THE DETERMINANTS AND IMPACTS OF FOREIGN DIRECT INVESTMENT IN THE THAI MANUFACTURING SECTOR: A THREE-WAY FIXED EFFECTS APPROACH

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By

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THE DETERMINANTS AND IMPACTS OF FOREIGN DIRECT INVESTMENT IN THE THAI MANUFACTURING SECTOR: A THREE-WAY FIXED EFFECTS APPROACH

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ABSTRACT

This study investigates the determinants of inward FDI in the Thai manufacturing sector. The data of industrial FDI are obtained from 14 source countries and 9 manufacturing industries during 1990 – 2008. The panel data analysis through a three-way fixed effects approach is employed to obtain consistent estimation. The results of the aggregate manufacturing analysis indicate that source country GDP, industrial production, FTA, infrastructure, economic stability, export from Thailand to source countries, and the government policies for both industrial and investment incentives have positive influence on industrial FDI inflows. In contrast, the geographic distance, import from source country to Thailand, and total bilateral trade between source countries and Thailand has negative influence on inward FDI.

Next, regarding the sectoral FDI determinants, the results show that the industrial production and government policies are important determinants to attract FDI inflows in most sectors. In addition, the results of FDI analysis from five major source economies suggest that a source country's GDP is a positive FDI factor for all major source economies. The manufacturing production has a positive influence on inward FDI from

EU-5, Singapore, and Japan. The exchange rate is a positive factor for EU-5 and Japan. The model also suggests that the total bilateral trade is a compliment to Hong Kong and Japanese FDI, but is a substitute to the FDI from EU-5 and the United States.

The model analysis also examines the impacts of the 1997 economic crisis on the manufacturing FDI inflows. The results indicate that the structure of inbound industrial FDI in Thailand has been changed after the crisis. Interestingly, the depreciation of Thai currency and government policies play an important role to attract inward FDI and restore the manufacturing growth.

Finally, a dual approach to growth accounting is employed with a panel Granger causality test to analyze the impacts of inbound FDI on the economic growth of Thailand. The empirical analysis finds the evidences indicating that inward industrial FDI enhances domestic real wages and support total factor productivity of Thailand.

CHAPTER 1

INTRODUCTION

1.1 Introduction and Motivation

In recent years, Foreign Direct Investment (FDI) has become one of the major issues in international economics. The growth rate of FDI has increased faster than any other international activities, especially international trade flows. Some authors such as Dunning (1993) and Dickens (1998) argue that FDI impacts host economies by enhancing national income, labor productivity, and employment. It also has some spillover effects including technology transfer, new management, and modern production techniques.

Like many developing economies, Thailand has emphasized the industrialization as a major economic goal. The industrial development requires numerous factors. One of the important elements is the sufficient investment funds to supply the industrial production. The second component is the innovation and technological progress. However, these two main components are inadequate to support the Thai economic achievements (Siamwalla, 1999; Brimble and Sibunreung, 2002). Fortunately, FDI can provide both of these substantial elements. Thus, to enhance the production sector and sustain the economic growth, the Thai government has implemented policies and improved the economic factors to promote the foreign direct investment.

A country with good quality resources, high potential markets, and sufficient infrastructures may have a good opportunity to attract more international investment. Nevertheless, the FDI factors operating well for one country may not be suitable for other countries (Dunning, 1993; Ietto-Gillies, 2005). Thus, researchers have attempted to empirically investigate the determinants of foreign direct investment to obtain correct information for specific host economies.

This study attempts to understand the determinants of FDI inflows to the Thai manufacturing sector. The gravity model, which is widely used to examine the international economic activities, is applied with a panel fixed effects method to investigate the inward FDI factors. Most of prior studies employ only the country level data. This dissertation departs from this tradition by utilizing both country and industry level data[1]. This will provide more specific information to the FDI determinant analysis. Also, employing multi-dimensional data needs an optional approach to obtain consistent results. A three-way fixed effects model is utilized in this study. Furthermore, a fixed effects vector decomposition (FEVD) is applied to estimate one-dimension varying determinants (for instance, only time varying variable) that are unable to be analyzed by a standard fixed effects method. I also examine the relationship between the industrial FDI inflows and the 1997 Asian economic crisis and identify the factors behind the extraordinary increase of inward FDI after the crisis.

Importantly, not many studies of FDI determinants investigate the impacts of FDI on the host economy. Furthermore, previous studies of the FDI impacts on growth rely on applying the proxies of technological progress and human resources. Nevertheless, the

[1] The details of source countries and industries are presented in Chapter 4.

inappropriate proxies may cause the misleading results. Alternatively, this dissertation selects a dual approach to growth accounting and applies the panel Granger causality test to examine the impacts of inbound FDI on economic growth. This approach provides a new channel to examine the relationship of FDI inflows, domestic real wages, and host country economic growth.

Finally, the ultimate goal of this dissertation is to motivate and provide the framework for the policy formation and implementation in Thailand through better understanding of the strengths and weaknesses of the FDI factors in the Thai manufacturing sector. This information would improve investment and industrial policies to sustain the industrialization of Thailand. Additionally, the findings of this study would be beneficial to enhance the knowledge base of the FDI studies in Thailand.

1.2 Research Objectives

The purposes of this research are (1) to investigate the determinants of FDI inflows to the Thai manufacturing scheme for the overall sector, and (classified by) major industry and source country; (2) to develop the approach analyzing the inward FDI determinants with three unobserved effects; (3) to examine the impacts of inward FDI on the economic growth of Thailand by a dual approach to growth accounting; and (4) to make policy suggestions for improving the investment climate in the manufacturing sector of Thailand.

1.3 Dissertation Organization

The dissertation is organized as follows. Chapter 2 describes an overview of the manufacturing sector in Thailand. The background of FDI and the development of investment promotion and industrial policies are discussed. In Chapter 3, the four main theoretical concepts consisting of the Eclectic paradigm, the New Trade Theories and Multinational Corporations, Networking Theory, and TNC's strategic behavior are investigated. The last part of Chapter 3 discusses the related empirical literatures of the FDI determinants and the FDI effects on local wages and host country economic growth.

Chapter 4 emphasizes the determinants of FDI in the Thai manufacturing sector. The summary of FDI determinants and the model specifications are presented. The empirical methodology and data sources employed in the model are discussed. The estimated results of FDI determinants model are analyzed. Nevertheless, the relationships between the economic crisis and the manufacturing FDI are investigated.

The impacts of FDI inflows to Thai economic growth are examined in Chapter 5. This chapter reviews the concept of a dual approach to growth accounting. This method suggests an alternative way to calculate total factor productivity from the growth rate of factor prices. Then, the methodology and data used in the model are presented. The estimated results of the FDI effects on the real wage and the economic growth of Thailand are discussed. Chapter 6 summarizes the research findings and discusses the policy implications with the recommendations for further studies.

CHAPTER 2

THE OVERVIEW OF THE MANUFACTURING SECTOR AND THE MANUFACTURING FDI IN THAILAND

This chapter demonstrates the historical background and overview of the manufacturing sector of Thailand including the development path, structure and the contributions to the Thai economy. Next, the industrial policies and strategies to enhance industrialization are investigated in section (2.2). Then, the pattern and characteristics of foreign direct investment in the manufacturing sector and investment promotion policies are discussed in section (2.3) and (2.4) respectively.

2.1 The Manufacturing Sector of Thailand [2]

Thailand is one of the successful Asian countries in economic development. Since the first modern economic plan was established in 1961, the average economic growth rate during 1961 – 1996 was nearly 8.0 percent annually (UNIDO, 2002). During the first half of the 1990s, Thailand was one of the highest economic growth countries in the world, with annual growth rate at almost 10 percent. In addition, the promising industrializations with massive domestic and foreign investment generate the substantial growth to the manufacturing sector. In this period, the industrial sector annually increased more than a double digit growth.

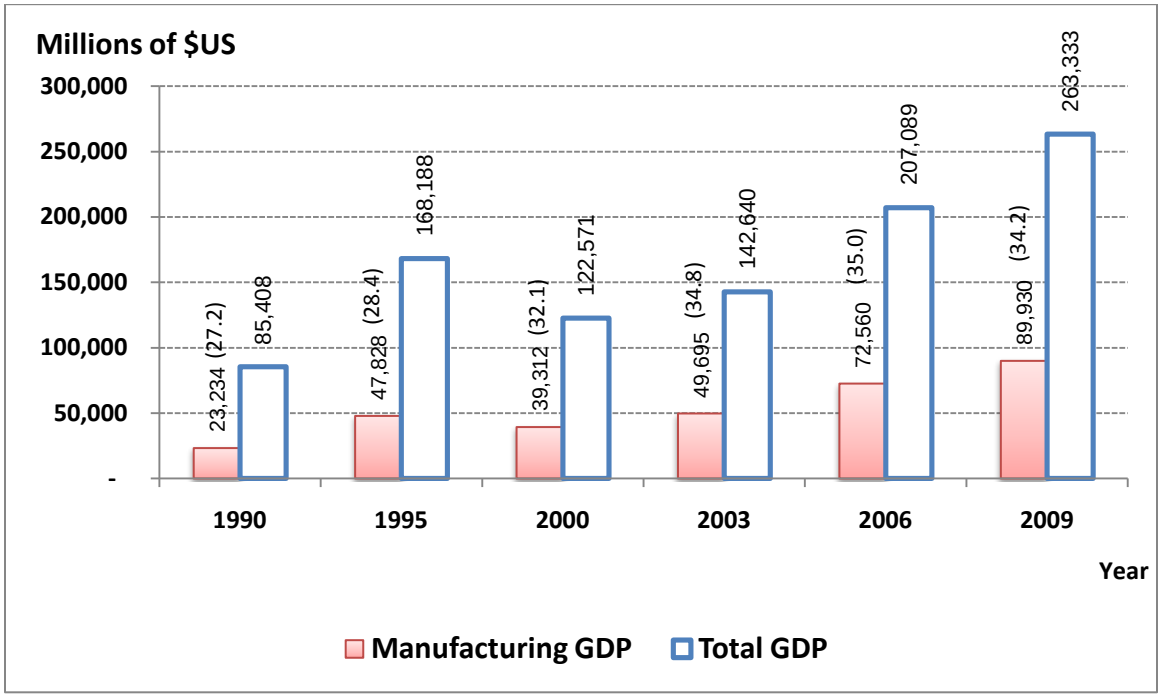
[2] The information for this section is collected from the published documents of several government agencies of Thailand, National Economic and Social Development Board (NESDB), National Statistic Organization, and Ministry of Industry.

