

รายงานวิจัยฉบับสมบูรณ์

The Impacts of Bilateral and Third-country
Exchange Rate and Economic Integration on
Foreign Direct Investment: An Application to ASEAN

โดย

ณัฐพรพรรณ อุตมา สำนักวิชาการจัดการ

งานวิจัยนี้ได้รับทุนสนับสนุนจากมหาวิทยาลัยแม่ฟ้าหลวง
ประจำปี พ.ศ.2552

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Nathapornpan Uttama

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Executive Summary

Foreign direct investment (FDI) inflows to ASEAN have increased dramatically in recent decades and continue to be a driving factor of economic globalization. According to ASEAN Secretariat (2008a), the inward FDI showed high growth rates during the 2000s, with the highest levels in 2004 (45%) and 2006 (34%). This trend, however, slowed down in 2001-2002 as the increase was significantly lower that year, and in 2008, FDI inflows diminished by 13%. The high FDI inflows to ASEAN can be seen as a result of the ASEAN's explicit policy to attract investments, both Inter-ASEAN investors and Intra-ASEAN investors, which ASEAN investment Area (AIA) and ASEAN comprehensive Investment Agreement (ACIA) have deemed as successful. The FDI inflows also benefited from the support of the Chiang Mai Initiative Multilateralism (CMIM) and Asian Bond Markets Initiative (ABMI) that were created to enhance regional financial and monetary stability.

Literature on FDI has mainly concentrated on individual determinants of bilateral characteristics, third-country effect, regional integration and foreign exchange on FDI. Although, it has seen the study of Uttama and Périddy (2009) focusing on the impacts of the simultaneous bilateral and third-country effects and RIA on FDI, it still avoids the inclusion of exchange rate effect in FDI analysis. Moreover, even though, the empirical studies in terms of exchange rate and FDI are extensive, such studies on ASEAN countries are very sparse. This is an important point for research with great significance for the international economists and the policy makers. Therefore, this study makes an attempt to address these issues in the context of Inter-ASEAN FDI and Intra-ASEAN FDI.

The research undertakes analyses at two levels. First, it is to provide the theoretical hypotheses. The analytical framework used in this study is an extension of the Knowledge-capital (KC) model framework proposed by Baltagi et al. (2007) by incorporating the impact of bilateral and third-country determinants, regional

integration and exchange rate. The augmented KC model is derived and then simulated using the mathematical program GAMS/MPSGE to provide the theoretical predictions on various determinants of FDI. These hypotheses are also employed to examine empirically the determinants of FDI inflows from member and non-member ASEAN countries.

Second, it is to investigate the impacts of bilateral- and third-country effects, exchange rate and regional integration on both Inter-ASEAN FDI and Intra-ASEAN FDI. The Inter-ASEAN FDI analysis is performed using data on bilateral U.S. outward FDI stock at the industry level, covering five ASEAN economies over the period 1995-2007. Meanwhile, the Intra-ASEAN FDI analysis is conducted using data on Intra-ASEAN FDI stock at country level during the period 1995-2007. The spatial panel data estimation, namely Maximum Likelihood is introduced because the Moran's I test indicates the presence of spatial correlation of the residuals. The results from Inter-ASEAN FDI flows illustrate evidence whether bilateral and third-country effects, exchange rate pegged to the U.S. dollar and regional integration would certainly attract the FDI flows from the U.S. to ASEAN. The findings empirically confirm that export-platform and complex vertical FDI are an optimal integration strategy for multinational firm outside of ASEAN member countries. Furthermore, the results from Intra-ASEAN FDI flows show the significant impacts of bilateral and third-country effects, exchange rate and regional integration on Intra-ASEAN FDI. Importantly, vertical and complex vertical FDI are regarded as the best investment strategy for Intra-ASEAN investors or ASEAN member countries. These results are interpreted in line with the theoretical predictions.

In sum, the results indicate that foreign exchange currency and ASEAN regional agreements have favorable effects on FDI. These findings also give important policy implications on the national and international level. Especially, governments could attract either horizontal or vertical foreign investor by adopting financial stability policy, enhancing monetary and financial integration, and accelerating the implementation of the existing ASEAN investment agreements.

Abstract

This study focuses on theoretical and empirical analyses of the impacts of exchange rate, third-country effect and regional integration on foreign direct investment (FDI) in the Southeast Asian countries. In theoretical perspectives, the Knowledge-capital model introduced by Baltagi et al. (2007) is extended. The results give the main theoretical signs of how third-country effect, exchange rate and regional integration determinants influence horizontal, vertical, export-platform and complex vertical FDI. Then, the model is empirically tested on both Inter-ASEAN and Intra-ASEAN FDI flows. The former is to investigate the U.S. FDI flows to five ASEAN economies using data at industry level; and the latter is to examine FDI flows among five ASEAN member countries using data at country level during the period 1995-2007. The spatial panel data method, namely maximum likelihood approach is applied to estimate the empirical results. The findings show that third-country effects, foreign exchange and regional integration are significant determinants of FDI in ASEAN countries, both Inter-ASEAN and Intra-ASEAN FDI. As a matter of fact that export-platform and complex vertical FDI are proved to be the most effective investment strategy to attract Inter-ASEAN investors, whereas vertical and complex vertical FDI are the best investment strategy for Intra-ASEAN investors.

Key words: Foreign direct investment, Foreign exchange, Regional integration, Third-country effect, Spatial panel data

JEL Classification: C31, F15, F21, F31

Table of Content

	Page
Chapter 1	Introduction
	1
1.1	Significance of the Study
	1
1.2	Objectives
	3
1.3	Benefits
	3
1.4	Conceptual framework
	3
1.5	Scope of the study
	4
1.6	Research period
	4
1.7	Organization of the study
	4
Chapter 2	Overview of FDI in ASEAN
	6
2.1	FDI in ASEAN: Stylized facts
	6
2.2	Inward FDI Performance
	10
Chapter 3	Literature Review
	13
3.1	Knowledge-capital model
	13
3.2	Impact of regional economic integration
	16
3.3	Impact of foreign exchange currency
	17
Chapter 4	Theoretical Implications
	20
4.1	Model setup
	20
4.2	Parameterized variables
	27
4.3	Theoretical Hypotheses
	28
Chapter 5	Empirical Analysis
	33
5.1	Model specification
	33
5.2	Data collection
	36
5.3	Empirical results
	37
Chapter 6	Conclusion
	49
Bibliography	51
Appendix	56

List of Tables

		Page
Table 4-1	Theoretical propositions	28
Table 5-1	Descriptive statistics	37
Table 5-2	Estimation results for Inter-ASEAN FDI	38
Table 5-3	Robustness checks for Inter-ASEAN FDI	42
Table 5-4	Estimation results for Intra-ASEAN FDI	45
Table 5-5	Robustness checks for Intra-ASEAN FDI	47

List of Figures

		Page
Figure 2-1	FDI flows to ASEAN countries, 1997-2008	7
Figure 2-2	FDI flows to ASEAN by host country, 2003-2008	8
Figure 2-3	FDI flows to ASEAN by source country, 2003-2008	9
Figure 2-4	FDI flows to ASEAN by economic sector, 2003-2007	9
Figure 2-5	ASEAN Inward FDI Performance Index, 1997-2008	10
Figure 2-6	Intra-ASEAN Inward FDI Performance Index, 1997-2007	11
Figure 3-1	Multinational activities for types of complex FDI	15

Abbreviations

ABMI	= Asian Bond Markets Initiative
ACIA	= ASEAN Comprehensive Investment Agreement
AEC	= ASEAN Economic Community
AIA	= ASEAN Investment Area
ASEAN	= Association of Southeast Asian Nations
CES	= Constant Elasticity of Substitution
CMIM	= Chiang Mai Initiative Multilateralism
CVFDI	= Complex Vertical Foreign Direct Investment
EXFDI	= Export-Platform Foreign Direct Investment
FDI	= Foreign Direct Investment
GAMS/MPSGE	= Generalized Algebraic Modeling System with Mathematical Programming System for General Equilibrium Analysis
GMM	= Generalized Method of Moment
HFDI	= Horizontal Foreign Direct Investment
KC Model	= Knowledge-Capital Model
ML estimator	= Maximum Likelihood Estimator
MNE	= Multinational Enterprise
RIA	= Regional Integration Agreement
SL	= Sensitive List
TEL	= Temporary Exclusion List
VFDI	= Vertical Foreign Direct Investment

Chapter 1

Introduction

1.1 Significance of the Study

The last decade has seen a significant increase in Inter-regional and Intra-regional foreign direct investment (FDI) flows, accompanied by strengthening regional economic integration. Particularly, the inward FDI to the Association of Southeast Asian Nations (ASEAN) steadily rose by 98% from 2004 to 2007 with a considerable increase in Intra-ASEAN FDI by 236% and an expansion in Inter-ASEAN FDI by 86% (ASEAN, 2008a). This does not include FDI inflows slightly declined 13% in 2008 as a result of the U.S. severe economic slowdown and global financial crisis. However, as of the end of 2008, the U.S., the EU, Japan and China were still the largest foreign investors while Singapore, Thailand, Malaysia and Vietnam were the major recipients of FDI in ASEAN. It is widely expected that the deepening economic and financial integration in Asian countries will help them successfully pass the economic crisis period and will pave the way for well-enhanced FDI flows to ASEAN.

After financial crisis in 1997, the ASEAN has accelerated more extensively not only the establishment of regional investment integration, but the establishment of monetary and financial integration. The ASEAN investment Area (AIA) was established in 1998 and was deepened through the ASEAN comprehensive Investment Agreement (ACIA) in 2007. Apart from investment cooperation, ASEAN has also strengthened its economic and strategic linkages with major investment partners in the world e.g. the U.S., the UK, Japan and China. Especially, ASEAN, China, Japan and the Republic of Korea agreed to establish Chiang Mai Initiative Multilateralism (CMIM) in 2000 and Asian Bond Markets Initiative (ABMI) in 2003 in order to enhance regional financial stability. It is interesting to note that the implementation of regional investment agreement as well as regional financial integration agreement would ensure to contribute to the greater FDI flows to ASEAN. It could make ASEAN as an integral part of a world economy and brings ASEAN closer together as a single market. Most

importantly, it further integrates the ASEAN's markets to achieve the ultimate goal of the ASEAN Economic Community (AEC) in 2015.

The recent theoretical literature has attempted to identify the impacts of changes in four primary determinants on FDI: bilateral characteristics, third-country effect, regional economic integration and foreign exchange. Likewise, the numerous empirical studies have been conducted to evidence them. First, bilateral characteristics including market size, country's similarity, differences in factor endowments and trade costs entirely influence the changes in horizontal and vertical FDI (Markusen et al., 1996; Markusen, 1997). Second, the role of third country substantially affects the magnitude of complex FDI, for example, export-platform and complex vertical FDI (Baltagi et al., 2007). Third, the greater degree of regional integration corresponding to the reduction in trade barriers is likely to increase both horizontal and vertical multinational activities (Altomonte, 2007). The regional integration agreements (RIAs) also give rise to an increase in FDI flows between member countries (Baltagi et al., 2008). Finally, the role of foreign exchange rate affects FDI flows in two directions. An appreciation in foreign exchange rate of recipient country tends to increase FDI inflows as a result of wealth effect (more profitable) and lower production cost effect (Froot and Stein, 1991; Egger et al., 2007). On the contrary, an appreciation in exchange rate of recipient country decreases FDI inflows because it tends to increase production cost in foreign market as compared to imported goods (Campa, 1993; Egger et al., 2007).

Most recently, it has seen the study of Uttama and Péridy (2009) focusing on the impacts of the simultaneous bilateral and third-country effects and RIA on FDI. However, it still avoids the inclusion of exchange rate effect in FDI analysis. Moreover, even though, the empirical studies in terms of exchange rate and FDI are extensive, such studies on ASEAN countries are very sparse. This paper contributes to a deeper understanding, theoretically and empirically, of how the simultaneity of exchange rate, third-country effect and regional integration causes changes in FDI flows. The research questions will focus on the following points:

- 1) How significant are non-member and member ASEAN investors in the Southeast Asian region?
- 2) What factors are the determinants of FDI in ASEAN economies?
- 3) What is an optimal investment strategy for Inter- and Intra-ASEAN investors?

1.2 Objectives

The objectives of the study include:

- 1) To augment the Knowledge-capital (KC) model that provides the theoretical predictions of how the simultaneity of exchange rate, regional integration, bilateral characteristics and third-country effect causes changes in FDI flows.
- 2) To investigate the impacts of bilateral characteristics and third-country effect, exchange rate and regional integration on member and non-member ASEAN FDI.

