z. (2012). Real Effective Exchange Rates for 178 Countries : A New Database. *Bruegel Working Paper*, (*6*), 1–35.

Do, T. T. (2006). A Gravity Model for Trade Between Vietnam and Twenty-Three European. *Department of Economics and Society*.

Elliott, R. J. R., & Ikemoto, K. (2004). AFTA and the Asian crisis: Help or hindrance to ASEAN intra-regional trade? *Asian Economic Journal*, *18*(1), 1–23. https://doi.org/10.1111/j.1467-8381.2004.00179.x

Endoh, M. (1999). Trade creation and trade diversion in the EEC, the LAFTA and the CMEA: 1960-1994. *Applied Economics*, *31*(2), 207–216. https://doi.org/10.1080/000368499324435

Felipe, J. and, & Kumar, U. (2010). The Role of Trade Facilitation in Central Asia: A Gravity Model. *Levy Economics Institute*, (628).

Gani, A. (2017). The Logistics Performance Effect in International Trade. *The Asian Journal of Shipping and Logistics*, *33*(4), 279–288. https://doi.org/10.1016/j.ajsl.2017.12.012

Hannan, S. A. (2016). The Impact of Trade Agreements : New Approach , New Insights. *IMF Working Paper*, 16–117.

Hapsari, I. M., & Mangunsong, C. (2006). Determinants of AFTA Members ' Trade Flows and Potential for Trade Diversion By. *Asia-Pacific Research and Training Network on Trade Working Paper Series*, (21), 3–28.

Haveman, J. D., & Hummels, D. L. (1996). Trade Creation and Trade Diversion : New Empirical Results. *Purdue CIBER Working Papers.*, *Paper 110*. https://doi.org/10.1300/J130v03n02_03

Hayakawa, K. (2014). Impact of diagonal cumulation rule on FTA utilization: Evidence from bilateral and multilateral FTAs between Japan and Thailand Kazunobu. *Journal of the Japanese and International Economics*, *32*, 1–16.

https://doi.org/10.1016/j.jjie.2013.12.005

Hertel, T. W., & Mirza, T. (2009). The Role of Trade Facilitaton in South Asian Economic Integraton. *Study on Intraregional Trade and Investment in South Asia* (pp. 12–39). Asian Development Bank.

Hoai, N. T., & Huy, N. Q. (2015). *The Impact of Free Trade Agreement on Trade Flow of Goods in Vietnam*.

Jongwattanakul, P. (2014). The Trade Enhancing Effect of the Free Trade Agreement and Tariff Margin : Evidence from Thailand. *Thammasat Economic Journal*, *Vol. 32 No*.

Kainulainen, J. (2011). The Influence of Regional Trade Agreements on Trade Flows - The Review of BIC-Countries. *Aalto University, School of Economics, Helsinki, Finland.*

Khurana, R., & Nauriyal, D. K. (2017). ASEAN-India Free Trade Agreement: Evaluating Trade Creation and Trade Diversion Effects. *Journal of East-West Business*, *23*(3), 283–307. https://doi.org/10.1080/10669868.2017.1322548

Komolavanij, S., Jeenanunta, C., Ammarapala, V., & Chongphaisal, P. (2008). *Thailand Regional Free Trade Agreements (FTA) and the Effect on Industrial Clustering*.

Krueger, A. O. (1997). Free Trade Agreements versus Customs Unions. *Journal of Development Economics, Stanford University*, *54*, 169–187.

Kumar, R. (2011). *Research Methodology A Step By Step Guide For Beginners* (3rd ed.). SAGE Publications Ltd. https://doi.org/10.1017/CBO9781107415324.004

Limcharoen, A., Jangkrajarng, V., Wisittipanich, W., & Ramingwong, S. (2017). Thailand Logistics Trend: Logistics Performance Index, *12*(15), 4882–4885.

Martí, L., Puertas, R., & García, L. (2014). The importance of the Logistics Performance Index in international trade. *Applied Economics*, *46:24*, 2982–2992. https://doi.org/10.1080/00036846.2014.916394

Nguyen, B. X. (2010). The Determinants of Vietnamese Export Flows: Static and Dynamic Panel Gravity Approaches. *International Journal of Economics and Finance*, *2*(4), 122–129. https://doi.org/10.5539/ijef.v2n4p122

Rahman, M. M. (2003). A Panel Data Analysis of Bangladesh's Trade: The Gravity Model Approach. *University of Sydney*.