Nevertheless, Thai economy experienced a serious crisis in the middle of 1997. The GDP growth was negative for two consecutive years: -1.4 percent in 1997 and -10.8 percent in 1998. The manufacturing sector also suffered from this outbreak with growing slightly at 1.6 percent in 1997, and then it sharply dropped down to -11.2 percent in 1998. Fortunately, due to the cooperation of private and public sectors associating with substantial foreign direct investment, the economy recovered considerably with 4.5 percent growth in 1999 and 4.7 percent in 2000. Interestingly, the annual average growth (2001 - 2009) continues increasing at about 4 percent.

In the early of 1960, the agricultural sector was the most important sector in Thailand, accounting for over 40 percent of the total GDP and almost 80 percent of national exports. However, the manufacturing sector has become more important following the industrialization programs that concentrate on export-oriented policies since 1972. In recent years, the GDP share of the agricultural sector has reduced to about 10 percent, while the GDP share of the manufacturing sector has risen to more than one-third, with 32 percent in 2000 and 34 percent in 2009 (see Figure 2.1).

Manufactured exports also dominated Thai export sectors. In 1990, the value of manufacturing export was 13,398.8 million U.S. dollars (60 percent of total export). Interestingly, the trend increases tremendously to more than 100 billion U.S. dollar s in 2006 and 135 billion U.S. dollars in 2009, accounting for 86 percent of the total Thai export share (see Figure 2.2). The principal manufactured export products consisted of computers and parts, electronic and integrated circuits, automobiles and parts, and plastic and chemical products.

Figure 2.1: GDP Share of Manufacturing Sector, 1990 – 2009

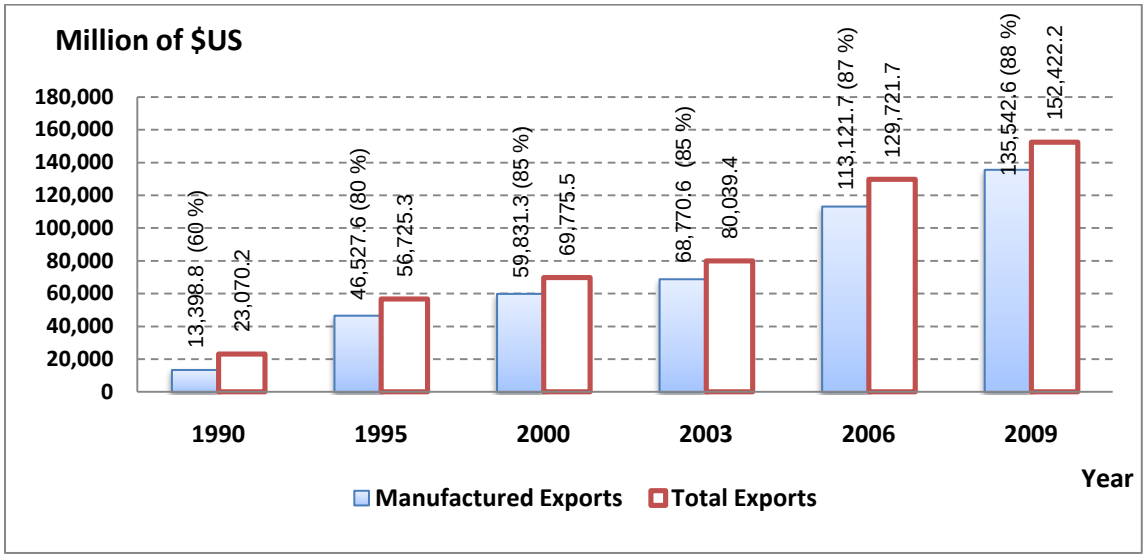


Source: National Economic and Social Development Board (NESDB)

Note: The percentage share of manufacturing GDP to total GDP is presented in parentheses

The manufacturing sector is one of the significant sectors generating employment in Thailand. There were 3.1 million industrial workers employed in 1990 or 10.2 percent of total national employment. The amount of employed labor augments significantly due to an increase in industrial production. By the late 2000s, the manufacturing sector created 5.3 million jobs accounting for 14.3 percent of the employment share in the Thai economy (see Figure 2.3).

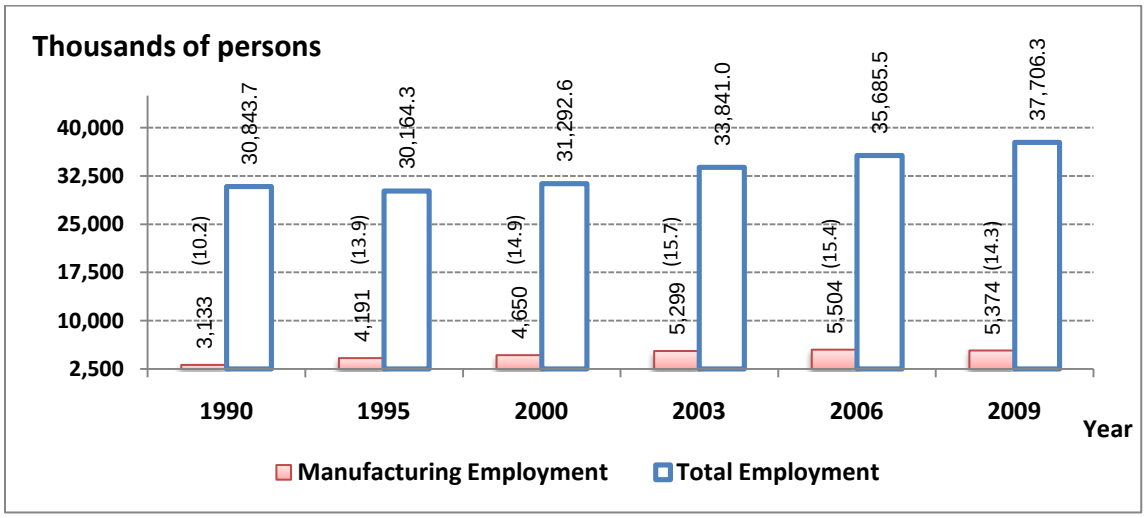
Figures 2.2: Manufactured Export of Thailand, 1990 – 2009



Source: Department of Custom and Bank of Thailand

Note: The percentage share of manufactured export to total export is presented in parentheses

Figures 2.3: Manufacturing Employment of Thailand, 1990 – 2009



Source: National Statistic Organization (NSO)

Note: The percentage share of manufacturing employment to total employment is presented in parentheses

2.2 Industrial Policies and Strategies[3]

Following the World Bank's aids and recommendations, Thailand established the first "Social and Economic Development Plan" (SEDP)[4] in 1961. The primary objective aimed to transform the local economy to become more industrialized for further development. The industrialization strategies of the 1960s supported import substitution industries including assembly and fundamental activities that utilize heavily imported parts and components. Thus, several policies such as a high tariff rate, tax reduction to foreign investors, and physical infrastructure investment were implemented to protect and strengthen domestic industries.

However, in the early 1970s, the industrial growth with the import substitution policy slowed down and the balance of payment turned to a deficit. The government initiated a new industrial policy: export promotion. This strategy was employed in the third to sixth Social and Economic Development Plan during 1972 – 1991. The third and fourth SEDP emphasized the labor and natural resource intensive industries. Also, the government established the Industrial Estate Authority of Thailand (IEAT) to promote the industrial estates in different regions of the country. In the fifth and sixth SEDP, the science and technology development was introduced to be a main priority. This helped to enhance engineering industries such as metal, machinery, electronics and communication equipment. Essentially, the FDI became a major interest of Thai government. Several monetary and non-monetary investment incentives were issued to induce foreign investment.

[3] The materials utilized in this section are collected from NESDB and Office of Industrial Economics published papers (various issues)
[4] At present, the tenth SEDP plan (2007-2011) is implemented.

The globalization trend in the early 1990s stimulated the government of Thailand's aim to improve Thai competitiveness in the world market. The industrial policies in the seventh SEDP plan (1992-1996) attempted to develop the manufacturing structure to be more diversified with greater numbers of intermediate and capital goods firms. This generated the rapid industrial and economic growth during that time. Nevertheless, the outstanding growth of the manufacturing sector was interrupted by the Asian economic crisis in 1997. To rehabilitate and fortify the manufacturing sector from the crisis, the Thai government through the Ministry of Industry launched the Industrial Restructuring Plan (IRP) in 1998. The detail of the IRP package will be discussed in subsection 2.2.1.