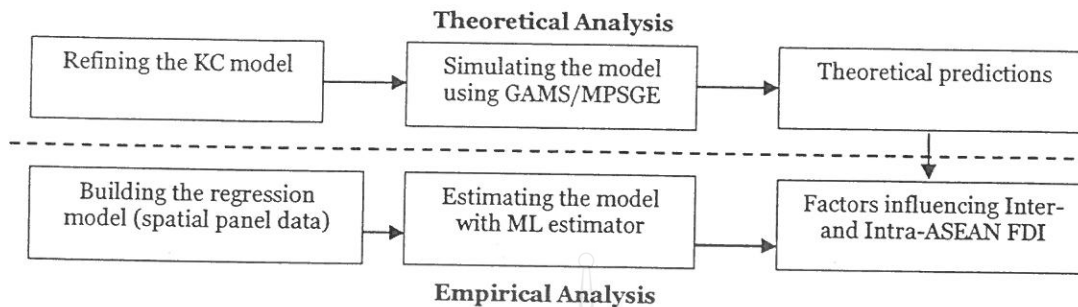
1.3 Benefits

The outcomes of the study are as follows:

- 1) Augmenting the theoretical hypotheses on bilateral and third-country determinants on FDI beyond their existing limitation.
- 2) Identifying the important factors influencing Inter- and Intra-ASEAN FDI.
- 3) Highlighting the significance of regional economic integration on FDI flows.
- 4) Being beneficial to governments and policy makers aiming to formulate policies to attract more investment into ASEAN. Companies can also benefit from this study while formulating investment strategies relating to various ASEAN markets.
- 5) Enhancing personal learning in the field of international investment and contributing to the existing international investment literature.

1.4 Conceptual Framework

For the purpose of this study it is to extend the theory of FDI and to test it using secondary data. This involves formulating hypotheses and using statistical and econometric tools to test the hypotheses.



On the theoretical side, the analytical framework used in this study is an extension of the Knowledge-capital model framework proposed by Baltagi et al. (2007) by incorporating the impact of bilateral and third-country determinants, regional integration and exchange rate. The theoretical predictions on FDI are simulated on the augmented KC model using the Mathematics program, namely GAMS/MPSGE. On the empirical side, it is to investigate the impacts of all concerned variables on both Inter-ASEAN FDI and Intra-ASEAN FDI. The spatial regression model is built, and then the Maximum Likelihood (ML) estimator is chosen to estimate the model.

1.5 Scope of the study

This study focuses on the theoretical and empirical analyses regarding the impacts of bilateral characteristics, third-country effect, regional economic integration and foreign exchange currency on FDI. The empirical analysis is carried out in both Inter-ASEAN FDI and Intra-ASEAN FDI. The U.S. FDI flow to ASEAN is represented as Inter-ASEAN FDI, whereas the FDI flows among Indonesia, Malaysia, Philippines, Singapore and Thailand are included on Intra-ASEAN FDI.

1.6 Research Period

May 2009 – March 2010

1.7 Organization of the study

The remainder of the study is organized as follows. Chapter 2 describes the stylized facts on FDI in ASEAN. Chapter 3 reviews the conventional FDI literature based on the

Knowledge-capital model. Chapter 4 provides the theoretical framework and numerical solution, which will be used to support the empirical results in the next chapter. Chapter 5 discusses model specification, data collection, econometric technique and empirical results. Chapter 6 summarizes research findings and discusses policy implications and suggestions for future research.



Chapter 2

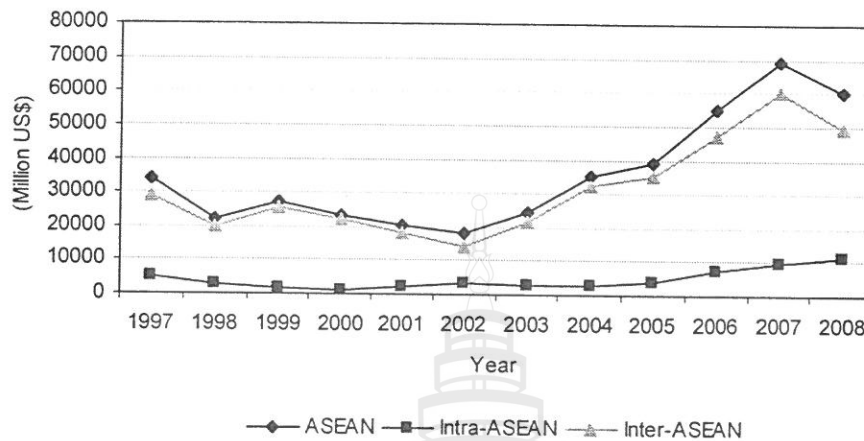
Overview of FDI in ASEAN

This chapter provides the stylized facts of foreign direct investment flows to Southeast Asian economies. It is an attempt to describe changes in FDI flows in ASEAN which are devoted to giving a detail of different patterns of FDI in these member countries. It also presents the ASEAN inward FDI performance.

2.1 FDI in ASEAN: Stylized facts

Foreign direct investment has played a major role in the successful economic development of ASEAN economies, especially, an increase in technology and know-how, labor skills, and production and distribution network. Moreover, it is also a key driver of a come-back to the world FDI scene after being interrupted by the Asian financial crisis in 1997. It is interesting to note that ASEAN by itself has originated investment framework for both member and non-member investors that has contributed to economic recovery and growth. The ASEAN investment Area initiated in 1998 aimed at making ASEAN as a competitive, conducive and liberal investment area. Under AIA all industries under manufacturing, agriculture, fishery, forestry and mining & quarrying and services incidental to these five sectors will be liberalized. National treatment shall be granted to ASEAN investors by 2010 and all other investors by 2020, with some exceptions as identified by the member countries in their Temporary Exclusion Lists (TEL) and Sensitive Lists (SL). The TEL will be phased out based on agreed timelines, whereas the SL will be reviewed periodically (ASEAN, 2008). Subsequently, the AIA was improved through the ASEAN Comprehensive Investment Agreement in 2007 to provide investors with a framework that is highly conducive for regional production and distribution activities. Recognizing the importance of the intra-regional investment flows, ASEAN is devoted to a free flow of investment and freer flow of capital as part of its effort toward building the ASEAN economic community by 2015 (ASEAN, 2009).

Figure 2-1: FDI flows to ASEAN countries, 1997-2008



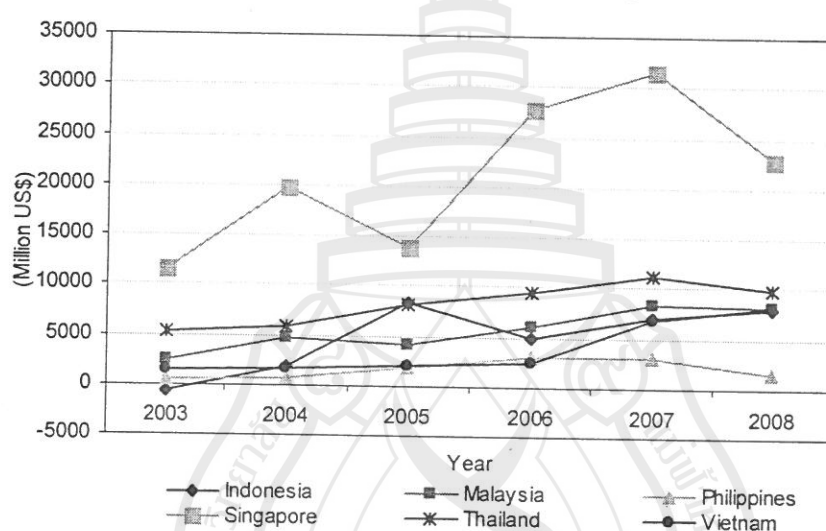
Source: Author's contribution based on data from ASEAN Secretariat

Figure 2-1 shows the FDI flows to ASEAN during 1997-2008. It has seen a significant increase in Inter-ASEAN FDI and Intra-ASEAN FDI over the past ten years with the exception in 2008. The ASEAN investment situation in the early implementation of the AIA has not still improved due to worldwide economic slowdown in the early 2010s. Until the end of 2002, the investment environment has shifted dramatically. The FDI inflows to ASEAN boomed, climbing from US\$ 15.8 billion in 2002 to an unprecedented peak level of US\$ 69 billion in 2007. FDI inflows jumped in 2007 by 26% from the year-ago period with a considerable increase in Intra-ASEAN FDI by 24% and an expansion in Inter-ASEAN FDI by 27%. Of course, the ASEAN investment reform in the direction of more liberalization, little restriction and deregulation was key contributory factor to regain the attention of foreign investors.

Unexpectedly, the FDI inflows to ASEAN slightly declined 13% in 2008 from the previous year because of the existence of the U.S. severe economic slowdown and global financial crisis in the mid of 2008. It is surprising that the Intra-ASEAN FDI growth has still an increase by 18% in 2008. As for this reason, it is widely expected that the deepening economic and financial integration in Asian countries will help them successfully pass the economic crisis period and will pave the way for well-enhanced FDI flows to ASEAN.

Moreover, it is an attention on patterns of FDI to ASEAN countries for whose data on FDI are available, for example, FDI flows to ASEAN by host country, source country and economic sector. Figure 2-2 presents the FDI flows to ASEAN host countries. Nearly all ASEAN countries received higher inflows. Singapore, Thailand, Malaysia, Indonesia and Vietnam, in that order, were the largest FDI recipients, together accounting for more than 90% of flows to the sub region.

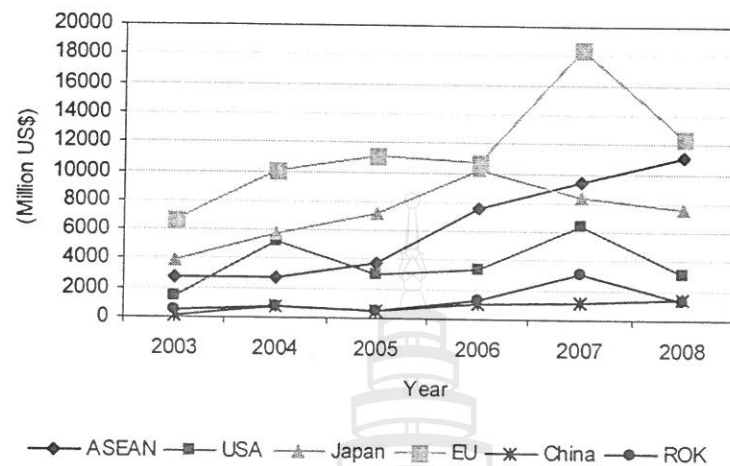
Figure 2-2: FDI flows to ASEAN by host country, 2003-2008



Source: Author's contribution based on data from ASEAN Secretariat

FDI inflows by country of origin from 2003 to 2008 are shown in Figure 2-3. The top investors of ASEAN in 2008 were still the U.S., the EU, Japan and China. The EU (especially United Kingdom, Netherlands and France) and the U.S. are now the first and second largest home countries, whereas Japan and the intra-ASEAN are the next most important sources of FDI. Specially, Republic Korean investments into ASEAN surged 149% in 2007 after a few years of slight growth in the early 2000s. Together with the other developed countries named above, they contributed almost half of total FDI in ASEAN (ASEAN, 2008a).

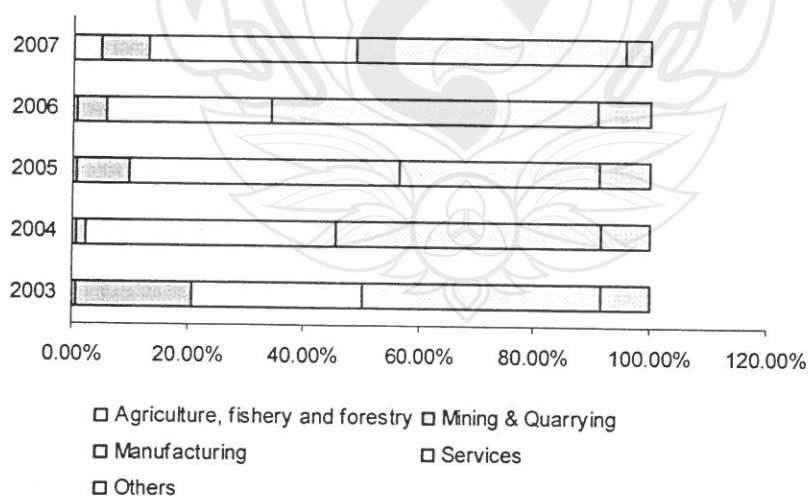
Figure 2-3: FDI flows to ASEAN by source country, 2003-2008



Source: Author's contribution based on data from ASEAN Secretariat

Remarkably, ASEAN is top ten investors in the period of 2003-2008. Intra-ASEAN FDI has grown significantly over the last decade. In particular, FDI inflows in 2008 rose by 18% from the previous year although there was world economic slowdown. The top three recipients of Intra-ASEAN FDI in 2008 were Indonesia, Thailand, Vietnam and Malaysia with a total share of 86% (US\$ 9.53 billion).