Rose, A. K., & Wincoop, E. Van. (2001). National money as a barrier to international trade: The real case for currency union. *American Economic Review*, *91*(2), 386–390. https://doi.org/10.1257/aer.91.2.386

Sen, R., Srivastava, S., Webber, D. J., Sen, R., Srivastava, S., & Webber, D. J. (2015). Effects of preferential trade agreements in the presence of zero trade flows : the cases of China and India. *Economics Working Paper Series, University of the*

West of England, 1507, 1–26.

Smith, V. H., Sumner, D. A., & Rosson, D. C. P. (2001). Bilateral and Multilateral Trade Agreements. The 2002 Farm Bill*: Policy Options and Consequences*.

Yang, S., & Martinez, Zarzoso, I. (2014). A panel data analysis of trade creation and trade diversion effects: The case of ASEAN-China Free Trade Area. *China Economic Review*, *29*, 138–151. https://doi.org/10.1016/j.chieco.2014.04.002

Zikmund, W. G., Babin, B. J., C., C., J., & Griffin, M. (2009). Business Research Method*s*. *Cengage Learning.* (8th ed.).

APPENDIX A

List of 75 Countries

Table A.1 List of Countries in the Sample

No	NAFTA	EU	ASEAN	Middle East	Others
1	Canada	Austria	Brunei Darussalam	Egypt	Australia
2	Mexico	Belgium	Indonesia	Iran	Bangladesh
3	United States	Denmark	Malaysia	Israel	Benin
4		Finland	Philippines	Kuwait	Brazil
5		France	Singapore	Oman	Chile
6		Germany	Cambodia	Qatar	China
7		Greece	Lao PDR	Saudi Arabia	Colombia
8		Ireland	Myanmar	United Arab Emirates	Cote D' Ivoire
9		Italy	Viet Nam	Yemen	Hong Kong
10		Luxembourg			India
11		Netherlands			Korea, South
12		Portugal			Nepal
13		Spain			New Zealand
14		Sweden			Nigeria
15		United Kingdom			Norway
16		Cyprus			Pakistan
17		Czech Republic			Panama
18		Estonia			Peru
19		Hungary			Russia
20		Latvia			Senegal
21		Lithuania			South Africa
22		Malta			Sri Lanka
23		Slovakia			Switzerland
24		Poland			Taiwan
25		Slovenia			Turkey
26		Bulgaria			Japan
27		Romania			
28		Croatia			

APPENDIX B

Thailand's Top Exporting Partners

Table B.1 Top 20 Thailand Exporting Partners

Rank	Country	Average Export
1	United States	16928.88143
2	Japan	15027.13857
3	China	11890.24524
4	Singapore	7897.116667
5	Hong Kong	7175.183333
6	Malaysia	6514.594286
7	Australia	4795.557619
8	Indonesia	4515.497619
9	Viet Nam	3371.395652
10	Netherlands	3041.850952
11	United Kingdom	2974.486667
12	Philippines	2661.43381
13	Germany	2511.190952
14	Korea, South	2491.196667
15	India	2296.073333
16	United Arab Emirates	1669.372381
17	Cambodia	1624.080952
18	Switzerland	1604.018571
19	Lao PDR	1484.139524
20	Myanmar	1410.008571

APPENDIX C

ASEAN Individual and Aggregate LPI

Table C.1 Individual and Aggregate LPI Rank of ASEAN Countries 2016

Country	Individual LPI Rank						Agg. LPI Rank
	Customs	Infrastructure	International shipments	Logistics quality	Tracking and tracing	Timeliness	
Singapore	1	6	5	5	10	6	5
Malaysia	40	33	32	35	36	47	32
Thailand	46	46	38	49	50	52	45
Indonesia	69	73	71	55	51	62	63
Vietnam	64	70	50	62	75	56	64
Brunei Darussalam	57	66	62	93	68	84	70
Philippines	78	82	60	77	73	70	71
Cambodia	77	99	52	89	81	73	73
Myanmar	96	105	144	119	94	112	113
Lao PDR	155	155	148	144	156	133	152