The experience of 1997 economic turbulence made the Thai government revise and improve its economic policy. The eight to tenth SEDP plans aimed to promote the economic stability and sustainability by adopting the good governance concept and investing in innovation and human capital. Regarding the industrial development, the major objective was to enhance Thai competitiveness and restructure the production system. Among these major changes were upgrading the quality of infrastructure, improving the production linkages (industrial cluster), developing small and medium enterprises, and promoting of science and technology innovation including manpower development. In addition, the government attempted to improve the law and regulations of both FDI and international trade to support long-term economic growth.

2.2.1 Industrial Restructuring Plan (IRP)[5]

In 1998, the Ministry of Industry implemented the important economic program called the Industrial Restructuring Plan (1998 - 2002). There were two main objectives of this plan. The first one was to help the domestic entrepreneurs recuperate from the economic recession. Thus, several urgent plans such as low interest rate loans, tax exemption for some capital and machinery goods, and infrastructure fee reductions were implemented. The other objective was to improve the long-term competitiveness of the industrial sector. The program was designed to support 13 major industries consisting of food processing, textile and garments, leather products and footwear, wood products and furniture, pharmaceutical and chemical products, rubber, plastic, ceramic, electronic and electrical products, motor vehicles, gems and jewelry, steel and iron, and petrochemical products.

To enhance the competitiveness for each target industry, the IRP plan was able to categorize to 8 work plans as follows:

(1) To improve industrial productivity and reduce the production and transportation cost.

(2) To upgrade the technological capabilities and introduce modern machinery to the target domestic sector.

(3) To promote the product development, product standard, and market channels.

(4) To promote FDI in strategic industries employing high technology.

(5) To upgrade labor skills and productivities.

[5] The more detail of IRP plan can be seen in the documents of the Office of Industrial Economics, the National Industrial Development Committee (1998), and UNIDO (2002)

(6) To support and aid small and medium supporting industries (support the whole industrial linkages)

(7) To relocate labor intensive and non-polluting industries to regional and rural areas; in order to support job creation and income distribution.

(8) To relocate high pollution industries to restricted areas and promote using clean technology.

The IRP program helped to recover and stimulate the industrial growth. In 2003, the manufacturing sector grew up to 10 percent and 8 percent in 2004. Consequently, the Ministry of Industry developed the IRP plan to be a national industrial policy: the Industrial Restructuring Strategy (2005 – 2008). This policy was similar to the IRP plan and included new strategic plans to generate value-added industry. The industry involving to the innovation or knowledge-based development would be compensated additionally. Furthermore, the quality and quantity of human capital were measured to be an important target for all manufacturing sectors. Other policies included industrial clustering, efficient energy consumption, and new entrepreneur creation.

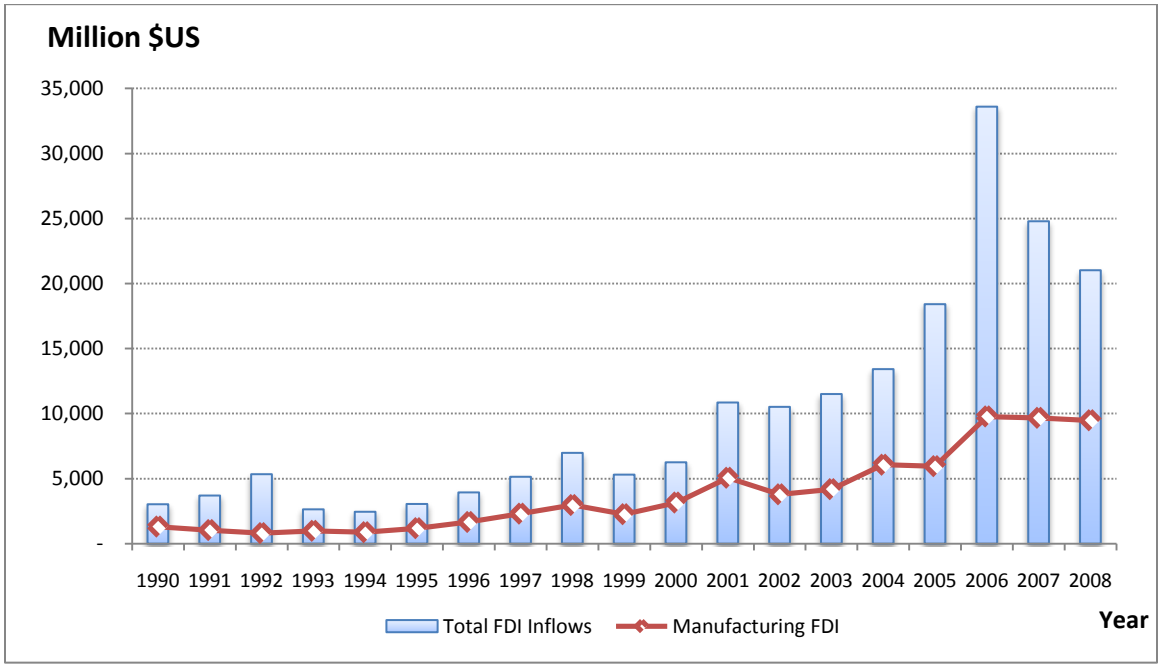
2.3 The Foreign Direct Investment in the Thai Manufacturing Sector[6]

Thai government has emphasized the FDI as an important engine to achieve its economic growth. The Board of Investment (BOI) was established in 1960 to promote both domestic and foreign investment. Prior to the 1980s, FDI inflows concentrated on import competing industries. Then, in the 1980s, more export oriented industries were invested in the country. After the Plaza Accord in 1985 with rapid appreciation of Japanese Yen, there was a massive investment from Japan to Thailand. Much of these inflows were channeled to export industries and intermediate products such as automotive, textiles, and electronic parts and components. In the early of 1990s, the FDI inflows were as stable as 3 billion U.S. dollars annually. Interestingly, after the 1997 economic crisis, the FDI inflows increased rapidly to 10 billion U.S. dollar in 2001 and continuously augment to achieve the maximum level at 33 billion U.S. dollars in 2006. During 2007 - 2008, the levels of FDI inflows were still greater than 20 billion U.S. dollars, with 24 billion in 2007 and 21 billion U.S. dollars in 2008.

Similar to the aggregate FDI inflows, the inward FDI in manufacturing sector has been substantially increased since 1998. Figure 2.4 indicates that, 10 years after the crisis, the inward manufacturing FDI has augmented about three times. In 1998, the amount of industrial FDI was 3 billion U.S. dollars, while the industrial FDI in 2008 was up to 9.5 billion U.S dollars.

[6] The materials utilized in this section are collected from Office of Industrial Economics and Bank of Thailand published papers (various issues)

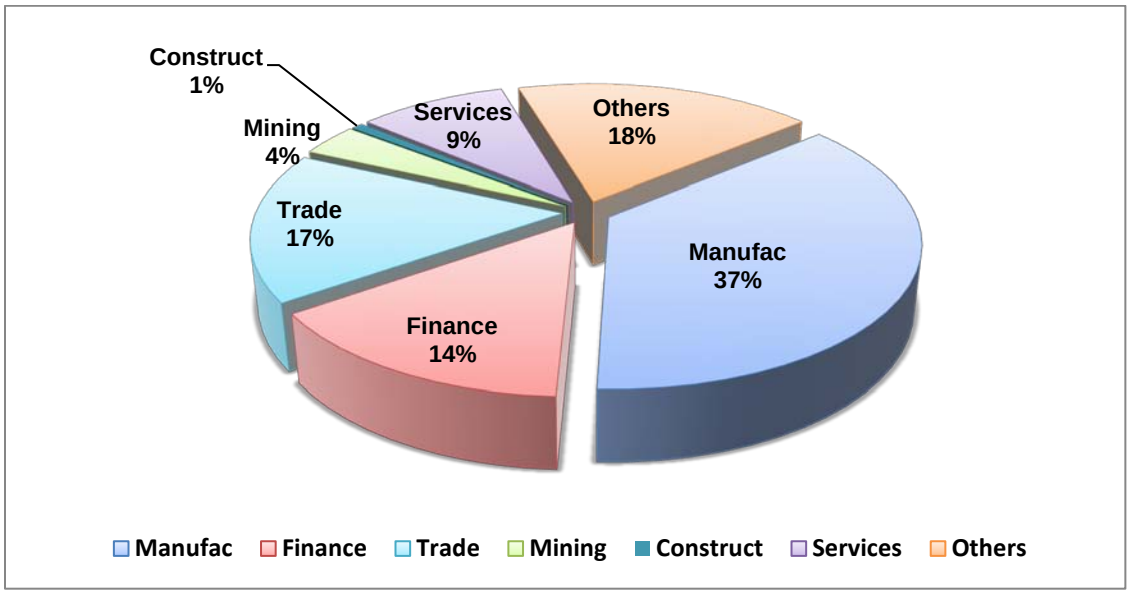
Figure 2.4: FDI Inflows in Thailand (Total and Manufacturing Sector), 1990-2008



Source: Bank of Thailand

The manufacturing sector has the largest share of foreign direct investment. On average, the inward FDI to the industrial sector (2004-2008) is almost 40% of total FDI inflows in Thailand (see Figure 2.5). Table 2-1 presents the inward FDI of each industry in the manufacturing sector during 1990 - 2008. The industries receiving most FDI inflows consist of machinery and transportation equipment, electrical appliance, and metal and non-metallic products. These industries account for 60 percent of the Thai manufacturing foreign investment.