Figure 2-4: FDI flows to ASEAN by economic sector, 2003-2007



Source: Author's contribution based on data from ASEAN Secretariat

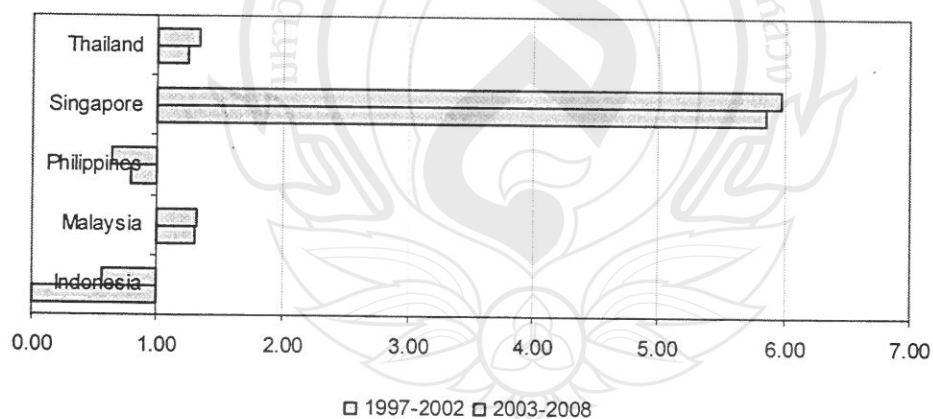
The FDI inflows by economic sector from 2003 to 2007 are shown in Figure 2-4. It has seen an increase in the FDI inflows in all four sectors in 2007. The services sector saw the largest increase, to US\$ 26 billion from a little under US\$ 25 billion in 2006, due to the significant increase in flows into trade and commerce, finance and real estate.

Almost half of FDI into the ASEAN were made into manufacturing sector. The high average share of manufacturing was at 37% between 2003 and 2007, but on annual basis it declined to 19% by 2006. The manufacturing industries as top recipients of FDI in 2003-2007 were chemical industries, electronic equipment, motor vehicle, and basic metals. By contrast, FDI in the primary sector was traditionally negligible, in spite of most ASEAN countries rich natural resources.

2.2 Inward FDI Performance

Inward FDI performance is typically considered to be an indicator of foreign investment attractiveness.

Figure 2-5: ASEAN Inward FDI Performance Index, 1997-2008

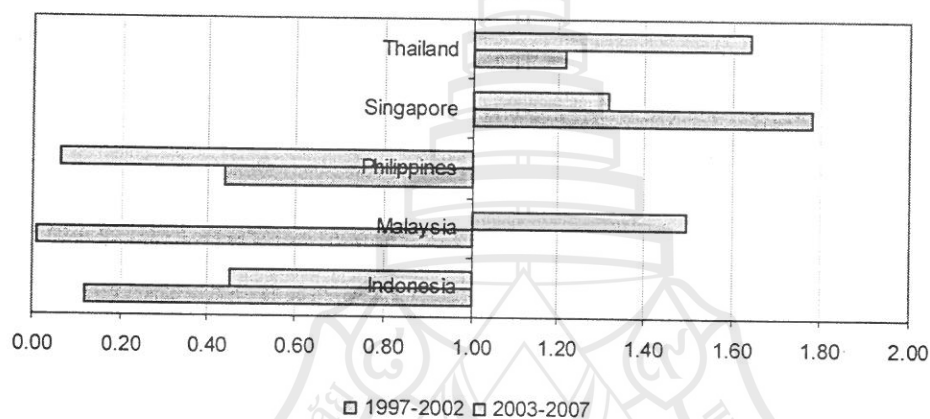


Source: Author's contribution based on data from ASEAN Secretariat

Figure 2-5 shows inward FDI performance index which ranks FDI inflows of ASEAN countries relative to their economic size. It is the ratio of a country's share in global FDI inflows to its share in global GDP. Comparing the FDI inflows of the five ASEAN

member countries relative to their GDP reveals a vastly different view of FDI performance. Singapore, Thailand and Malaysia have an attractive investment environment for foreign investors in the period of 1997-2002 and 1998-2008, whereas Philippines and Indonesia do not attract foreign investors. Thailand and Malaysia attract more FDI inflows than their GDP while Singapore attracts almost six times the amount of FDI inflows expected based on its relative GDP.

Figure 2-6: Intra-ASEAN Inward FDI Performance Index, 1997-2007



Source: Author's contribution based on data from ASEAN Secretariat

Likewise, Intra-ASEAN inward FDI performance index also indicates that Singapore, Thailand and Malaysia have an attractive investment environment for Intra-ASEAN investors (Figure 2-6). It is the ratio of country's share in ASEAN FDI to its share in ASEAN's GDP. Comparing the ASEAN and Intra-ASEAN Inward FDI performance Index demonstrates a same direction between two groups. The ASEAN inward FDI performance index is significantly greater than the Intra-ASEAN index.

The stylized facts presented above indicate that the investment environment in the Southeast Asian region differed strongly since the presence of ASEAN investment area framework. Both Inter-ASEAN and Intra-ASEAN FDI flows were raised remarkably. Even though it has the severe global economic downturn in 2008, Intra-ASEAN FDI flows still continued to increase. As for this reason, ASEAN region becomes a global attractive FDI destination. In addition, ASEAN has improved the AIA through the ASEAN

Comprehensive Investment Agreement in 2007 and committed free flow of capital and free labor movement in the ASEAN economic community by 2015. This is not only to improve the economic growth of ASEAN economies but to increase their welfare.



Chapter 3

Literature Review

This chapter reviews the relevant literature that focuses on factors influencing FDI flows toward countries. Four main factors i.e. bilateral characteristics, third-country effect, regional economic integration and foreign exchange currency which have driven FDI are discussed under the theory of FDI and their empirical evidence.

3.1 Knowledge-Capital Model

The Knowledge-capital model is regarded as the recent theory of foreign direct investment. In fact, the KC model has originated from the Eclectic paradigm, theory of horizontal FDI and theory of vertical FDI. The Eclectic paradigm noted by Dunning (1977) explained that a firm's FDI decision is influenced by three factors: ownership, location and internalization. Even though this paradigm helps to explain why FDI takes place but it has still limited to explain multinational enterprises' (MNEs) activities. Therefore, theory of FDI has further developed to the theory of horizontal FDI and vertical FDI. First, theory of horizontal FDI has been studied by Horstmann and Markusen (1987, 1992), Brainard (1993) and Markusen and Venables (1998, 2000). The intuitions behind the theory of horizontal FDI are derived from the proximity-concentration and general-equilibrium approach. It is to explain how a firm's decision to serve a foreign market by exporting or by engaging in foreign investment. The horizontal model was developed to predict that horizontal multinational activity is most likely to occur in countries that are relatively similar in size and in relative endowments and high transport costs, whereas skill differences are negatively related to FDI. Second, the theory of vertical FDI has been studied by Helpman (1984, 1985) and Helpman and Krugman (1985). This theory has an attempt to explain why firms locate different production processes in different countries. The intuition behind the theory of vertical FDI is derived from the factor-price equalization approach. The vertical model was developed to predict that vertical multinational activity is driven to take advantage in factor cost differences and low transport costs. It concludes that

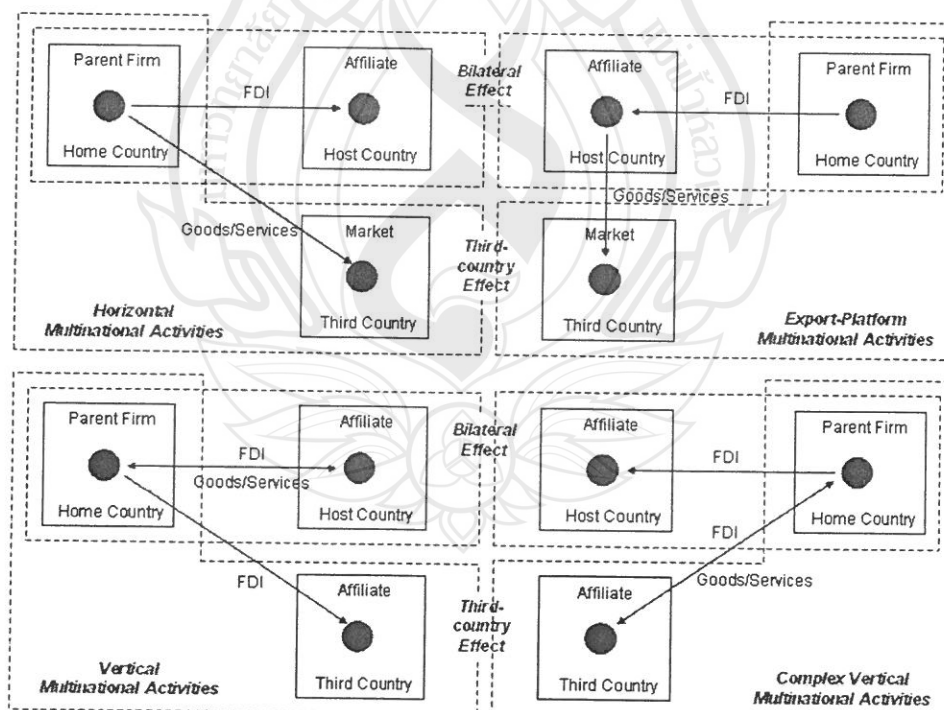
horizontal firm tends to produce similar goods and duplicates activities in other countries to serve foreign markets (market-seeking), whereas vertical FDI tends to geographically separate its headquarters and production activities to reduce factor costs (resource-seeking).

Recently, Markusen (1997) and Markusen (2002) have developed a model that combines both horizontal and vertical motives for foreign investment, the Knowledge-Capital Model. It assumes that headquarter services can be geographically separated from production activities and that they can be supplied simultaneously to several production facilities at low cost. Firms in the KC model include national firms, horizontal multinationals and vertical multinationals. Horizontal MNEs are firms with production plants in both countries, but headquarters located in only home country. Vertical MNEs are firms with different production plants in both countries, but headquarters located in only home country. Finally, national plants maintain a single plant and headquarters in the same country to sell domestically and export. Some additional assumptions are necessary to make the model operational: transportability or fragmentation, skilled-labor intensity, and jointness. The implications under the KC model indicated that similarity in market size and relative endowments, and high trade costs encourage horizontal FDI in favor of the KC model, whereas differences in relative factor endowments and low trade costs encourage vertical FDI in favor of the KC model.

More recently, Baltagi et al. (2005) extended the KC model by adopting the third-country effects into their model. They labeled the multinational activities in four types of MNEs: horizontal multinationals, export-platform multinationals, vertical multinationals and complex vertical multinationals (Figure 3-1). Horizontal MNEs are firms with plants in home and host country with exports from home country to third country. Export-platform MNEs are firms with plants in home and host country with exports from host to third country. Vertical MNEs are firms with plants in host and third country with exports from host to home country. Complex vertical MNEs are firms with plants in host and third country with exports from third to home country. Using the

numerical simulations, the theoretical hypotheses give rise to the predicted signs of the bilateral and third-country determinants on bilateral FDI. The implications of the horizontal and vertical multinationals are in line with the original KC model. Horizontal FDI tends to dominate when countries have similarities in market size and unskilled labor endowments, and trade costs across countries are relatively high. Vertical FDI tends to dominate when countries have differences in relative unskilled labor endowments, and trade costs across countries are low. Export-platform FDI tends to dominate when countries have similarities in market size and unskilled labor endowments, and trade costs across countries are relatively high. Complex vertical FDI tends to dominate when countries have differences in relative unskilled labor endowments, and trade costs across countries are high. These theoretical predictions provide a clear picture of why bilateral and third-country characteristics matter for bilateral complex FDI.

Figure 3-1 Multinational activities for types of complex FDI



Source: Author's contribution.

The development in the theory of FDI above led to a burgeoning empirical work to examine the importance of alternative FDI theories. The empirical literature on the KC model gave both consistent and inconsistent support for the KC model. The studies gave support evidence for the KC model; for example, Braconier et al. (2002), Davies (2002), Braconier et al. (2003), Yeaple (2003), Waldkirch (2004), Geishecker and Görg (2005), Torosyan and Waldkirch (2006), Mariel et al. (2007) and Baltagi et al. (2007), whereas Blonigen et al. (2002), Carr et al. (2002), Davies (2002), Kristjánsdóttir (2005) and Torosyan and Waldkirch (2006) gave contradictory evidence for the KC model. The main reason for their rejection in the KC model is the lack of evidence for vertical composition in the model. Although the proxy measures of variables have some limitations, the empirical model specification of the KC model can still explain the multinational activity closely related to the observed investments. That is because the KC model can capture the multinational activity under certain condition well. Hence, there are a number of empirical studies on multinational activity, with reference to the KC model until now.