APPENDIX D

Regression Results

Table D.1 Regression Result of Equation 3.1

Source	SS	df	MS	Number of obs =	375
				F(6, 368) =	151.81
Model	176.143568	6	29.3572614	Prob > F =	0.0000
Residual	71.163933	368	.193380253	R-squared =	0.7122
				Adj R-squared =	0.7076
Total	247.307501	374	.661250004	Root MSE =	.43975

trade	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
gdp	.8375097	.0378533	22.13	0.000	.7630738	.9119457
gdppc	-.1375985	.0622899	-2.21	0.028	-.2600873	-.0151097
lpi	1.719837	.5421791	3.17	0.002	.6536787	2.785995
distance	-.9744134	.0883544	-11.03	0.000	-1.148156	-.8006706
reer	.0609676	.0908736	0.67	0.503	-.1177291	.2396643
border	.553654	.1327048	4.17	0.000	.2926991	.8146089
_cons	-13.22411	.7720335	-17.13	0.000	-14.74226	-11.70596

Table D.2 Regression Result of Equation 3.2

Source	SS	df	MS		
Model	182.374825	7	26.0535464	Number of obs =	375
Residual	64.9326765	367	.176928274	F(7, 367) =	147.25
Total	247.307501	374	.661250004	Prob > F =	0.0000
				R-squared =	0.7374
				Adj R-squared =	0.7324
				Root MSE =	.42063

trade	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
gdp	.8397816	.0350843	23.94	0.000	.7707902	.908773
gdppc	.0120309	.0412007	0.29	0.770	-.0689881	.0930499
fta	.3485115	.0747118	4.66	0.000	.2015945	.4954284
distance	-.6806096	.1027653	-6.62	0.000	-.8826923	-.4785269
reer	.0339664	.0869677	0.39	0.696	-.1370512	.2049839
afta	.2487451	.1238344	2.01	0.045	.0052311	.4922591
border	.2955535	.13332	2.22	0.027	.0333866	.5577205
_cons	-13.85956	.7874488	-17.60	0.000	-15.40803	-12.31108

Table D.3 Regression Result of Equation 3.3

Source	SS	df	MS
Model	1.45122239	6	.241870398
Residual	.630582851	368	.00171354
Total	2.08180524	374	.005566324

Number of obs	= 375
F(6, 368)	= 141.15
Prob > F	= 0.0000
R-squared	= 0.6971
Adj R-squared	= 0.6922
Root MSE	= .04139

lpi	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
gdp	.0258434	.0040213	6.43	0.000	.0179358	.0337509
gdppc	.0740021	.0045716	16.19	0.000	.0650123	.082992
nfta	.0215958	.0053523	4.03	0.000	.011071	.0321206
reer	.0030199	.0087015	0.35	0.729	-.014091	.0201308
rem	.0017524	.0034709	0.50	0.614	-.0050729	.0085778
bfta	.0161992	.0052856	3.06	0.002	.0058055	.026593
_cons	-.2033865	.0902405	-2.25	0.025	-.3808382	-.0259347

Table D.4 Correlation Table

```
. corr trade gdp gdppc fta distance reer afta border lpi
(obs=375)
```

	trade	gdp	gdppc	fta	distance	reer	afta	border	lpi
trade	1.0000								
gdp	0.6596	1.0000							
gdppc	0.1193	0.4217	1.0000						
fta	0.4784	0.0438	-0.2064	1.0000					
distance	-0.3182	0.2601	0.4107	-0.5515	1.0000				
reer	0.1254	0.2364	0.0644	-0.0140	0.1539	1.0000			
afta	0.3252	-0.2213	-0.2911	0.6821	-0.7543	-0.1029	1.0000		
border	0.2144	-0.2544	-0.3122	0.4384	-0.6359	-0.1048	0.6428	1.0000	
lpi	0.3240	0.5447	0.7886	-0.0487	0.2903	0.0869	-0.1983	-0.2895	1.0000

AUTHOR BIOGRAPHY

Author: Mr. Goitom Kibrom Gebremichael

Degree: Master of Science

Date: 9th June 2018

Date of Birth: 19th August 1986

Place of Birth: Adi Neamin, Eritrea

Undergraduate and Graduate Education:

Master of Science in Logistics and Supply Chain Management,
King Mongkut's Institute of Technology Ladkrabang, Bangkok, 2018

Bachelor degree in Business Management,
Halhale College of Business and Economics, Eritrea, 2012

Major: Logistics and Supply Chain Management

Experience: Assistant Lecturer, Halhale College of Business and Economics