Figure 2.5: Inward FDI Share Classified by Economic Sector, 2004 – 2008



(Million of $US)

	2004	2005	2006	2007	2008	Avg. 2004 - 2008
Manufacturing	6,062.0	5,952.3	9,774.4	9,667.4	9,480.0	8,187.2
Finance	615.8	2,925.9	4,596.5	4,433.2	3,624.4	3,239.1
Trade	4,097.9	2,813.2	7,645.0	2,389.0	1,578.1	3,704.6
Mining	398.4	397.0	934.5	1,720.6	554.4	801.0
Construction	117.5	89.8	146.2	251.3	230.8	167.1
Services	577.3	883.3	2,724.8	2,830.8	3,187.2	2,040.7
Others	1,550.2	5,351.4	7,777.8	3,495.9	2,367.2	4,108.5

Source: Bank of Thailand

Table 2-1: Inward FDI in Manufacturing Sector, 1990 – 2008

(Million $US)

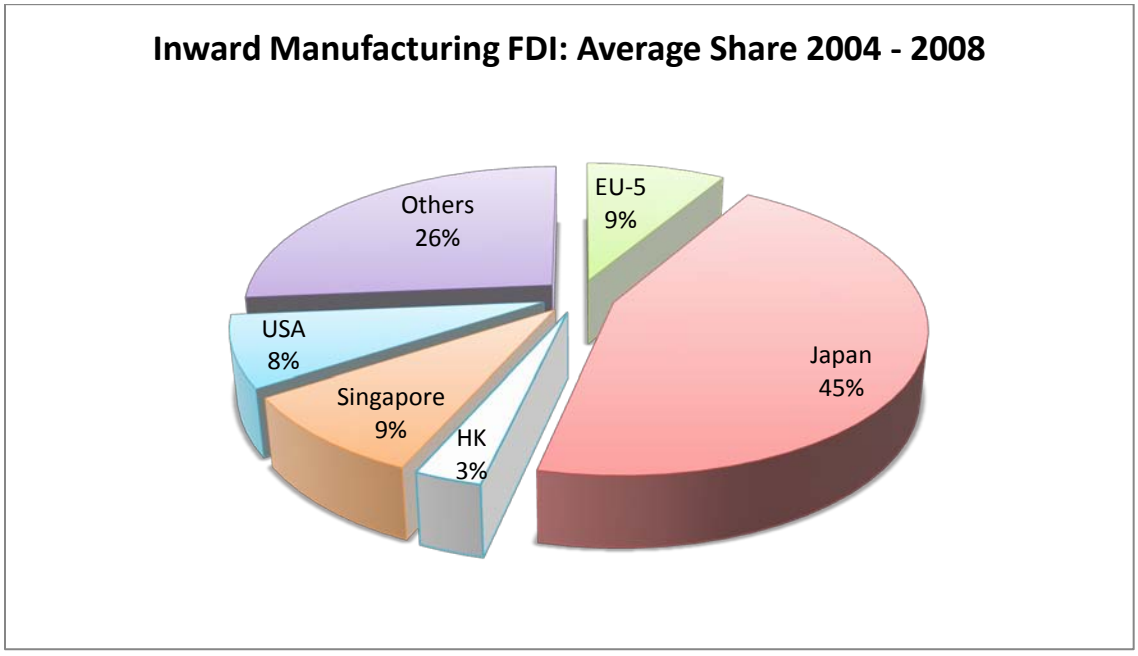
Industry	1990	1995	2000	2005	2006	2007	2008
1 Food	74.26	44.44	105.39	211.05	491.17	503.58	554.06
2 Textiles	72.26	60.20	38.36	176.71	264.63	167.10	172.02
3 Metal & non-Metallic	118.55	103.36	251.32	447.87	835.60	958.19	856.82
4 Electrical Appliances	454.80	470.38	1,100.95	1,338.43	2,210.59	1,474.53	2,723.94
5 Machine & Transport	98.45	177.67	726.22	1,627.59	2,199.29	3,325.14	2,950.40
6 Chemicals	181.65	121.48	536.09	607.08	537.94	606.72	642.22
7 Petroleum Products	123.79	89.75	93.58	309.45	1,214.77	803.22	55.24
8 Construction Materials	0.65	25.40	57.94	33.66	25.45	35.62	20.90
9 Other industry	184.00	92.34	245.68	1,200.46	1,994.97	1,793.27	1,504.44
Total Manufacturing	1,308.41	1,185.02	3,155.52	5,952.31	9,774.41	9,667.38	9,480.04

Source: Bank of Thailand

In terms of investing countries, Japan has been the largest FDI source, followed by Singapore, the United States, Hong Kong, and the EU-5[7] countries. The FDI from these major source countries accounted for 74 percent of the total FDI in manufacturing sector during 2004 - 2008. Figure 2.6 indicates that the Japanese FDI inflows from over the last 5 years were approximately 45 percent, Singapore 9 percent, the United States 8 percent, the EU-5 8 percent, and Hong Kong 3 percent.

[7] EU-5 comprises of Belgium, France, Germany, Netherlands, and United Kingdom

Figure 2.6: FDI inflows Share from Major Source Countries, 2004 – 2008



(Million of $US)

	2004	2005	2006	2007	2008	Avg. 2004 - 2008
EU-5	115.80	506.73	1,114.44	1,019.54	748.81	701.07
Japan	2,461.43	2,782.39	3,441.51	4,910.42	4,845.51	3,688.25
HK	235.90	94.74	486.26	167.96	235.11	243.99
Singapore	531.84	866.70	1,089.64	800.62	465.03	750.77
USA	123.95	699.98	897.24	804.30	686.15	642.32
Others	2,593.09	1,001.77	2,745.32	1,964.54	2,499.42	2,160.83

Source: Bank of Thailand

2.4 FDI Policy in Thailand[8]

Thailand established the first modern investment policy called the "Investment Promotion Act" in 1961. It has been revised several times. Prior to the early 1970s, the investment promotion aimed to support the import substitution industries. Due to inefficiency among promoted enterprises, the Thai government shifted the policy to more emphasis on export-oriented industries during the middle of 1970s. Several incentives have been given to export firms since then.

The provided investment incentives consist of tax reductions and exemptions such as exemptions or reductions of imported machinery and raw materials, exemption of corporate income taxes for 3 to 8 years, and exclusion of dividends from promoted enterprises. Furthermore, the Board of Investment (BOI) also facilitates foreign investors' bringing in foreign technicians and experts, to own land for promoted activities, and to facilitate foreign currency transactions. Interestingly, to sustain FDI in the long run, the Thai government has also enrolled in international investment agreements to protect foreign enterprises and avoid double taxation with several major investing countries including Japan, the United States, EU countries, and Asian countries.

There was a major change in investment policies after the economic crisis. During 1997 – 1998, the domestic production and local investment declined rapidly. Then, the foreign direct investment became an important factor to stimulate the production and create the employment in the country. Hence, the BOI generated several measures to aid existing firms and enhance new investment. The policies for supporting industries (backward and forward linkages) emphasized tax reduction and exemption for

[8] The details of this section are based on several published documents of Office of Industrial Economics (OIE) and Board of Investment (BOI).

both corporate income and imported machines and raw inputs. Moreover, foreign investors were allowed to have all or a majority ownership in existing manufacturing firms located in investment zone[9] 1 and 2. In 2000, the BOI issued the latest incentive policy to be consistent with WTO regulations.

Recently, the Thai government assigned the special privilege to investment projects including agricultural products, public utilities and infrastructure, environment protection, technological and human resource development, and economic target industries. These investment projects will receive the benefits similar to investment in zone3 regardless of their location. The BOI reserves the right to announce target industries depending on economic situations and government policies. For instance, the electronic, food processing, and automobile industries were assigned to be target industries in 2003.

In sum, this chapter briefly describes the overview of the manufacturing sector and industrial foreign direct investment. Furthermore, the industrial and FDI policies in Thailand are reviewed. The next chapter will examine the theoretical concepts of foreign direct investment and relevant empirical literatures including FDI determinants and impacts on host economic growth and domestic wage.

[9] In 1993, BOI announced the investment zones which provide the different privilege to promote the regional investment. Bangkok and metropolitan are in Zone 1. Zone 2 encompasses 10 provinces surrounding Zone 1, and the remainder provinces are in Zone 3. Investment enterprises located in Zone 1 obtain the least incentives, while the Zone 3 enterprises receive the maximum incentives.

CHAPTER 3

LITERATURE REVIEW

This chapter investigates the relevant theoretical and empirical studies of foreign direct investment. Since the enormous growth of international business and foreign direct investment over the last two decades, it is challenging to find the theories that can explain the Transnational Corporations (TNCs) behaviors and foreign direct investment (FDI) at the present time. Consequently, this chapter will initially discuss the FDI concepts in four main modern theories which are the Eclectic Paradigm, the New Trade Theories and MNCs, Networking Theory, and Nation-States and TNC's Strategic Behavior concept. Finally, the empirical literature of the determinants of FDI and its impacts will be discussed.

3.1 Theories of Foreign Direct Investment

This part consists of two sections. The first section provides a background and development path of the modern FDI theories. The second one will discuss the concept of the Eclectic Paradigm, followed by the New Trade Theory and Multinational Corporations, Networking Theory, and the concept of Nation-States and TNC's Strategic Behavior Theory.