3.2 Impact of Regional Economic Integration

There was an attempt to verify the presence of the RIA factor on FDI since a dramatic rise in the FDI flows in the last decade. The early work by Motto and Norman (1996) examines the relationship between FDI and economic integration using game-theoretic models of FDI. The results predicted that an increase in country size leads to dispersed FDI; and an improvement in market accessibility leads to export-platform FDI. The economic integration by market accessibility tends to induce outside firms to invest in the integrated regional bloc, particularly intra-regional platform FDI from the external country. Moreover, the impact of economic integration on FDI can explain in terms of members of the same RIA and from source countries outside the RIA. The former is the effect of RIAs on intra-regional FDI. Blomström and Kokko (1997) gave two contradictory predictions: (i) Removal of tariffs can decrease horizontal or tariff-jumping FDI because costs of serving foreign markets by exports are cheaper than by setting up foreign affiliates. (ii) Removal of tariffs can increase vertical FDI as a result of comparative advantage of differences in factor prices, and lower trade costs for exporting back to

home country. The latter is the effect of RIAs on extra-regional FDI. The formation of RIAs becomes profitable for foreign investors outside the region to extend more markets, and to use inputs from more than one country in the region (Velde and Bezemer, 2004).

Recently, Altomonte (2004) developed the monopolistic competition model to analyze the impact of regional economic integration on FDI. He hypothesized that the RIAs tend to induce an increase in market potential, and consequently bring about the higher profits obtained from FDI. The market potential is a proxy for degree of the RIAs in the model. His findings can explain an increase in FDI flow taking place in parallel with a surge of RIAs. Most recently, Uttama and Péridy (2009) and Uttama (2009) extended the augmented KC model introduced by Baltagi et al. (2007) to analyze the impacts of the simultaneous bilateral and third-country effects and RIA on FDI. In the former study, market potential as a proxy for RIA parameter is included into the model, whereas tariffs are as proxy for RIA in the latter one. Both theoretical predictions showed that the determinants of Bilateral and third-country effects are consistent with the theoretical predictions of Baltagi et al. (2007) and greater degree of RIAs influences export-platform and vertical FDI rather than horizontal and complex vertical FDI. Moreover, the empirical evidence on Altomonte (2004), Uttama and Péridy (2009) and Uttama (2009) gave strong support the RIA on FDI.

3.3 Impact of Foreign Exchange Currency

The theoretical and empirical literature attempted to examine whether foreign exchange currency influences FDI inflows to host countries over the last decade. Importantly, the existing literature has generally found both positive and negative effect of local currency depreciation on inward FDI. Several reasons are suggested, with many studies verifying the effect of exchange rate from a supply-side or push factor and wealth effect on the FDI inflows. Froot and Stein (1991) developed a model with imperfect capital market to explain the relationship between exchange rate and FDI. Their results showed that depreciation in foreign exchange rate of recipient country tends to increase FDI inflows as a result of lower production cost

effect. This can explain it as stronger home currency increases outward FDI. In contrast, Campa (1993) developed the model of Dixit's (1989) real options approach to explain that an appreciation in exchange rate of recipient country decreases FDI inflows due to the higher production cost effect. Moreover, Campa (1993), Goldberg and Kolstad (1995) and Blonigen (1997) suggested that depreciated currency as a given amount of foreign currency which can buy more investment give rise to the FDI inflows.

Recently, Egger et al. (2007) augmented the oligopoly model to explain the relationship between a revenue effect and a cost-related competition effect of bilateral and third-country exchange rate on multinational activity in host country. Their findings indicated two counteracting effects of exchange rate on multinational activities. An appreciation of a foreign currency increases local affiliate sale called a revenue effect. On the other hand, it increases the production costs rendering the multinational activity in the host country less attractive called a competitive effect. It is interesting to suggest that even though it has seen the augmented theory of FDI or multinational activity regarding exchange rate but it still neglects the theoretical hypotheses on the relationship between foreign exchange rate and bilateral complex FDI e.g. export-platform FDI and complex vertical FDI.

Empirical evidence concerning the effects of foreign exchange currency on FDI is mixed. A number of empirical studies confirm the strongly positive (negative) impacts of exchange rate on FDI. The studies provide the positive evidence; see for example, Froot and Stein (1991), Blonigen (1997), Kiyota and Urata (2004), Xing and Zhao (2008) and Grossman et al. (2009) while Campa (1993) and Goldberg (1993) provide the negative evidence. Specially, Egger et al. (2007) shows both positive and negative evidence for bilateral and third-country exchange rate effects on FDI.

Summing up, the recent theory of FDI can explain the impacts of the simultaneous bilateral and third-country effects and RIA on FDI. However, it still avoids the inclusion of exchange rate effect in FDI analysis and multinational activities. Of course, the

omission of interdependence among bilateral and third-country effects, RIA and foreign exchange currency induces inconclusive results for the firm's decision to invest abroad.



Chapter 4

Theoretical Implications

This chapter discusses model setup, numerical simulation and theoretical hypotheses. The Baltagi's (2007) Knowledge-capital model with additional assumptions is refined; and then is derived using numerical simulation to provide theoretical predictions on the impacts of bilateral and third-country effect, regional economic integration and foreign exchange currency on FDI flows to host country.

4.1 Model setup

To further advance the theoretical understanding of FDI, the KC framework of Baltagi et al. (2007) with two traded good sectors (homogenous- Y and differentiated- X good sectors), three production factors (physical capital- K , skilled labor- S and unskilled labor- L factors) and three countries (home- i , host- j and third- k countries) is extended. Homogenous sector uses only unskilled labor in production while differentiated sector uses all three factor endowments. There are four types of bilateral FDI served in the model: horizontal FDI (HFDI), export-platform FDI (EXFDI), vertical FDI (VFDI), and complex vertical FDI (CVFDI). Horizontal multinational enterprise is characterized by establishing similar plants in home and host country for serving both markets and exporting from home to third country. Export-platform MNE is characterized by establishing similar plants in home and host country for serving both markets and exporting from host to third country. Vertical MNE is characterized by fragmenting production in host and third country and exporting from host country back to home country. Complex vertical MNE is characterized by fragmenting production in host and third country and exporting from third country back to home country.

Moreover, it is also assumed that headquarters of MNE serve their affiliates with physical capital and skilled labor, trade in differentiated goods is impeded by tariffs

and iceberg transport costs, and appreciated and/or depreciated foreign exchange rate results in overvalued and/or undervalued trade in differentiated goods.

a. Demand

The demand is modeled by following the nested utility function based on Dixit and Stiglitz (1977). Let U_i denote the utility of representative consumer in country i , α be the Cobb-Douglas expenditure share for differentiated products, and ε be the elasticity of substitution between varieties given by $\varepsilon > 1$. Manufacturers can be produced by five different firm types: national firm, horizontal firm, export-platform firm, vertical firm and complex vertical firm. These will be reflected in three sets of components in the first of two right-hand-side bracketed terms in Equation (4-1) below:

$$U_i = \left[N_{ii} X_{ii}^{\frac{\varepsilon-1}{\varepsilon}} + N_{ji} \left(\frac{X_{ji}}{T_{ji}} \right)^{\frac{\varepsilon-1}{\varepsilon}} + N_{ki} \left(\frac{X_{ki}}{T_{ki}} \right)^{\frac{\varepsilon-1}{\varepsilon}} \right]^{\frac{\varepsilon}{\varepsilon-1} \alpha} [Y_{ii} + Y_{ji} + Y_{ki}]^{1-\alpha} \quad (4-1)$$

The first component reflects differentiated goods production from plants in home country for serving home market. X_{ii} denotes X goods produced in region i for consumption in region i . N_{ii} is a number of firms serving market i from plants in i ; $N_{ii} = n_i + h_{ij,ik} + h_{ij,jk}$ where n_i is national firm, $h_{ij,ik}$ and $h_{ij,jk}$ are horizontal and export-platform multinational firm in region i . National and multinational firms are assumed to have identical technologies throughout.

The second set of components reflects differentiated goods production from plants in host country for serving home market. X_{ji} denotes X goods produced in region j for consumption in region i . N_{ji} denotes a number of firms serving market j from plants in i ; $N_{ji} = n_j + v_{jk,ji}$ where n_j is national firm and $v_{jk,ji}$ is vertical multinational firm in region j .

The third component reflects differentiated goods production from plants in third-country country for serving home market. X_{ki} denotes X goods produced in region k for consumption in region i . N_{ki} denotes a number of firms serving market k from plants in i ; $N_{ki} = n_k + v_{jk,ki}$ where n_k is national firm and $v_{jk,ki}$ is complex vertical multinational firm in region k .

In the second bracketed right-hand-side term, Y_{ji} , Y_{ji} and Y_{ki} denote the output of homogeneous good produced in country i , j , and k respectively under constant return to scale and consumed for consumption in region i . Let T_{ji} and T_{ki} be gross trade costs for shipping goods from region j to i and from region k to i respectively; $T_{ji} = (1+t_{ji})(1+\tau_{ji})$ and $T_{ki} = (1+t_{ki})(1+\tau_{ki})$ where t is iceberg transport cost and τ is tariff rate on imports.

The budget constraint of representative consumer in country i is assumed to be:

$$\begin{aligned} M_i = & w_{Ki}K_i + w_{Si}S_i + w_{Li}L_i + (\tau_{ji}E_{ji}N_{ji}p_jX_{ji} + \tau_{ki}E_{ki}N_{ki}p_kX_{ki}) \\ & - (\tau_{ij}E_{ij}N_{ij}p_iX_{ij} + \tau_{ik}E_{ik}N_{ik}p_iX_{ik}) + (\tau_{ji}E_{ji}q_iY_{ji} + \tau_{ki}E_{ki}q_iY_{ki}) \\ & - (\tau_{ij}E_{ij}q_jY_{ki} + \tau_{ik}E_{ik}q_kY_{ik}) \end{aligned} \quad (4-2)$$

where p_i , p_j and p_k denote price charged by producers in i , j , and k respectively for X goods, whereas q_i , q_j and q_k are price charged by producers in i , j , and k respectively for Y goods. Let E be foreign exchange adjustment for trade in X goods and Y goods, and w_{Ki} , w_{Si} and w_{Li} denote factor rewards of capital, skilled labor and unskilled labor in country i respectively. The first three right-hand-side terms denote factor income; the last four right-hand-side terms denote tariff revenue adjusted foreign exchange currency by the government in country i back to the representative consumer. The equivalence of total factor income (M_i, M_j, M_k) and demand in each economy implicitly balances international payments.

It is also assumed that prices of homogeneous good consumed in such country are identical no matter where the good originates from. There is no price discrimination

on X varieties. However, price in i of varieties from j and k has to encounter different trade costs and foreign currency in X sector. Trade costs effect is captured by multiplying a price of imported varieties with constant $(1+t)(1+\tau)>1$ units of each good X while foreign exchange rate effect is captured by multiplying a price of imported varieties with constant $(1+1/e)>1$ units of each good X where e denotes the values of exporting country's currency in terms of importing country's currency. Maximizing the utility's equation with respect to expenditure constraint, product market clearing and complementary goods price yields the demand functions:

$$X_{ii} \geq p_i^{-\varepsilon} I_i^{\varepsilon-1} \alpha M_i \quad \perp \quad p_i \geq 0 \quad (4-3)$$

$$X_{ji} = p_j^{-\varepsilon} T_{ji}^{1-\varepsilon} E_{ji}^{1-\varepsilon} I_i^{\varepsilon-1} \alpha M_i \quad (4-4)$$

$$X_{ki} = p_k^{-\varepsilon} T_{ki}^{1-\varepsilon} E_{ki}^{1-\varepsilon} I_i^{\varepsilon-1} \alpha M_i \quad (4-5)$$

$$Y_{ii} + Y_{ji} + Y_{ki} \geq \frac{(1-\alpha)M_i}{q_i} \quad \perp \quad q_i \geq 0 \quad (4-6)$$

where $\perp$ indicates that at least one of the adjacent conditions has to hold with equality and M_i is income (and expenditure) of the representative consumer in i . The price index of differentiated varieties (I) in region i is also obtained as:

$$I_i^{1-\varepsilon} = N_{ii} p_i^{1-\varepsilon} + N_{ji} (p_j T_{ji} E_{ji})^{1-\varepsilon} + N_{ki} (p_k T_{ki} E_{ki})^{1-\varepsilon} \quad (4-7)$$

where $E_{ji} = (1+1/e_{ji})$ and $E_{ki} = (1+1/e_{ki})$.

b. Factor requirement

There are two good sectors in the economy: homogeneous and differentiated good sector. The homogeneous good is produced for a perfectly competition market using a technology with constant returns to scale and requires only unskilled labor in its production. Setting Y_i as the model numéraire, all firms in the Y sector will equate marginal revenue with marginal costs so that $q_i = w_{Li} = 1$. In the absence of trade frictions for the homogenous good, unskilled wages in country j and k are given by $w_{Lj} = 1/e_{ji}$ and $w_{Lk} = 1/e_{ki}$, respectively. Unit cost function for Y good in country i is $c_{Yi} \geq w_{Li} \perp Y_{ii} \geq 0$. Although prices of homogeneous goods under perfect competition

market are identical, trade in homogeneous good is impeded by tariff and iceberg transport cost. Thus, the unit cost function for good Y from exporting country is given by $c_{Yl}(1+t_{il})(1+\tau_{il}) \geq q_l \perp Y_{il} \geq 0, l = j, k$.