3.1.1 A Background and Development of Modern FDI Theories

Before the Second World War, the studies of FDI and international production explained the neoclassical theory of international trade such as Ricardo's comparative advantage and the Heckscher-Ohlin model. However, during the period of the 1950s and 1960s, there was a sign of significant growth in FDI especially in the industrial sectors by American and British entrepreneurs to several developed countries (Ietto-Gillies, 2005). Some of these changes cannot be demonstrated by the conventional neoclassical ideas such as an international firm’s behaviors and the impacts of international production on local firms and host countries. Hence, several modern concepts of FDI were developed to clarify this new trend.

The modern theory of FDI initially counted in Hymer's study (1960, published in 1976). His study concentrated on the direct investment under market imperfections. According to Hymer, the market failures can be caused by imperfections in goods and factors market, economies of scale, and governments' intervention. In addition, he suggests there are two main determinants of international investment. The first factor is the firm’s specific effects or ownership advantages that cause firms to have comparative advantage over their business rivals. The other one is the conflict reduction in foreign markets by cooperating with the rivals or moving to control foreign production. Furthermore, Hymer's concept of FDI particularly in ownership specific advantages was developed by many authors such as Caves (1971) and Kindleberger (1973) and it also gives contributions to several following FDI theories.

Another FDI characteristic explanation was from Vernon (1966). He proposed that international production follows the cycle of products that can be divided into three processes: the new product, the maturing product, and the standardized product process. The theory's key assumptions are the innovation and technological advantages that drive firms need to be able to find the better markets and resource locations.

Then, the internalization theory was developed during the period of 1970s by several economists such as McManus (1972), Buckley and Casson (1976) and Teece (1977). The important keys of this theory are the transaction costs and market imperfections. The market failures in intermediate goods and technology markets will create transaction costs and some uncertainties. To avoid this risk, entrepreneurs decide to construct the internal markets within their organizations. Also, transnational enterprises and international production are constructed when the internalization moves across nations. Furthermore, this theory explains the horizontal and vertical FDI and becomes a part of the well-known Eclectic Paradigm.

Combining the theory of internalization with some concepts of international production, Dunning (1980, 1988, and 2001) developed a group of theoretical concepts or a "Paradigm" to explain the patterns of multinational enterprises behaviors. The Eclectic Paradigm was officially proposed in 1976 at a Nobel Symposium on the International Location of Economic Activity (Dunning, 2001). The paradigm suggests that FDI can be demonstrated by three advantages: ownership, location, and internalization. This framework could also explain FDI in firms, industries and country structures. Interestingly, numerous subsequent studies have employed Dunning's theoretical

approach up until present time. (The concept of the Eclectic Paradigm is discussed in detail in the next section).

The global economies have altered tremendously during the last two decades. The economic integration in both the same regions and inter-regions is more sophisticated. In addition, the TNCs' behaviors have developed more advanced and create many great impacts to several host countries. This change also causes the cooperation and conflict among international investors, source countries, and local government. Consequently, the Networking theory (Chen and Chen, 1998; Gulati, 1999; Hecox *et.al*, 2003; Ando and Kimura, 2003), and Nation-States and TNCs' strategic behavior theories (Ietto-Gillies, 2002; Cowling and Tomlinson, 2005; and Sorensen, 2009) were developed to investigate these phenomenon.[10]

3.1.2 Eclectic Paradigm

The Eclectic or OLI paradigm is the attempt of Dunning (1998, 2001, and 2008) to clarify three issues: why, where and how/when a firm determines to get involved in international business. He proposes that an international enterprise is influenced by three types of advantages: ownership (O), location (L), and an internalization (I) advantage. Interestingly, the paradigm suggests that a firm will be involved in direct investment if all three advantages are satisfied.

The first advantage is the ownership advantage (O) that is specific to a particular company. This allows a firm to have privilege over other firms in the market. Dunning specifies the O-advantage into three types. The first type is called the asset-specific

[10] Networking Theory and Nation-States and TNCs' Strategic behavior are discussed in the next section.

advantage (Oa) including the property rights and intangible asset ownership such as product innovation, product management, innovatory capacity, organizational and marketing system, etc. The second one is the transaction cost minimization advantage (Ot) that a branch of established company might have over a new firms or the advantage that a firm gains the business experience from its multinational operations. This includes the access to cheaper inputs, knowledge of markets and local production conditions, risk diversification, ability to learn from societal or cultural difference, etc. Finally, the third ownership advantage is the institutional asset (Oi) consisting of norm and cooperate culture, incentive systems, appraisal leadership, and diversity management in the organization.

In addition to ownership advantage, the location advantage (L) is all those advantages related to geographic, politic, and economics of both home and host economies that facilitate the investing enterprises. This includes the quantity, quality, and price of inputs, transportation and communication costs, international barriers, infrastructure facilities, government policies, legal and regulatory systems, stability of politics and economy, etc. The third advantage is internalization (I) which is obtained from production within its own organization. This benefit allows a firm to avoid the uncertainty due to the market failure and sudden external economic change.

Consequently, a company will decide to implement FDI if it possesses net ownership advantages over other foreign firms in a specific market, gains benefits from internalizing and exploits its ownership resources rather than selling patents or licensing. Finally, the countries where FDI is established have to offer location incentives to an enterprise to be able to utilize the benefits from its ownership and internalization system.

The eclectic paradigm is widely utilized to investigate the transnational business and FDI by several researchers including Markusen (2001), Cantwell and Narula (2001), Sethi *et.al* (2003), Konig (2003), and Mitgwe (2006). The paradigm provides an outstanding method to measure the international business activities holistically connecting firm, industry, and national condition for foreign production. Nevertheless, the main problem of this concept is that the numbers of variables based on three OLI advantages are very large and tend to increase endlessly. Thus, it may have limited power to explain some specific international production or it is too broad to conduct the study in a particular issue (Dunning and Lundan, 2008; and Ietto-Gillies, 2005).

3.1.3 New Trade Theories and Multinational Corporations

During the 1980s, there was a major change in the international trade theory. The classical and neoclassical trade theories with constant return to scale and perfect competition assumption could not explain some new trends of the foreign trade and international business activities. A general equilibrium framework with increasing return to scale and imperfect competition (a monopolistic competition) was applied to the new trade concepts. Helpman (1984), one of the new trade scheme pioneers, clarified the emergence of multinational corporations in the international economy. He suggested that a firm becomes a multinational firm when it can gain rewards from the certain inputs and specific assets that it possesses such as marketing, management, and technology to service the production line in foreign countries. Hence, it is advantageous if the services from the firm's certain inputs are utilized within its organization (Helpman and Krugman, 1985). This generates the intra-firm and intra-industry trade.

The new trade theories were applied to explain the FDI patterns from developed and developing countries and were also utilized to study the international vertical integration and intra-firm trade. Nevertheless, this theory has some limitations to explain some modern behaviors of MNCs such as the spreading of investment to the areas that may be unprofitable or the joint cooperation among local firms and MNCs.

3.1.4 Networking Theory

According to the evolution of modern global economy, a firm cannot stand alone and determine its actions indulgently. In contrast, it is advantageous for any enterprise to employ and gain the benefits from the global business network. The networking is a set of interrelationships among business companies including production, marketing, information, R&D, buyer-supplier partnerships, or other business cooperation. Chen and Chen (1998) conducted research on FDI and network linkages in Taiwan. They suggested that the strategic linkage or networking allows the FDI firms to gain strategic assets in an international market such as raw materials, market information, and local know-how. In addition, an investing firm will have an opportunity to gain economies of scales and diversify uncertain risks.

Ando and Kimura (2003) investigated the international distribution and production network in East Asia. The networks include both intra-firm and inter-firm business relations. They generate the chain of production, risk diversification, and large scale consumption resulting in more profit to investing firms. Similarly, Hecox *et.al* (2003) suggested that the externalities of international business networks encourage an investing enterprise to establish firms in some countries even though the current profit is

not persuasive. The main reason is that the externalities such as market information, technological sharing, and mutual alliances with both other foreign enterprises and domestic companies in that area will generate great benefits (non-monetary) in the long run.

In summary, the networking concept provides an alternative explanation of MNCs behaviors during the modern economic era. However, this theory cannot clarify all of FDI patterns such as the importance of institutional and political factors on FDI as well as the impact of government policies.

3.1.5 Nation-States and TNC's Strategic Behavior Theory

The nation-state is a set of regulatory regimes including specific institutions, rules and regulations within the border of the nation-state. Some of these regulations are based on legal or institutional systems and government policies. Ietto-Gillies (2005) stated that different nation-states are different in currency regimes, tax regimes, and business and labor regulations. This generates the four specific advantages of transnational corporations (TNCs) due to different regulatory systems including labor advantages, negotiation (with government) advantages, currency and tax system advantages, and risk spreading advantages.

Jensen (2005) mentioned that the nation-state causes TNCs to have much bargaining power over the domestic labor and local government. Similarly, Cowling and Tomlinson (2005) and Ietto-Gillies (2005) suggested that whenever a TNC enlarges its production to many countries, the local labors are more fragmented and less organized making it difficult to bargain any demand from multinational enterprises.

Other than obtaining more bargaining power, investing in several different areas allows multinational firms to be able to maximize their returns from exchange rate fluctuations. In addition, TNCs can gain benefits from the different tax incentives and government policies.