The differentiated good is monopolistically competitive. It produces differentiated good under a constant elasticity of substitution (CES) technology using physical capital, skilled labor and unskilled labor, and faces increasing returns to scale in production. Each country is assumed to be endowed with exogenous amounts of skilled labor and unskilled labor which is internationally immobile, whereas an exogenous world endowment of physical capital is mobile internationally. Physical capital and skilled labor enter into the fixed costs to set up plants and to generate firm-specific assets (e.g. headquarters services, R&D, blueprint etc.) respectively, whereas unskilled labor only enter the variable costs of production. All firms employ three primary factors in X production under the same technology. The variable unit costs of differentiated goods in country i are given by

$$c_{Xi} = a_{KX}w_{Ki} + a_{SX}w_{Si} + a_{LX}w_{Li} \quad (4-8)$$

where a_{KX} , a_{SX} and a_{LX} are the country-specific unit input coefficient for capital, skilled and unskilled labor respectively.

In setting up a production plant abroad, MNE with headquarters in country i has to supply the fixed firm inputs of capital and skilled labor from i . Suppose that a is the amount of skilled labor required to run headquarters services; and g is the amount of capital required to set up a production facility. If their values are equal to one in local production, $a-1 > 0$ units of skilled labor and $g-1 > 0$ units of capital are required to operate plant abroad. On the one hand, a requirement of a fixed firm input of skilled labor amounts a units for each type of MNEs. That is because it arises from the joint-input nature of skill-intensive activities. On the other hand, a requirement of a fixed plant input of physical capital amounts $1+g$ units for $h_{ij,jk}$ and $h_{ij,jk}$ type of MNEs and $2g$ units for $v_{jk,ji}$ and $v_{jk,ki}$ type of MNEs. Hence, factor

market clearing given by the supply of factor endowments in equilibrium is equal to demand for them in homogeneous and differentiated good sector in the followings:

$$K_i \geq a_{KX}(N_{ii}X_{ii} + N_{ij}X_{ij} + N_{ik}X_{ik}) + n_i + (1+g)(h_{ij,ik} + h_{ij,jk}) + 2g(v_{jk,ji} + v_{jk,ki}) \quad (4-9)$$

$$\perp w_{Ki} \geq 0$$

$$S_i \geq a_{SX}(N_{ii}X_{ii} + N_{ij}X_{ij} + N_{ik}X_{ik}) + n_i + a(h_{ij,ik} + h_{ij,jk} + v_{jk,ji} + v_{jk,ki}) \quad (4-10)$$

$$\perp w_{Si} \geq 0$$

$$L_i \geq a_{LX}(N_{ii}X_{ii} + N_{ij}X_{ij} + N_{ik}X_{ik}) + (Y_{ii} + Y_{ij}T_{ij} + Y_{ik}T_{ik}) \quad (4-11)$$

$$\perp w_{Li} \geq 0$$

Equation (4-9)–(4-11) imply that a given supply of capital, skilled labor and unskilled labor respectively is fully employed for country i in equilibrium. The first right-hand-side term in Equation (4-9) is variable input of physical capital employed to produce X-goods in i ; the last three right-hand-side terms are fixed firm input of physical capital employed to set up production plant for national firm, horizontal-type firms and vertical-type firms in i . It is equal to one for local production plant of national firm; $1+g$ for horizontal firm plant and export-platform firm plant; and $2g$ for vertical firm plant and complex vertical firm plant. The first right-hand-side term in Equation (4-10) is variable input of skilled labor employed to produce X-goods in i ; the last two right-hand-side terms are fixed firm input of skilled labor employed to run headquarters services for all firms in i . It is equal to one for national firm; and a for each multinational firm. Each term in Equation (4-11) is variable inputs of unskilled labor employed to produce X-goods and Y-goods respectively in i .

c. Zero profit condition

The product market equilibrium in the differentiated good sector is a key to analyze multinational activities. In doing so, the structure of MNE activity is first determined jointly by market clearing conditions and zero profit conditions with respect to each type of firms. To obtain zero profit conditions in each type of firms, the assumption of free entry and exit is required. Under the X good production regime, an operation of firm in equilibrium occurs when operating profits are able to cover fixed costs. It is so-called “free entry” where firms earn zero profits in differentiated good sector. The

“markup revenue less than or equal to fixed costs” is a necessary condition for zero profit equation. The zero profit equations are written individually as follows:

$$\begin{aligned} \Pi_{n_i} : & p_i(X_{ii} + X_{ij} + X_{ik})/\varepsilon - w_{Si} - w_{Ki} \leq 0 \\ & \perp n_i \geq 0 \end{aligned} \quad (4-12)$$

$$\begin{aligned} \Pi_{h_{ij},ik} : & (p_i X_{ii} + p_j X_{jj} + p_i X_{ik})/\varepsilon - aw_{Si} - (1+g)w_{Ki} \leq 0 \\ & \perp h_{ij,ik} \geq 0 \end{aligned} \quad (4-13)$$

$$\begin{aligned} \Pi_{h_{ij},jk} : & (p_i X_{ii} + p_j X_{jj} + p_j X_{jk})/\varepsilon - aw_{Si} - (1+g)w_{Ki} \leq 0 \\ & \perp h_{ij,jk} \geq 0 \end{aligned} \quad (4-14)$$

$$\begin{aligned} \Pi_{v_{jk,ji}} : & (p_j X_{ji} + p_j X_{jj} + p_k X_{kk})/\varepsilon - aw_{Si} - 2gw_{Ki} \leq 0 \\ & \perp v_{jk,ji} \geq 0 \end{aligned} \quad (4-15)$$

$$\begin{aligned} \Pi_{v_{jk,ki}} : & (p_k X_{ki} + p_j X_{jj} + p_k X_{kk})/\varepsilon - aw_{Si} - 2gw_{Ki} \leq 0 \\ & \perp v_{jk,ki} \geq 0 \end{aligned} \quad (4-16)$$

Equation (4-12)–(4-16) demonstrate the zero profits of differentiated good sector in national firm, horizontal MNE, export-platform MNE, vertical MNE and complex vertical MNE respectively. The first left-hand-side term represents markup revenue of X-good that markup in large-number monopolistic competition is assumed to be a constant $1/\varepsilon$ over marginal cost. The last second left-hand-side terms represent total fixed costs employed for X-good sector.

d. General Equilibrium

Combining zero profit equations with respect to demand for differentiated goods yields product market equilibrium of X-good sector:

$$\begin{aligned} \Pi_{n_i} : & p_i^{1-\varepsilon} I_i^{\varepsilon-1} \alpha M_i + p_i^{1-\varepsilon} T_{ij}^{1-\varepsilon} E_{ij}^{1-\varepsilon} I_j^{\varepsilon-1} \alpha M_j + p_i^{1-\varepsilon} T_{ik}^{1-\varepsilon} E_{ik}^{1-\varepsilon} I_k^{\varepsilon-1} \alpha M_k \\ & \leq \varepsilon(w_{Si} + w_{Ki}) \quad \perp n_i \geq 0 \end{aligned} \quad (4-17)$$

$$\begin{aligned} \Pi_{h_{ij},ik} : & p_i^{1-\varepsilon} I_i^{\varepsilon-1} \alpha M_i + p_i^{1-\varepsilon} T_{ik}^{1-\varepsilon} E_{ik}^{1-\varepsilon} I_k^{\varepsilon-1} \alpha M_k + p_j^{1-\varepsilon} I_j^{\varepsilon-1} \alpha M_j \\ & \leq \varepsilon(aw_{Si} + (1+g)w_{Ki}) \quad \perp h_{ij,ik} \geq 0 \end{aligned} \quad (4-18)$$

$$\begin{aligned} \Pi_{h_{ij},jk} : & p_i^{1-\varepsilon} I_i^{\varepsilon-1} \alpha M_i + p_j^{1-\varepsilon} I_j^{\varepsilon-1} \alpha M_j + p_j^{1-\varepsilon} T_{jk}^{1-\varepsilon} E_{jk}^{1-\varepsilon} I_k^{\varepsilon-1} \alpha M_k \\ & \leq \varepsilon(aw_{Si} + (1+g)w_{Ki}) \quad \perp h_{ij,jk} \geq 0 \end{aligned} \quad (4-19)$$

$$\begin{aligned} \Pi_{v_{jk,ji}} : & p_j^{1-\varepsilon} T_{ji}^{1-\varepsilon} E_{ji}^{1-\varepsilon} I_i^{\varepsilon-1} \alpha M_i + p_j^{1-\varepsilon} I_j^{\varepsilon-1} \alpha M_j + p_k^{1-\varepsilon} I_k^{\varepsilon-1} \alpha M_k \\ & \leq \varepsilon (aw_{Si} + 2gw_{Ki}) \quad \perp v_{jk,ji} \geq 0 \end{aligned} \quad (4-20)$$

$$\begin{aligned} \Pi_{v_{jk,ki}} : & p_k^{1-\varepsilon} T_{ki}^{1-\varepsilon} E_{ki}^{1-\varepsilon} I_i^{\varepsilon-1} \alpha M_i + p_j^{1-\varepsilon} I_j^{\varepsilon-1} \alpha M_j + p_k^{1-\varepsilon} I_k^{\varepsilon-1} \alpha M_k \\ & \leq \varepsilon (aw_{Si} + 2gw_{Ki}) \quad \perp v_{jk,ki} \geq 0 \end{aligned} \quad (4-21)$$

At the present, the model consists of the number of unknown variables, for example, number of national and multinational firms, outputs, good prices and factor prices. Regarding Walrus's law, it is possible to analyze the model with respect to observed parameters. Therefore, the model is simulated numerically to obtain the theoretical predictions, instead of analytically. That is because the complexity of the model and complementary-slackness problems shown above which cause a high degree of nonlinearity; and it cannot be solved analytically.

4.2 Parameterized Variables

In the calibration of the model, the recent model of multinational enterprises must be kept as close as possible. The following assumptions about the exogenous variables and parameter values in this model are made following Baltagi et al. (2007) and Egger et al. (2004); and Mathematical program, namely GAMS/MPSGE¹, is employed to provide the theoretical solutions.

a. Exogenous variables

It is assumed that physical capital endowment $K_i = 40$ units and $K_j = K_k = 20$ units; skilled labor endowment $S_i = 15$ units and $S_j = S_k = 7.5$ units; and unskilled labor endowment $L_i = 40$ units and $L_j = L_k = 30$ units where i is capital-abundant country, j and k are unskilled-labor-abundant countries. To examine the impacts of bilateral and third-country effect, host- and third-country endowment configurations are changed from 90% to 110%.

¹ The General Algebraic Modelling System/Mathematical Programming System for General Equilibrium (GAMS/MPSGE) has a robust non-linear complementarity solver in it (Markusen, 2005).

b. Parameter values

The parameter values are assumed as follows: (i) stable parameters i.e. elasticity of substitution between varieties $\varepsilon = 4$, expenditure share for differentiated varieties $\alpha = 0.8$, iceberg transport costs $t_{ij} = t_{ji} = t_{ik} = t_{ki} = 0.07$ and $t_{jk} = t_{kj} = 0.27$, fixed skilled labor endowment for running headquarters services $a = 1.01$, fixed physical capital endowment for setting up a plant $g = 1.07$ and input coefficient $a_{KX} = 0.3$; $a_{SX} = 0.1$; $a_{LX} = 0.6$, (ii) policy parameter of tariffs $\tau_{ij} = \tau_{ik} = \tau_{jk} = \tau_{kj} = 0.15$ and $\tau_{ji} = \tau_{ki} = 0.075$, and (iii) exchange rate parameter $E_{ij} = 1.45$ obtained by averaging the values of world currency in terms of the U.S. currency over the last ten years. To examine the impact of the exchange rate and regional economic integration, the value of foreign currency in terms of home currency and tariffs are raised by 50%.

4.3 Theoretical Hypotheses

The augmented general equilibrium model is derived from numerical simulation to assess various propositions. These propositions are plausible for FDI to have an impact on the observed variables relating to bilateral and third-country effects, exchange rate and regional integration. Table 4-1 shows the theoretical propositions among four types of bilateral FDI. It includes the impacts of changes in the bilateral- and third-country determinants such as total market size, similarity in economic size, relative endowments of physical capital, skilled labor and unskilled labor, interaction between relative capital endowment and total size, interaction between capital-to-unskilled labor ratio and transport costs, tariffs as proxy for regional economic integration, and exchange rate on bilateral FDI.

Table 4-1: Theoretical Propositions

Explanatory variables	Mode of FDI			
	HFDI	EXFDI	VFDI	CVFDI
Bilateral Determinants				
Bilateral sum of GDP	+	+	+	+
Similarity in GDP	+	+	-/+	+
Relative capital endowment	+	+	+	+

Table 4-1: Theoretical Propositions (cont.)