Thus, the nation-states and TNC's strategic behavior help to explain the tremendous increase of foreign direct investment worldwide (both in developed and developing countries) during the last two decades. Multinational enterprises can receive more economic power and increase the opportunity to select the most beneficial areas for spreading their foreign investments. Nevertheless, this concept has some limitations since it does not analyze the competition among rival firms that affect the TNC's behavior. Furthermore, it lacks of the cooperation dimension between MNCs, domestic firms, local labor, and host governments that are also important for FDI determination.

In conclusion, it is not effective to utilize one sole theory to investigate the FDI patterns since the characteristics of FDI are various and complex. In addition, each FDI concept has strong and weak aspects. Thus, studying several theoretical reviews provides the useful information for conducting an empirical analysis of FDI determinants and their impacts on a host country. The next section presents the related empirical literature reviews.

3.2 Empirical Literature

The first section of the empirical review discusses the previous works relating to the determinants of FDI. Later, the empirical literature of the impacts of FDI on economic growth and host country wage are examined.

3.2.1 Determinants of Foreign Direct Investment

There are numerous studies from several parts of the world on the determinants of FDI. To understand the patterns of FDI factors, this section will initially review some previous FDI works emphasizing on multiple host countries and then continue to review the one host country models.

3.2.1.1 Multiple Host Countries Model

This part demonstrates the previous studies on FDI determinants utilizing a large data set of both developed and developing host economies. The details of the literature are presented as follows:

Vijayakumar *et.al* (2010) investigated the determinants of FDI in five large emerging counties including Brazil, Russia, India, China and South Africa from 1975 to 2007. They utilized the panel data analysis and found that market size, labor cost, exchange rate, economic stability, and infrastructure facilities are major factors to attract FDI to these countries. Surprisingly, trade openness was not a significant factor. In addition, the authors recommended that although these five host countries have high

potentials to induce foreign investment, they should maintain the currency stability, economic reform and liberalization to sustain FDI inflows in the long run.

Laabas and Abdmoulah (2009) conducted FDI analysis by employing the augmented gravity model with the panel fixed effects framework. The researchers attempted to investigate the bilateral FDI factors within the Arab region (Intra Arab FDI). The data used in the model consist of 17 Arab countries (in Asia and Africa) during the period 1998 to 2007. Interestingly, the model employed the concept of inverse hyperbolic sine function to handle the zero value of the dependent variable (FDI). They also included the dummy variables accounting for trade and investment environment such as borders, language, colonial history, trade and investment treaties, and trade blocs. These could better explain the Arab FDI pattern. The results indicated that economic size, bilateral trade, control of corruption and political and economic stability enhance the FDI. In contrast, the geographic distance and infrastructure are negative determinants. The authors explained that the negative sign of infrastructure is because many Arab countries still lack many infrastructure facilities. The fewer infrastructures in the countries have, the more facilities (for example, telecommunication) are invested in. Nevertheless, trade and investment treaties are not significant in the model.

Sova *et.al* (2009) examined the patterns of FDI in the new EU member countries (Romania, Poland, Hungary and Bulgaria). They applied the concept of the gravity model to explain the determinants of FDI. In their model, the panel data by fixed effect vector decomposition (FEVD) was employed to manage the large data set of 17 source

countries, 4 host economies, and a 16 year period (1990-2005). The empirical result indicated that the positive FDI determinants consisted of country size, multilateral agreement, political stability, and the progress of economic reform. The negative factors include the geographic distance, high labor costs, and exchange rate appreciation. The policy implication suggested that host countries should improve institution factors such as economic and political reform and law improvement to attract more FDI.

Büthe and Milner (2008) attempted to explain the international trade agreement effect of FDI in developing countries. They analyzed the impact within 129 developing countries during 1970 to 2000 by utilizing the fixed effects approach. The authors also applied the instrument variable method for the country trade agreements and institution factors. Their findings indicated that multilateral agreement such as the WTO and bilateral trade treaties supports inward FDI to host economies. Furthermore, the results recommended the importance of the government role such as political power, cooperation, and strong institutions to enhance FDI and international trade. Finally, the model result was consistent with some previous works indicating the international trade is a complement to foreign direct investment.

Bellack *et.al* (2008) analyzed the policies to attract foreign direct investment from 11 host countries (US plus EU-6 and four central and Eastern Europe). The analysis collected industry-level data during the period of 1995 to 2003. The authors employed a dynamic panel data approach to separate country and industry level specification. The scope of FDI policies in their model was defined as the difference between the stock

of inward FDI received by a country-industry-pair and potential FDI which is the best policy in practice. In addition, the authors divided the regressors into two categories: policy variables comprising of the average effective tax rate, private and public R&D expenditure, level of legal trade barriers and labor cost. These variables have direct effects on the decision of policy makers in the short run. The other one is called intervention variables consisting of the political risk level, inflation rate representing the macro risk level, market potential, and GDP per capita which indirectly involve the policy controllers in the middle and long run period.

A significant point in this paper was that the model provides the information gap between actual policies and best policies. This helps the government understand which policy would promote the FDI and how the policies should be implemented. From the estimation, the result demonstrated that the increasing of R&D in US-plus-EU-6 countries would enhance more inward FDI. Hence, the host countries should invest more on research and development and improve the education and training systems.

Demakas *et.al* (2007) studied the role of government policies to FDI in European countries. The gravity concept with the panel data procedure was employed in the FDI model. The results demonstrated that both gravity variables such as population and economic size and policy regressors such as trade liberalization, labor cost control, and infrastructure reforms encourage FDI to EU countries. The researchers recommended that European governments maintain the economic growth and open more trade among EU members especially for the new member countries to support FDI.

Bénassy-Quéré *et.al* (2005) conducted an empirical work to measure the impact of the institutional environment on foreign direct investment. The data were collected from the survey of foreign network corporations in 52 countries conducted by the French ministry of finance in the year 2001. The authors applied the panel data analysis with the gravity model method and compared the result with matched variables. The result suggested that public efficiency including tax systems, easiness to create a company, lack of corruption, transparency, security of property rights, efficiency of justice and prudential standards are major determinants of inward FDI. Moreover, the geographic distance between the countries reduces the bilateral FDI significantly. Essentially, this is an example of empirical study attempting to capture the qualitative determinants and the international trade theory (Gravity model) to measure the FDI. Unfortunately, the quality of institution factors is somewhat questionable and covers only a one year survey. Nevertheless, the model is very beneficial to policy makers in case of improving the quality of institutions in host economy and enhances FDI particularly in the developing countries.

Neumayer and Spess (2005) investigated the importance of bilateral investment agreements to FDI in developing countries. The model included the interaction term of bilateral investment treaties with investment quality factors such as political risk, investment and regular law, and government stability. The result supported the role of investment agreements to attract FDI inflow to a host country. The authors suggested that bilateral agreement is a significant tool for both foreign investors and domestic

governments to create a good investment environment together. Then, the higher number of agreements will increase FDI inflow to developing countries.

Nonnemberg and Mendonca (2004) examined the factors that induce FDI into developing countries. The authors empirically analyzed by panel data analysis of 38 developing countries (including transition economics) during the years 1975 - 2000. They selected several variables of host countries and other economic factors in the econometric model. Furthermore, the authors eliminated the unobserved effects by a fixed effects estimation. The results indicated that level of schooling, degree of openness, and the Dow Jones index representing the investment atmosphere have positive impacts on FDI. The positive effect of level of schooling demonstrates that an increasing of the direct investment in developing countries involve to knowledge base factor. In contrast, the rate of inflation as an indicator of macroeconomic stability has a negative effect on FDI. Nevertheless, the risk variables, energy consumption in host countries and GDP growth of OECD countries showed no significance in FDI implementation.

Bevan and Estrin (2004) studied the determinants of foreign direct investment of 11 eastern and central European countries from the 18 source countries of FDI. The period covers the years 1994 to 1998. The researchers applied Dunning's Eclectic paradigm and gravity concept to create the FDI determinants consisting of macroeconomic factors and some gravity variables. Interestingly, they analyzed the model into two stages. First, the model estimated the risk factors in each host countries by least square method with several macro-economic variables such as consumer price,

government balance, external debt, and the index of corruption. The second stage was in estimation the full FDI model by employing a panel data approach and first difference method. The results demonstrated that country risk, unit labor cost, host market size and gravity factors determine the FDI. In addition, the estimation suggested countries with poor preparing for EU transition; for example, delaying to be an EU member will result in lower levels of FDI inflow. This lack of readiness for transaction will degenerate their transition progress.

Kiyota and Urata (2004) studied the relationship between exchange rate and foreign direct investment. The authors collected the manufacturing level data of FDI from the United States and Japan during 1990 – 2000. The estimated results indicated that the depreciation of host currency attracts FDI since the depreciation decreases costs of production and lower the asset value in the host country compared to the source country. In addition, both Japan and U.S. investors prefer fixed or small change in the host currency value. Then, the high volatility of exchange rate is harmful to FDI inflow. Finally, the policy implication suggested that host government avoid currency overvaluation and impose the flexible and stable exchange rate policy to maintain FDI.

Banga (2003) tested the impact of government policies and investment agreements on FDI inflows in 15 Asian developing countries. The author categorized the government policies into three groups. The first group is the policies to improve the host country economy. The second group is the measurement that reduces the transaction cost of foreign investors and the last one is the international policy including investment incentive and multi and bilateral agreement. The model results indicated that FDI policies such as lower tariff rates, lower investment restriction, and investment zone are significant factors of FDI inflows. Furthermore, good economic factors including large market size, low labor cost, low external debt, and infrastructure improvement have a positive impact on foreign direct investment. For the investment treaties, the bilateral agreement has stronger effects to FDI inflows than the multilateral agreement.