Explanatory variables	Mode of FDI			
	HFDI	EXFDI	VFDI	CVFDI
Relative skilled labor endowment	+	+	+	+
Relative unskilled labor endowment	-	-	-	-
Capital-size interactive term	-	-	+	-
Trade costs interactive term	+	+	-	+
Tariffs	+	-	-	+
Real exchange rate	+	+	-	+
Third-country Determinants (spatially weighted)				
Bilateral sum of GDP	+	+	+	+
Similarity in GDP	-	+/-	-/+	-/+
Relative capital endowment	+	+	+	+
Relative skilled labor endowment	+	+	+	-
Relative unskilled labor endowment	-	-	-	-
Capital-size interactive term	-	-	-	+
Trade costs interactive term	+	+	-	+
Tariffs	-	-	+	+
Real exchange rate	-	-	+	-

Source: Author's numerical simulation using General Equilibrium Modeling with MPSGE

After the numerical simulation, the theoretical propositions in four types of bilateral FDI can be obtained. They illustrate the impacts of changes in the bilateral- and third-country determinants on bilateral FDI, either positively or negatively, in the following theoretical propositions.

Proposition 1: *Bilateral FDI rises with a larger bilateral market size which is regarded as primary factor to surge FDI inflows.*

Proposition 2: *Horizontal, export-platform and complex vertical FDI increase with similarity of two economies, whereas vertical FDI tends to decline with similarity in country size.*

Dissimilarity in country size encourages investors to fragment production plant abroad in order to exploit low-cost production factors.

Proposition 3: *Bilateral FDI rises with a ratio of physical capital and skilled labor endowments in two countries, whereas bilateral FDI declines with a ratio of unskilled labor endowments.*

Differences in capital and skilled labor abundance indicate comparative advantages in setting up plants and running headquarters services abroad; and difference in unskilled-labor abundance implies a production cost advantage from foreign plants.

Proposition 4a: *In bilateral determinant, horizontal, export-platform and complex vertical FDI increase with the interaction term between capital endowment ratio and sum of total size, whereas vertical FDI decreases with it.*

Proposition 4b: *In third-country determinant, horizontal, export-platform and vertical FDI increase with the interaction term between capital endowment ratio and sum of total size, whereas complex vertical FDI decreases with it.*

In fact, the interaction term between capital endowment ratio and sum of total size indicates a capacity of a smaller capital-abundant country in making FDI. Higher relative capital endowments tend to stimulate vertical FDI from advanced countries as long as bilateral size is large, whereas it tends to stimulate horizontal, export-platform and complex vertical FDI when bilateral size is small.

Proposition 5: *Bilateral FDI rises with the interaction term between differences in capital-to-unskilled-labor ratios and transport costs.*

The interaction term between differences in capital-to-unskilled-labor ratios and transport costs represents foreign investment barriers from transport costs, whereas difference in relative factor endowments is used to disentangle the effects on horizontal-type and vertical-type FDI (Baltagi et al., 2007).

Proposition 6a: *In bilateral determinant, horizontal and complex vertical FDI increase with tariffs of host country as proxy for regional economic integration, in contrast to vertical and export-platform FDI.*

Proposition 6b: *In third-country determinant, vertical and complex vertical FDI increase with tariffs of host country as proxy for regional economic integration, in contrast to horizontal and export-platform FDI.*

In general, the deeper degree of RIAs enhances export-platform and vertical FDI, whereas it tends to diminish horizontal and complex vertical FDI.

Proposition 7a: *In bilateral determinant, horizontal, export-platform and complex vertical FDI raise with an appreciation in exchange rate of recipient country, whereas vertical FDI raises with depreciation in exchange rate of recipient country.*

Proposition 7b: *In third-country determinant, horizontal, export-platform and complex vertical FDI decline in an appreciation in exchange rate of third country, whereas vertical FDI declines in depreciation in exchange rate of third country.*

A depreciation in exchange rate decreases production costs in host country that tends to induce vertical multinational activities (competitive effect). In contrast, an appreciation in exchange rate increases local affiliate sales that tends to induce horizontal, export-platform and complex vertical FDI (revenue effect). These reasons can be explained the impacts of third-country exchange rate on bilateral complex FDI.

These theoretical propositions regarding country's characteristics are consistent with the theoretical aspects of Markusen et al. (1996), Markusen (1997), Markusen and Maskus (1999), Yeaple (2003) and Baltagi et al. (2007). The theoretical propositions on regional integration effect closely resemble Motto and Norman (1996), Blomström and Kokko (1997) Altomonte (2007) and Uttama and Péridy (2009), whereas the theoretical propositions on exchange rate effect are in line with Froot and Stein (1991), Campa (1993) and Egger et al. (2007).

In summary, the theoretical derived model provides the important impacts of bilateral- and third-country determinants on FDI, especially foreign exchange rate and regional integration regarding as the heart of the interest. First, country characteristics can influence bilateral FDI either positively or negatively. Second, regional integration can positively influence export-platform and vertical FDI, whereas it negatively influences horizontal and complex vertical FDI. Third, depreciated value of host (third) currency in terms of home currency tends to increase (decrease) vertical FDI, whereas appreciated value of host (third) currency in terms of home currency tends to increase (decrease) horizontal, export-platform and complex vertical FDI. Importantly, all of these plausible theoretical predictions on FDI are employed to investigate empirically the determinants of FDI inflows from member and non-member ASEAN countries.

Chapter 5

Empirical Analysis

This chapter discusses model specification, data collection and econometric technique used to determine the FDI flows to ASEAN. This is followed by empirical evidence on Inter-ASEAN FDI and Intra-ASEAN FDI, and robustness check.

5.1 Model Specification

The gravity model equation is widely used to solve the foreign direct investment issues. Hence, the model specification based on the gravity model is defined to investigate factors influencing non-member and member ASEAN investors in their decision to locate foreign affiliates in ASEAN countries. The primary determinants of bilateral and third-country characteristics, regional economic integration and foreign exchange currency are provided in a spatial model specification.

a. Inter-ASEAN FDI

It is to investigate factors influencing Inter-ASEAN FDI. The spatial model specification is given by:

$$\begin{aligned} \ln(FDI_{ijt}) = & \beta_0 + \beta_1 SGDP_{ijt} + \beta_2 RGDP_{ijt} + \beta_3 RK_{ijt} + \beta_4 RKG_{ijt} + \beta_5 RS_{ijt} \\ & + \beta_6 RL_{ijt} + \beta_7 RKLT_{ijt} + \beta_8 TAR_{jt} + \beta_9 RER_{jt} + \beta_{10} W_{N_t} SGDP_{ijt} \\ & + \beta_{11} W_{N_t} RGDP_{ijt} + \beta_{12} W_{N_t} RK_{ijt} + \beta_{13} W_{N_t} RKG_{ijt} + \beta_{14} W_{N_t} RS_{ijt} \\ & + \beta_{15} W_{N_t} RL_{ijt} + \beta_{16} W_{N_t} RKLT_{ijt} + \beta_{17} W_{N_t} TAR_{jt} + \beta_{18} W_{N_t} RER_{jt} + u_{ijt} \end{aligned} \quad (5-1)$$

Throughout the empirical analysis, subscripts i, j and t denote source and recipient country of FDI and time period, respectively. The dependent variable, FDI_{ijt} is the value of U.S. outward FDI stock in host-country j at year t where $j = 1, \dots, N_t$ and $t = 1, \dots, T$. The subscript j includes Indonesia, Malaysia, the Philippines, Singapore and Thailand, T is 13 years (1995-2007) and N_t is a number of country-pair observed at year t . There are two set of explanatory variables: bilateral and third-country

determinants. First, a set of bilateral determinants consists of bilateral size ($SGDP_{ijt}$), similarity in size ($RGDP_{ijt}$), relative factor endowments of physical capital (RK_{ijt}), skilled labor (RS_{ijt}) and unskilled labor (RL_{ijt}), interaction term between economic size and relative physical capital (RKG_{ijt}), interaction term between transport costs and relative endowments ($RKLT_{ijt}$), tariffs (TAR_{ijt}) as proxy for economic integration, and real exchange rate (RER_{ijt}).² Second, a set of third-country determinants is represented by spatially weighted averages to capture the impacts of determinants in third country other than host country.³ This includes bilateral size ($WSGDP_{ijt}$), similarity in size ($WRGDP_{ijt}$), relative factor endowments of physical capital (WRK_{ijt}), skilled labor (WRS_{ijt}) and unskilled labor (WRL_{ijt}), interaction term between economic size and relative physical capital ($WRKG_{ijt}$), interaction term between transport costs and relative endowments ($WRKLT_{ijt}$), tariffs ($WTAR_{ijt}$), and exchange rate ($WRER_{ijt}$).

Interestingly, the spatial regression model allows for spatially weighted exogenous variables to capture not only the third-country effects of bilateral FDI, but the spatial correlation in the error term to control the transmission of shocks across host countries. The error term (u_{ijt}) is assumed to be $u_t = \rho W_{N_t} u_t + \varepsilon_t$ with $|\rho| < 1$, where

² $SGDP_{ijt} = \ln(GDP_{it} + GDP_{jt})$ measures total bilateral economic size, where GDP refers to real gross domestic product. $RGDP_{ijt} = \ln(1 - [GDP_{it}/(GDP_{it} + GDP_{jt})]^2 - [GDP_{jt}/(GDP_{it} + GDP_{jt})]^2)$ measures two countries' similarity in economic size. $RK_{ijt} = \ln(K_{it}/K_{jt})$, $RS_{ijt} = \ln(S_{it}/S_{jt})$ and $RL_{ijt} = \ln(L_{it}/L_{jt})$ are home-to-host endowment ratios in physical capital, skilled and unskilled labour, respectively. $RKG_{ijt} = RK_{ijt} + SGDP_{ijt}$ is an interaction term between differences in physical capital endowments and bilateral economic size. $RKLT_{ijt} = \ln(DIST_{ij}) + RK_{ijt} - RL_{ijt}$ is an interaction term between relative factor endowments and transport costs where $DIST$ refers to bilateral geographical distance. $RER_{ijt} = \ln(EX_j/EX_i)$ measures host-to-home exchange currency ratio where EX denotes foreign exchange rate.

³ The spatially weighting matrix W_{N_t} is $N_t \times N_t$, based on distance between the capitals of host and third countries (d_{jk}). It is row-normalized with typical elements $w_{jk} = d_{jk}^{-1} / \sum_{k=1}^{N_t} (d_{jk}^{-1})$ if $j \neq k$ and $w_{jk} = 0$ if $j = k$. The spatially-weighted explanatory variables account for if FDI from home to host countries is affected by determinants between home and other host countries.

$\varepsilon_{ijt} = \mu_{ij} + v_{ijt}$. The term μ_{ij} is country-pair effects to be control for time-invariant heterogeneity effects. The term v_{ijt} is classical error assumed to be uncorrelated over all i, j and t . The term ρ is a coefficient on the spatially correlated errors which measures how third-country observations affect the dependent variable. However, if $|\rho| = 0$, then the disturbances are not spatially correlated.

To obtain the robust empirical results, the diagnostic tests are first made to choose an appropriate estimator, then, the spatial panel data model is estimated by the chosen estimators. As a matter of fact, the Hausman test is used for identify the correlation between the residuals and some independent variables (endogeneity test). The Moran's I test is used to check for spatial autocorrelation in residuals, the Breusch-Pagan test for the heteroskedasticity, the Jarque-Bera test for the normality, and the variance inflation factor (VIF) for the multicollinearity. Estimations are performed with the spatial econometrics toolbox by LeSage (1998, 1999) developed on MATLAB.

b. Intra-ASEAN FDI

It is to examine factors influencing Intra-ASEAN investors in their decision to locate affiliates in ASEAN countries where includes Indonesia, Malaysia, Philippines, Singapore and Thailand. The model specification is given as Equation (5-1).

$$\begin{aligned} \ln(FDI_{ijt}) = & \beta_0 + \beta_1 SGDP_{ijt} + \beta_2 RGDP_{ijt} + \beta_3 RK_{ijt} + \beta_4 RKG_{ijt} + \beta_5 RS_{ijt} \\ & + \beta_6 RL_{ijt} + \beta_7 RKLT_{ijt} + \beta_8 TAR_{jt} + \beta_9 RER_{jt} + \beta_{10} W_{N_t} SGDP_{ijt} \\ & + \beta_{11} W_{N_t} RGDP_{ijt} + \beta_{12} W_{N_t} RK_{ijt} + \beta_{13} W_{N_t} RKG_{ijt} + \beta_{14} W_{N_t} RS_{ijt} \\ & + \beta_{15} W_{N_t} RL_{ijt} + \beta_{16} W_{N_t} RKLT_{ijt} + \beta_{17} W_{N_t} TAR_{jt} + \beta_{18} W_{N_t} RER_{jt} + u_{ijt} \end{aligned}$$

The dependent variable, FDI_{ijt} , is the value of Intra-ASEAN FDI stock in host-country j at year t where $i, j = 1, \dots, N_t$ and $t = 1, \dots, T$. T is 13 years (1995-2007) and N_t is a number of country-pair observed at year t .