3.2.1.2. Single Host Country Model

The empirical studies of the single host country model provide specific information to both investors and host governments to better understand the pattern of foreign direct investment in host countries.

Nguyen and Nguyen (2007) examined the FDI in Vietnam during the period 1988-2006 concentrating on the four groups of FDI determinants: market factors, labor cost, infrastructure, and government policies. The results demonstrated that GDP growth rate used as proxy for market potential is positive and significant. Moreover, two variables representing labor market factors, the number of high school graduates and wage cost are positive and strongly significant. Nevertheless, local government policies

toward FDI show no influence on FDI in Vietnam. Furthermore, the authors separately analyzed the FDI from five main source country investors (EU, US, Taiwan, Singapore and Japan) and found that as in the case of European investors, market factors are less important. On the other hand, the market factors are significant factors for all other main foreign investors in Vietnam. The labor cost is also important among US, European and Taiwan investors, but less important for Japanese and Singaporean investors. In addition, this work provided the information of the impact of FDI on the Vietnamese economy such as the employment, income distribution, and poverty reduction.

Kimino *et.al* (2007) investigated the macro determinants of foreign direct investment inflows to Japan by focusing on the set of source country economic data. The data were collected from 17 source countries for the period 1989 to 2002. An important contribution of this study is that the selected host country (Japan) is one of the main FDI exporters in the world. This would clarify the concreteness of FDI theories so that they are able to explain the FDI pattern in both advanced and developing countries. The authors developed six main FDI determinants including market size of source countries, source country exports, currency, the cost of borrowing differential between Japan and source countries, relative labor cost, and investment climate. The methodology employed a panel data to control country-specific effects since if the unobserved effect is not eliminated, the estimation will be biased. Finally, the estimation result suggested that less relative exchange rate fluctuation, higher borrowing cost in source countries, and the stability of the business climate are strong incentives to attract foreign direct investment inflows to Japan.

Kristjánsdóttir (2005) investigated the FDI pattern in Iceland. Although the trend of FDI increased overtime, when compared with neighboring countries, Iceland's FDI was still in the low level. Therefore, the authors attempted to search the determinants and obstacles of FDI in Iceland. Since Iceland is an isolated country away from the continents, the gravity factors should be important. Then, the author selected the model specification applying the Bergstrand (1985) gravity model combined with other macroeconomic determinants. Furthermore, the panel data method was employed to four investment sectors including power intensive, the commercial and financial sector, telecommunication, and other sectors and 17 different source countries covering the period from 1989 to 1999. Consequently, there are 748 observations. An interesting thing in this paper is the researcher utilized the method called "Inverse Hyperbolic Sine Function" to the dependent variables rather than applying the natural logarithm function because a gravity equation with a natural logarithm format cannot operate zero or negative values. The independent variables comprise the host country and source country GDP, source country population, geographic distance, and the dummy variables represent manufacturing sector and trade bloc. The result found that distance and population growth of both host and source country have negative impacts on FDI, but the GDP is a positive determinant. The empirical result of the sector specific level indicated that when controlling distance, wealth, and market size, MNCs have higher incentives to invest in the power-intensive sector, and commercial and financial sector compared to the telecommunication sector. Moreover, the countries outside trade blocs have less incentive to invest in Iceland than EU member countries. Thus, this model provides a powerful tool

to measure the foreign direct investment at the micro and macro level and also clarifies the effect of regional integration effect of FDI.

Farrell *et.al* (2004) analyzed the determinants of FDI in Japan from 15 source countries during 1984 to 1998. The result found that economic size and trade variables are main FDI factors. This result verified the compliment between international trade and FDI. In addition, the trade protection of both tariff and non-tariff barriers obstructs the FDI inflow to Japan. Nevertheless, the labor cost, interest rates, and exchange rate were insignificant.

Zhao (2003) examined the effects of the country factor differential by studying the connection between FDI in China and the characteristics of source countries. Based on the data, the model utilized the data from 21 source countries from 1983 to 1999. The authors applied the pooled regression for cross country analysis consisting of several determinants of FDI including host country wealth, growth potential, export competition, cost of borrowing, foreign exchange, and political and operating risk. The empirical result indicated that several variables are consistent with previous literature. The continuous growth, promising export, and relative low currency values have a positive impact on the inflows of FDI to China. In contrast, high financial costs, political risks and operation obstacles have a negative impact on FDI. Surprisingly, in the relative source countries, wealth had no significantly effect to FDI. Lastly, the policy implication suggested the host government should reduce the investment cost and maintain both political and economic stability to attract foreign direct investment.

Liu *et.al* (1997) investigated the country characteristics and foreign direct investment in China based on the data of 22 source economies during 1983 to 1994. The authors employed the panel method to eliminate country specific effects and included economic variables, culture variables and geographic distance. The estimation result of supported the model hypotheses that inward FDI is determined by relative wage rates, relative exchange rates, and economic integration represented by real exports and imports. An interesting result suggested that the cultural difference between source countries and China is statistically significant. Thus, the larger culture differences between investing countries and China may cause foreign investors to find it harder to operate the business and also reduces the attractiveness of FDI. Unfortunately, some important factors such as borrowing costs, country risk and geographic distance have no impact on FDI. The borrowing cost data are doubtful due to data misspecification since it includes the period that China began to liberalize its economy. Consequently, some collected (financial) data may be questionable.

3.2.2 The Impacts of Foreign Direct Investment

Several countries attempt to attract FDI due to its benefits to host countries. This section evaluates the previous FDI-growth literature from several host economies. Then, the studies about FDI effects to domestic wages will be examined.

3.2.2.1 The Impacts of FDI on Host Economic growth

Wang (2009) investigated the FDI effects on the economic growth for 12 Asian countries during 1987 – 1997. The author applied the concept of the endogenous growth theory with panel data regression to examine six economic sectors including agriculture, manufacturing, construction, finance, services, and other sector. The estimated results indicated that FDI inflows have a positive impact to the economic growth. In addition, the author found that FDI in the manufacturing sector creates the major contribution to the economic growth. The main reason is that the manufacturing sector has numerous linkages and is directly involved in the technology. The innovation and new management from foreign investors can spill over to domestic manufacturing firms. In addition, the level of education as a proxy of human capital is also an important factor to support growth. Finally, the researcher suggested that countries should invest more on R&D and improve human capital to promote economic growth.

Khaliq and Noy (2007) studied the FDI effects to economic growth in Indonesia over the period 1997 – 2006. A panel fixed effects method was utilized to investigate the FDI in 12 economic sectors. Interestingly, this work concentrates on one host country and employs FDI in sector levels. Although this work provided specific results, it is beneficial for further studies. The results demonstrated that at the aggregate level, the FDI has the positive impact on Indonesian economic growth. However, the FDI effect on growth in the sectoral level is less significant. The policy implications suggested that the Indonesian government should promote FDI inflows to all sectors in order to support the economic growth.

Vu *et.al* (2007) attempted to prove the importance of FDI to host economies. They selected two large FDI recipients in Asia: China and Vietnam during 1990 – 2003 to examine FDI effects on growth. The authors collected the data from five sectors consisting of industry, construction, transportation, real estate, and the agricultural sector and estimated the model by panel data estimation. The researchers suggested that the FDI effects to host country growth are through labor-augmenting technical transfers. Hence, the model is derived from an augment Cobb-Douglas productions function including labor transfer effect and human capital variables. The results indicated that FDI has a positive impact on economic growth for both China and Vietnam. Interestingly, the effect is stronger when including the interaction variable between FDI and host labor. In addition, the sectoral analysis indicated that the FDI in manufacturing sector creates the growth effect more than other sectors. Last, the authors recommended collecting more sectoral data for the future studies in order to obtain a more efficient result.

Johnson (2005) applied growth theories to study the relationship between FDI and economic growth. This study employed a large data set of 90 host countries during 1980 – 2002. The exogenous variables consisted of capital accumulation, labor, FDI and average years of schooling as a proxy of human capital. The model also includes the regional dummies and an interaction variable (FDI and schooling). The empirical results indicated FDI enhances the economic growth of host economies. Interestingly, the author suggested that the technology spillover from FDI is the most substantial factor to stimulate host economic growth. Nonetheless, the FDI effects to growth were found more significant in host developing economies than developed countries.

Alfaro (2003) investigated the importance of FDI in each sector to host economic growth. The author argued that FDI in each sector should have different impacts on overall growth. The data were obtained from 47 countries during the period of 1980 - 1999. The sectors are classified to three groups: primary, manufacturing, and services. The empirical results demonstrated that FDI in the primary sector has a negative impact on the economic growth and in the service sector FDI has ambiguous effect. In contrast, the FDI in the manufacturing sector supports the economic growth. This sector has a high potential to absorb the technology, management, skill improvement from foreign investment due to its strong linkage. Finally, the authors recommended that these results do not indicate that the government should not to support the FDI in non-preferable sectors. Rather, it provided useful information to host governments in order to create the right FDI policy for each economic sector.