5.2 Data Collection

FDI data from the U.S. to ASEAN countries is data on bilateral U.S. outward FDI stock at the industry level, covering five ASEAN economies while FDI data within five ASEAN member countries are data on Intra-ASEAN FDI stock at country level. This study uses bilateral U.S. outward FDI stock data at industry level, manufacturing and non-manufacturing industries,⁴ published by the Bureau of Economic Analysis; and Intra-ASEAN FDI stock data at country level, published by the ASEAN Secretariat. All data cover the period 1995-2007.

Data on real GDP and gross fixed capital formation (investment) at 1990 U.S. million dollars are available from the United Nations Statistics Division. Real GDP is used to build up the bilateral market size and country's similarity while gross fixed capital investment is used to calculate the countries' capital stock. The physical capital endowment at period t (K_t) is computed with the perpetual inventory method: $K_t = (1 - \delta)K_{t-1} + I_t$, where K_{t-1} represents the capital stocks of the previous year, I_t denotes investment in year t and δ is the depreciation rate at 7%. 1978 is chosen as the initial year (Baltagi and al., 2007). The capital stock is also used for the calculation of the relative capital endowment and the capital-size interaction term.

Skilled and unskilled labor endowments are calculated by using tertiary school enrollment and the country's labor force, published in World Development Indicators and UNESCO Institute for Statistics. More precisely, skilled labor endowment is measured by the labor force multiplied by the share of people with tertiary school enrollment. On the other hand, unskilled labor endowment is measured by the difference between labor force and skilled labor endowment. These measures are also used to construct countries' relative skilled and unskilled labor endowments as

⁴ Manufacturing industries include food products, chemicals products, primary and fabricated metals, machinery, computers and electronic products, transportation equipment, and other manufacturing. Non-manufacturing industries include mining, petroleum, wholesale trade, finance (except banking), insurance, real estate, and services.

well as the distance-factor endowment ratios. Data on bilateral tariff rate are available from the UNCTAD database. It is as a proxy for regional economic integration. Foreign exchange variable is measured by the value of ASEAN currency in terms of U.S. currency, published by the United Nations Statistics Division. Table 5-1 summarizes the descriptive statistics.

Table 5-1: Descriptive Statistics

	n	Mean	Std.	Min	Max
Bilateral FDI	845	4.26	2.84	-	9.60
Bilateral size	845	15.9	0.11	15.69	16.08
Similarity in size	845	-3.64	0.42	-4.23	-2.89
Relative capital endowment	845	4.05	0.43	3.43	4.82
Relative skilled labor endowment	845	1.95	1.92	-	5.08
Relative unskilled labor endowment	845	0.29	1.29	-1.88	3.05
Interactive relative capital and size	845	19.96	0.45	19.23	20.88
Interactive relative capital and distance	845	10.51	6.77	-	15.71
Tariffs	845	0.66	1.01	-	3.24
Real exchange rate	845	-3.41	2.99	-9.75	0.06

Note: All variables are in logarithms.

5.3 Empirical Results

a. Inter-ASEAN FDI

From model specification (5-1), the investigation starts with the diagnostic tests for FDI stocks and Table 5-2 provides their results. Moran's I test unsurprisingly indicates the presence of spatial correlation of the residuals in the data. This suggests that the spatial regression model with spatially correlated residuals should be provided. The complementary tests suggest that the error term is normally distributed (Jarque-Bera) and the hypothesis of homoskedasticity is not rejected (Breusch and Pagan).

Table 5-2: Estimation Results for Inter-ASEAN FDI

	Model 1: Manufacturing				Model 2: All industries			
	FEM		REM		FEM		REM	
	β	t-test	β	t-test	β	t-test	β	t-test
SGDP	91.63	0.09	5.41	1.17	218.07	0.01	6.32	1.57***
RGDP	1.07	0.37	9.03	0.01	-1.56	-0.65	-21.26	-0.01
RK	-102.78	-0.01	-0.48	-1.23	202.82	0.01	0.31	0.83
RS	-0.42	-0.97	0.37	0.83	0.03	0.09	-0.51	-1.22
RL	0.24	0.51	-2.73	-0.01	-0.25	-0.62	21.72	0.01
RKG	103.33	0.01	0.03	0.48	-204.34	-0.01	-0.03	-0.56
RKLT	0.02	0.43	0.10	0.75	0.01	0.17	0.01	0.12
TAR	-0.96	-0.07	1.16	1.76***	-0.24	-2.14**	-1.07	-1.65***
RER	0.78	3.51*	-8.02	-0.01	0.83	4.22*	52.33	5.35*
WSGDP	167.23	0.08	55.26	2.77*	101.68	0.01	37.28	1.81*
WRGDP	-17.57	-2.53*	-5.47	-0.01	-20.86	-3.41*	48.41	3.55*
WRK	-179.95	-0.08	-2.22	-1.25	-20.20	-0.01	-2.79	-1.67***
WRS	0.35	0.18	2.26	1.55***	1.49	0.92	2.04	1.53***
WRL	-0.56	-0.41	6.52	0.01	-0.19	-0.15	-4.56	-3.55*
WRKG	167.41	0.08	0.33	0.71	9.93	0.01	0.91	2.01**
WRKLT	0.04	0.11	0.34	0.86	-0.26	-0.78	0.36	1.54***
WTAR	0.09	0.28	4.07	1.18	-0.62	-3.15*	-9.86	-2.85*
WRER	1.74	2.03**	2.55	8.44*	2.46	3.05*	7.19	16.54*
Rho	-0.14	-0.87	1.01	4.89*	0.17	1.23	1.04	0.01
constant	-184.38	-2.25**	92.69	0.01	-219.10	-2.90*	25.04	0.01
Goodness of fit:								
Observations	520		520		845		845	
Adj. R ²	0.20		0.45		0.38		0.52	
Log	-1199.7				-2018.2			
Likelihood								
AIC	4.68				4.83			
BIC	-733.27				-1564.7			
Variance	5.90				6.94			

Table 5-2: Estimation Results for Inter-ASEAN FDI (cont.)

	Model 1: Manufacturing				Model 2: All industries			
	FEM		REM		FEM		REM	
	β	t-test	β	t-test	β	t-test	β	t-test
Diagnostic tests:								
Jarque-Bera	21.65*				50.15*			
VIF	17.67				17.54			
Breusch-Pagan	22.60*				17.93*			
Moran's I	311.25*				479.77*			
Hausman Test			4.01				9.42	

Note: The subscripts *, ** and *** denote the 1%, 5% and 10% significance level.

However, the VIF statistic indicates some multicollinearity but can be ignored because it does not exceed 30 (Greene, 2003). Then, the Maximum Likelihood (ML) estimator on fixed effect model (FEM) and random effect model (REM) is particularly appropriate in testing this model (Kelejian and Prucha, 1999).

Table 5-2 summarizes the results from the ML estimation for FDI with the FEM and REM. Model 1 relies on FDI in “manufacturing industries” while Model 2 relies on FDI in both “manufacturing and non-manufacturing industries”. The estimated results show that significant explanatory variables are in line with the theoretical propositions developed previously. However, there is obvious difference in the estimates between two models. In the discussion of the results, the REM estimates are concentrated because the Hausman test accepts the REM. The results for FDI given in Model 1 indicate that bilateral tariff determinant of FDI stock exhibits positive and significant sign. Third-country determinants of FDI i.e. market size, skilled labor ratio and exchange rate have an expected positive sign. Importantly, the signs of significant parameters of Model 1 tend to support complex vertical FDI.

The estimated results for FDI given in Model 2 indicate that most sign of significant parameters are in line with the theoretical predictions. On the one hand, bilateral determinants of FDI stock i.e. economic size and exchange rate have an expected positive sign, whereas tariffs as proxy for regional integration exhibit negative and significant sign. On the other hand, third-country determinants of FDI i.e. market size, similarity in size, skilled labor ratio, capital-size interaction term, transport costs-relative endowment interaction term and exchange rate have an expected positive sign, whereas physical capital ratio, unskilled labor ratio and tariffs have an expected negative sign. The signs of parameters in Model 2 tend to support export-platform and complex vertical FDI.

The estimated results of Model 1 and Model 2 provide that bilateral and third-country determinants are significant to bilateral FDI, on the one hand, and export-platform and complex vertical FDI are the most effective investment strategy in ASEAN countries, on the other hand. Especially, the variables of the interest, exchange rate and regional integration indicators, are significant and tend to support export-platform and complex vertical FDI. Surprisingly, even though the results of Model 1 and Model 2 should not be comparable, complex FDI e.g. export-platform and complex vertical FDI is similarly defined as the optimal FDI strategy for non-member ASEAN investors in the Southeast Asian countries.

In addition, the robustness check is provided to test the consistency in spatial weighting schemes. There are two alternative spatial weighting schemes for the third-country effects: inverse squared and inverse square roots of bilateral distance. The inverse square of bilateral distance, $w_{jk} = (1/DIST_{jk})^2, \forall j \neq k$, implies a faster spatial decay of third-country effects, whereas the inverse square roots of bilateral distance, $w_{jk} = (1/DIST_{jk})^{\frac{1}{2}}, \forall j \neq k$, implies a slower spatial decay of third-country effects. The estimated results with alternative weighting schemes are shown in Table 5-3. There is a little bit difference in the estimated results obtained in Table 5-2. The sign and magnitude of the parameters are even quite commonly expressed at the basic regression discussed previously. The estimated results strongly support export-

platform and complex vertical FDI. This confirms that the empirical results are fairly robust with respect to the spatial weighting schemes.



Table 5-3: Robustness Checks for Inter-ASEAN FDI

	Model 1: Manufacturing				Model 2: All industries			
	Weighting scheme 1		Weighting scheme 2		Weighting scheme 1		Weighting scheme 2	
	FEM	REM	FEM	REM	FEM	REM	FEM	REM
SGDP	28.65 (0.18)	0.71 (0.46)	70.42 (0.01)	0.41 (0.09)	57.73 (0.82)	1.77 (0.73)	81.34 (0.01)	0.67 (0.34)
RGDP	1.08 (0.37)	49.24 (0.04)	1.25 (0.43)	-55.49 (-0.63)	-1.26 (-0.52)	-1.97 (-0.13)	-1.56 (-0.65)	-6.07 (-0.01)
RK	16.82 (0.10)	-0.66 (-3.85)*	59.27 (0.01)	-0.63 (-2.05)***	-71.24 (-0.83)	-0.17 (-0.72)	66.62 (0.01)	-0.37 (-1.46)***
RS	-0.38 (-0.89)	0.38 (2.20)**	-0.39 (-0.89)	0.49 (0.88)	-0.01 (-0.04)	0.09 (0.38)	-0.01 (-0.03)	0.25 (0.88)
RL	0.18 (0.39)	-50.82 (-0.04)	0.20 (0.41)	53.67 (0.57)	-0.18 (-0.44)	3.33 (0.13)	-0.18 (-0.47)	5.19 (0.01)
RKG	-16.22 (-0.01)	0.07 (2.78)*	-58.54 (-0.01)	0.04 (0.65)	69.95 (0.83)	0.01 (0.26)	-8.18 (-0.01)	0.05 (1.66)***
RKLT	0.02 (0.40)	-0.06 (-1.04)	0.02 (0.38)	-0.16 (-0.89)	0.01 (0.21)	0.19 (0.19)	0.01 (0.23)	0.03 (0.37)
TAR	0.43 (0.33)	0.96 (3.13)*	0.11 (0.88)	0.77 (1.92)***	-0.24 (-2.09)**	0.65 (1.68)***	-0.23 (-2.07)***	0.44 (1.69)***

Table 5-3: Robustness Checks for Inter-ASEAN FDI (cont.)

	Model 1: Manufacturing				Model 2: All industries			
	Weighting scheme 1		Weighting scheme 2		Weighting scheme 1		Weighting scheme 2	
	FEM	REM	FEM	REM	FEM	REM	FEM	REM
RER	0.81 (3.59)*	-85.68 (-0.01)	0.79 (3.53)*	2.70 (0.01)	0.78 (4.09)*	2.51 (0.04)	0.81 (4.23)*	0.57 (0.01)
WSGDP	145.74 (0.64)	7.77 (2.25)**	127.30 (0.11)	24.68 (1.15)	46.27 (0.10)	3.68 (0.79)	53.72 (0.01)	8.72 (1.02)
WRGDP	-18.70 (-2.68)*	-98.06 (-0.01)	-18.03 (-2.63)*	52.95 (0.01)	-18.84 (-3.14)*	9.92 (0.04)	-19.95 (-3.25)*	8.69 (0.01)
WRK	131.13 (0.57)	-3.28 (-2.34)**	113.29 (0.10)	-1.40 (-0.29)	39.81 (0.01)	-0.98 (-0.63)	-61.29 (-0.01)	0.37 (0.16)
WRS	0.27 (0.14)	-0.03 (-0.02)	0.25 (0.13)	-1.57 (-0.30)	1.54 (0.93)	1.01 (0.74)	1.56 (0.92)	-0.08 (-0.03)
WRL	-0.65 (-0.46)	88.84 (0.01)	-0.61 (-0.44)	-87.49 (-0.01)	-0.05 (-0.04)	-3.60 (-0.04)	-0.10 (-0.08)	-9.67 (-0.01)
WRKG	-145.36 (-0.64)	0.82 (2.72)*	-126.96 (-0.11)	0.51 (0.49)	-7.33 (-0.01)	0.19 (0.60)	2.74 (0.01)	-0.13 (-0.26)
WRKLT	0.06 (0.16)	0.34 (1.02)	0.06 (0.17)	-0.74 (-0.71)	-0.27 (-0.81)	0.19 (0.68)	-0.27 (-0.79)	0.38 (1.40)***

Table 5-3: Robustness Checks for Inter-ASEAN FDI (cont.)

	Model 1: Manufacturing				Model 2: All industries			
	Weighting scheme 1		Weighting scheme 2		Weighting scheme 1		Weighting scheme 2	
	FEM	REM	FEM	REM	FEM	REM	FEM	REM
WTAR	0.09 (0.29)	-0.97 (-1.65)***	0.09 (0.31)	4.02 (1.90)***	-0.60 (-2.99)*	-0.32 (-0.37)	-0.62 (-3.07)*	2.29 (1.62)***
WRER	1.86 (2.09)**	-1.62 (-9.33)*	1.74 (2.02)**	-2.93 (-2.41)**	2.13 (2.85)*	2.48 (10.86)*	2.34 (3.02)*	1.04 (8.90)*
Rho	-0.02 (-0.24)	1.85 (13.89)*	-0.09 (-0.58)	0.99 (7.91)*	0.99 (0.10)	-0.45 (-0.03)	0.10 (0.74)	1.08 (3.98)*
constant	-195.91 (-2.31)**	51.86 (0.47)	-187.12 (-2.26)**	-55.95 (-0.63)	-194.93 (-2.70)	-71.85 (-0.13)	-210.10 (-2.82)*	-24.17 (-0.01)
Obs.	520	520	520	520	845	845	845	845
Adj. R ²	0.39	0.33	0.43	0.76	0.36	0.30	0.37	0.42
Log Likelihood	-1199.93		-1199.88		-2018.59		-2018.47	
Moran's I	248.28*		282.12*		414.24*		459.52*	
Hausman Test		4.12		3.31		5.07		7.93

Note: a) The t-statistics are shown in parentheses underneath the coefficients. b) The subscripts *, ** and *** denote the 1%, 5% and 10% significance level. c) Weighting scheme 1 and 2 represent the inverse squared distance and inverse square root distance weighting scheme respectively.

b. Intra-ASEAN FDI

From model specification (5-1), the diagnostic tests for Intra-ASEAN FDI stocks are first conducted to determine an appropriate estimator. Table 5-4 exhibits the normally distributed error term, the presence of multicollinearity, the absence of heteroskedasticity and the presence of spatial autocorrelation in the residuals. Of course, the Moran's I test result confirms that the spatial model with spatially correlated residuals should be employed to estimate determinants of Intra-ASEAN FDI. The results from the ML estimation for FDI with the FEM and REM are shown in Table 5-4. In the discussion of the results, the FEM estimates are concentrated because the Hausman test rejects the REM. The results for FDI given in the model indicate that bilateral similarity determinant of FDI stock exhibits positive and significant sign, whereas skilled labor ratio, transport cost-relative endowment interaction term and tariffs have an expected negative sign. Third-country determinants of FDI i.e. similarity in size, transport cost-relative endowment interaction term, tariffs and exchange rate have an expected negative sign. Of course, the signs of significant parameters of the model tend to support vertical FDI.

Table 5-4: Estimation Results for Intra-ASEAN FDI

	FEM		REM	
	β	t-test	β	t-test
SGDP	0.56	0.80	1.14	0.36
RGDP	7.94	3.34*	-0.65	-1.72***
RS	-0.53	-1.92**	0.27	0.93
RL	0.31	1.22	-0.04	-0.08
RKG	-0.20	-0.45	-0.04	-1.04
RKLT	-0.22	-4.02*	-0.23	-0.97
TAR	-0.68	-2.90*	0.72	3.38*
RER	0.11	1.27	-3.69	-0.01
WSGDP	11.85	0.86	5.94	2.01**
WRGDP	-6.08	-1.75***	-3.25	-0.01
WRS	-0.81	-0.86	-0.27	-1.05
WRL	-0.19	-0.69	3.18	0.01

Table 5-4: Estimation Results for Intra-ASEAN FDI (cont.)

	FEM		REM	
	β	t-test	β	t-test
WRKG	1.43	0.86	0.68	0.09
WRKLT	-0.12	-1.81***	0.36	1.04
WTAR	0.70	1.83***	0.12	0.47
WRER	-0.16	-1.73***	1.31	5.64*
Rho	0.37	3.39*	-0.16	-0.93
constant	6.11	0.85	0.60	1.04
Goodness of fit:				
Observations	260		260	
Adj. R ²	0.52		0.56	
Log Likelihood	-562.86			
AIC	4.48			
BIC	-218.43			
Variance	4.38			
Diagnostic tests:				
Jarque-Bera	16.71*			
VIF	9.57			
Breusch-Pagan	30.30*			
Moran's I	28.72*			
Model tests:				
Country-pair effect	0.04			
Time effect	0.03			
Country specific time variant effect	0.03			
Hausman Test			82.52*	

Note: The subscripts *, ** and *** denote the 1%, 5% and 10% significance level.

In addition, the robustness check for Intra-ASEAN FDI is performed as shown in Table 5-5. The magnitude and significance of the variables in the model change little across the various weighting matrix specifications. However, the estimated results still

strongly support vertical FDI. This concludes that the empirical results are fairly robust with respect to the spatial weighting scheme.

Table 5-5: Robustness Checks for Intra-ASEAN FDI

	Weighting Scheme 1				Weighting Scheme 2			
	FEM		REM		FEM		REM	
	β	t-test	β	t-test	β	t-test	β	t-test
SGDP	0.61	0.90	7.17	2.43*	0.76	1.09	-3.73	-1.16
RGDP	6.38	2.70*	-0.69	-1.73***	7.47	3.13*	-0.85	-2.32**
RS	-0.52	-1.86***	0.28	0.91	-0.53	-1.92**	0.41	1.74***
RL	0.40	1.78***	0.11	0.23	0.35	1.75***	0.05	0.10
RKG	-0.20	-0.44	-0.06	-1.66***	-0.18	-0.41	-0.05	-1.16
RKLT	-0.17	-3.48*	-0.21	-0.92	-0.21	-3.84*	-0.25	-1.08
TAR	-0.70	-2.92*	0.67	2.68*	-0.71	-2.94*	0.66	4.30*
RER	0.15	1.64***	7.56	0.05	0.13	1.56***	-0.49	-0.01
WSGDP	6.49	0.26	7.09	2.29**	8.91	0.13	6.67	2.23**
WRGDP	-4.44	-1.26	8.11	0.05	-5.63	-1.60***	-9.98	-0.17
WRS	7.39	0.26	-0.26	-0.96	-7.94	-0.13	-0.26	-1.06
WRL	-0.21	-0.74	-7.96	-0.05	-0.19	-0.66	0.59	0.17
WRKG	-6.75	-0.26	-0.26	-0.03	8.56	0.13	-0.89	-0.11
WRKLT	-0.17	-2.18**	0.13	0.41	-0.14	-1.73***	0.33	0.94
WTAR	0.85	2.16**	-0.34	-0.93	0.79	2.03**	-0.30	-1.65***
WRER	-0.16	-1.61***	1.42	5.15*	-0.16	-1.79***	-0.79	-5.69*
Rho	0.12	1.31	0.07	0.63	0.31	2.64*	0.09	0.56
constant	3.77	0.54	-0.13	-0.26	2.87	0.41	0.13	0.24
Goodness of fit:								
Observations	260		260		260		260	
Adj. R ²	0.33		0.80		0.34		0.66	
Log Likelihood	-565.7				-564.0			
AIC	4.44				4.46			
BIC	-229.4				-225.4			
Variance	4.53				4.44			

Table 5-5: Robustness Checks for Intra-ASEAN FDI (cont.)

	Weighting Scheme 1				Weighting Scheme 2			
	FEM		REM		FEM		REM	
	β	t-test	β	t-test	β	t-test	β	t-test
Diagnostic tests:								
Jarque-Bera	14.20*				14.39*			
VIF	4.45				5.51			
Breusch-Pagan	22.45*				28.31*			
Moran's I	27.92*				28.72*			
Model tests:								
Country-pair effect	-33.9*				2.99			
Time effect	-11.8*				-4.81			
Country specific time variant effect	-5.83				-4.22			
Hausman Test			63.17*				71.93*	

Note: a) The t-statistics are shown in parentheses underneath the coefficients.

b) The subscripts *, ** and *** denote the 1%, 5% and 10% significance level.

c) Weighting scheme 1 and 2 represent the inverse squared distance and inverse square root distance weighting scheme respectively.

In conclusion, empirical evidences on determinants of Inter-ASEAN and Intra-ASEAN FDI gave some justification to policies aimed at supporting inward investment to ASEAN, particularly , export-platform, vertical and complex vertical FDI. These results also support that regional economic integration and foreign exchange currency explains investment inflows in recent years, and policies to strengthen investment, financial and monetary integration are needed.

Chapter 6

Conclusion

This paper focuses on the impacts of bilateral and third-country exchange rate and regional integration on FDI to Southeast Asian countries. In this regard, the theoretical predictions and empirical investigation corresponding to bilateral and third-country determinants of FDI in ASEAN are performed. In the theoretical studies, the Knowledge-Capital model of Baltagi et al. (2007) and Uttama and Péridy (2009) is refined by additionally assuming the presence of exchange rate and tariffs. This model is derived and then simulated using GAMS/MPSGE to provide the theoretical hypotheses on determinants of FDI. In the empirical studies, the impacts of bilateral- and third-country effects, exchange rate and regional integration on non-member and member ASEAN FDI are investigated using Maximum Likelihood estimator. Data on U.S. FDI stock to ASEAN and Intra-ASEAN FDI over the period of 1995-2007 are employed. The estimated results from Inter-ASEAN FDI reveal that the significant parameters tend to support export-platform and complex vertical FDI, whereas the estimated results from Intra-ASEAN FDI tend to support vertical FDI. However, these results are interpreted in line with the theoretical predictions. Of course, the findings confirm the important and significant relationship between FDI and regional integration and foreign exchange currency.

These results also provide the policy implication aiming at supporting inward FDI to ASEAN. On the one hand, foreign firm's decision in FDI is contingent upon tariffs and foreign exchange policy in the national and regional level. On the other hand, the foreign investment policy for non-member ASEAN countries should focus on the most common types of FDI to ASEAN i.e. export-platform and complex vertical FDI. Meanwhile Intra-ASEAN investment policy would support vertical FDI. With this regard, policies for promoting FDI inflows to ASEAN might be the acceleration of implementation of investment, monetary and financial integration agreements, as

well as adopting financial stability policies. Moreover, it is indeed beneficial to enhance economic growth and welfare in the ASEAN economies.

Even though this study is able to accomplish the significant results, there are several extensions that would be addressed in the future research. The issues should include currency difference in making FDI, variable measures to provide reliable and consistent results in analysis, and sophisticated tools in model estimation. In the currency issue, it might be to compare the difference in the impact of exchange rate on FDI in ASEAN in different parts of the world. For instance, the value of ASEAN currency in terms of either Japanese yen or Euro currency has a positive or negative influence on FDI in Southeast Asian countries, as well as the value of different currency within ASEAN region has a positive or negative influence on Intra-ASEAN. In the variable measure issue, it concerns more reliable estimated results when target variables are well defined and conceptualized. That means, variables should reflect a problem which is the main consideration. In the econometric tool issue, it is to introduce an advanced econometric tool which is very powerful to attack problem that can be very difficult to solve in any other way. For example, the generalized method of moments (GMM) estimator is introduced as an appropriate tool to estimate the spatial panel model (Kapoor et al., 2004; Baltagi et al., 2007). These improvements would bring about more efficient way to estimate the model and further steps towards best practice to be implemented.

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Date: October 30, 2009

Name: Dr. Nathapornpan UTTAMA
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LETTER OF ACCEPTANCE

Dear Dr. Nathapornpan UTTAMA,

Thank you very much for your interest in participating and presenting paper in the conference.
I am very glad to inform you that your paper entitled:

**"The Impacts of Exchange Rate and Regional Integration on FDI:
Do They Really Exist in the Southeast Asian Countries?"**

has been accepted for the oral presentation at the 8th International Conference of the Japan Economic Policy Association (JEPA), which will be held at Center for National University Finance and Management in Tokyo on November 28-29, 2009. The main theme of the conference is "The Financial Crisis and Economic Depression: Tasks of Economic Policies in Simultaneous Slowdown of the World Economy".

I am looking forward to seeing you soon in Tokyo, Japan.

Sincerely yours,

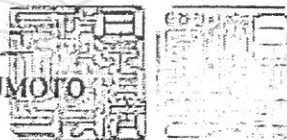

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