Borensztein *et.al* (1998) analyzed how FDI affects economic growth for 69 host developing countries from 1970 to 1989. The endogenous growth theory was applied to measure the FDI effect. It provided the framework to study the link between host economic growth and foreign direct investment with other important growth factors. The authors hypothesized that the technology progress is the major factor of the long term growth. The model employed exogenous variables such as government consumption, FDI, inflation rate, regional dummy variables, and some variables representing institution. In addition, the male secondary schooling as a proxy of human capital and its interaction with FDI were introduced in the model. The results were consistent with their hypothesis, indicating FDI has a positive impact on economic

growth. Essentially, the effect is stronger after including the interaction between FDI and human capital. Consequently, the authors suggested that the flow of technological progress from FDI enhances host economic growth. However, the size of the impact is determined by the human capital stock of host economies.

3.2.2.2 The Impacts of FDI on Host Country Wages

Foreign direct investment not only affects economic growth, but also generates other impacts to host economies; for instance, the impacts of domestic real wages. Some related earlier works are reviewed in this subsection.

Mutascu and Fleischer (2009) investigated the relationship between FDI and wages in Romania during by vector autoregressive (VAR) analysis. The data were collected in monthly from January 2002 to January 2009. To examine the connection between both variables, the researchers employed a pairwise Granger causality test. The model results suggested that FDI increases domestic real wages. On the contrary, the impacts of wages on FDI are ambiguous.

Onaran and Stockhammer (2008) investigated the impacts of FDI and international trade on host country wages in central and eastern European countries during 2000 - 2004. The data were obtained from 14 manufacturing sectors in 5 countries consisting of Hungary, Poland, Czech Republic, Slovakia, and Slovenia. The main wage equation was utilized from a standard bargaining model. In addition, a panel fixed effects method was employed to estimate the wage equation. The exogenous variables included

labor productivity, FDI, export, import, and unemployment. The results indicated that FDI in the short run has a positive impact on domestic wages. A 10% increase in the FDI resulted in 1.2 % increasing in wage. The labor productivity also improved local wage, but the unemployment had a negative effect. Surprisingly, the international trade variables are insignificant. In the medium run, the impact of FDI on wage is ambiguous. The FDI effect in some industrial sectors found negative impacts on wages. The authors explained that the negative effect indicates the inverse causality between domestic wage and FDI (low wage supports FDI).

Banga (2005) examined the impacts of FDI, trade, and technology on domestic wages and employment in the Indian manufacturing sector. The research data were collected from 78 industries at three-digit level of national industrial classification during 1991 – 1998. The data of FDI were obtained from the share of foreign companies in total sales of the industries. Furthermore, the author constructed an index of technology from R&D expenditures, license and technology costs, and capital goods as a measurement of technological effect. The model utilized a dynamic panel data approach proposed by Arellano and Bond (1991). The exogenous regressors included labor productivity, FDI, export, import, R&D intensity and other related economic variables. The results indicated that the flow of FDI increases the wage rate of Indian manufacturing sector, but found insignificant effect's on employment. The international trade and technology changes had no impact on domestic wages. In addition, the results also indicated that an increasing in export value supports the employment. Finally, due to many changes from globalization,

the authors suggested that host developing countries like India need to reform labor markets and remove economic obstacles to receive the benefits from this change.

Lipsey and Sjöholm (2004) studied the FDI and wage spillover in the Indonesian industrial sector. They collected the data from the Indonesian manufacturing census in 1996 including 18,652 firms. Their first finding confirmed that foreign firms pay higher wages than local-owned firms in Indonesian industries. The researchers utilized a cross-sectional regression to measure the spillover effects. In the aggregate level, the results indicated that FDI has positive spillover impact on domestic wage. Similarly, the results of the industrial and provincial level also suggested that wages in domestic-owned plants are higher in the industries and provinces that have huge foreign investments. Consequently, FDI enhances the local wage in host economies.

Velde and Morrissey (2002) examined the effects of FDI on local wages and wage inequality in five Asian countries including Hong Kong, South Korea, Philippines, Singapore, and Thailand over the period 1985 – 1998. They assumed that FDI can affect the skill of labor through technological change. Then, the authors applied two-factor CES production function with low-skilled and skilled labor to investigate the FDI spillover effects on local host wages. The results indicated that FDI increases the domestic wages for both skilled and unskilled labor. Nonetheless, the spillover of skilled workers is larger than unskilled workers. Then, the FDI does not help to improve wage inequality. Finally, the policy implication suggested that host countries should invest more on human capital to better absorb the benefits from FDI.

CHAPTER 4

THE DETERMINANTS OF FDI INFLOWS TO THE THAI MANUFACTURING SECTOR

The previous literature review provides beneficial information to investigate the inward FDI determinants in the Thai manufacturing sector. The reviewed FDI determinants are initially summarized. The model specification and empirical methodology are investigated in the following sections. Then, the data used in the model is discussed in the fourth section. The final part discusses the results of FDI analysis. The results of the determinants of FDI for the industrial sector are shown; following by the results of the FDI factors classified by industrial sectors and categorized by major source countries, respectively. The relationships between the 1997 economic crisis and FDI in the Thai manufacturing sector are also examined.

4.1 Summary of the Determinants of Foreign Direct Investment

There are several factors attracting FDI to host countries. The determinants of FDI can be classified to nine categories including the economic size of home and host countries, exchange rate, international trade, multi and bilateral agreements, borrowing costs, geographic distance, infrastructure facilities, government policy, and economic stability. The detail of each determinant, the hypothetical signs, and its supporting literature are summarized in Table 4-1.

Table 4-1: Summary of Variables Employed in the Determinants of FDI Model

Determinants	**Variables in the Model**	**Expected Sign**	**Supporting Literature**
1. Economic size of source and host countries	- Source country GDP - Manufacturing Production	+	Laabas and Abdmoulah (2008), Bellak.*et.al* (2008), Kimino.*et.al* (2007), Nguyen and Nguyen (2007), Kristjandottir (2005), Nonnemberg and Mendonca (2005), Benassy-Quere.*et.al* (2005), Bevan and Estrin (2004), Farrell.*et.al* (2004) and Liu.*et.al* (1997)
2. Exchange rate	- Exchange rate (Thai Baht/source country's currency)	+	Kimino.*et.al* (2007), Farrell.*et.al* (2004), Banga (2003), Zhao (2003), Kiyota and Urata (2002), and Liu.*et.al* (1997)
3. Trade (Thailand and source countries)	- Total Trade - Export - Import	+	Laabas and Abdmoulah (2008), Nonnemberg and Mendonca (2005), Bevan and Estrin (2004), Zhao (2003), Liu.*et.al* (1997)
4.Multi/Bilateral Agreement	- APEC - FTA	+	Buthe and Milner (2008), Kristjandottir (2005), Neumayer and Spess (2005), and Banga (2003)
5. Borrowing Cost	- Thai interest rate	-	Zhao (2003), and Banga (2003)
6. Geographic Distance	- The average of naval and air distance between Thailand and host countries	-	Laabas and Abdmoulah (2008), Demekas.*et.al* (2007), Kristjandottir (2005), Benassy-Quere.*et.al* (2005), Bevan and Estrin (2004)

Determinants	Variable in the Model	Expected Sign	Supporting Literature
7. Infrastructure	- The amount of telecommunication of Thailand used as a proxy	+	Vijayakumar *et.al* (2010), Bellak.*et.al* (2008), Nguyen and Nguyen (2007), Banga (2003)
8. Government policy	- BOI policy - Industrial restructuring plan	+	Sova.*et.al* (2009), Buthe and Milner (2008), Bellak.*et.al* (2008), and Banga (2003)
9. Economic Stability	- Thailand's international reserve used as a proxy	+	Bellak.*et.al* (2008), Kimino.*et.al* (2007), Neumayer and Spess (2005), and Nonnemberg and Mendonca (2004)

Note: 1.The detail of each supporting work is discussed in chapter 3: literature review

2. BOI is Board of Investment of Thailand, APEC is Asia-Pacific Economic Cooperation, and FTA is Free Trade Agreement

4.2 Model Specification

4.2.1 The Determinants of FDI Inflows to Overall Manufacturing Sector

The empirical work investigates the determinants of foreign direct investment in Thailand by applying the gravity concept with a fixed effects model[11]. The gravity models proposed by Anderson (1979) and Bergstand (1989) are utilized in this study. Interestingly, there are further developments of both gravity methods such as Bevan and Estrin (2004), Kristjánsdóttir (2005), and Laabas and Abdmoulah (2008) to improve the explanation on the FDI by extending other potential economic determinants into the model. As shown, the gravity model can predict the volume of FDI inflows through the gravity variables such as the GDP of the host and FDI-source countries, distance, and bilateral variables. It is also augmented by institutional arrangement and governance of host countries and government policy induced variables to account for the quality of the investment environment that affects investment decisions. The gravity model specification used in this model is demonstrated in Equation (4.1). The dependent variable is now defined as the inward FDI in the Thai manufacturing sector, varying over source countries (*i*), manufacturing sectors (*j*), and year (*t*).

The general form of the gravity equation derived from the reduced form of the gravity model is specified as follows:

$$FDI_{ijt} = e^{\beta_0}(X_{it})^{\beta_1}(Z_{jt})^{\beta_2}\eta_{ijt} \quad (4.1)$$

[11] Anderson and Van Wincoop (2003) suggested the possibility of omitted variable bias, the multilateral effects in the gravity model. The effects are denoted by the price indices as multilateral resistance variables. In this study, this effect is absorbed by the time dummies (See Hummels, 1999).

where X_{it} represents determinants that induce FDI which vary over source countries and over time. These reflect the economic environment which is the same across all industries. Also, Z_{jt} includes variables changing over industries and time while η_{ijt} is a log-normally distributed error term

Furthermore, a logarithm format is applied for Equation (4.1) and adjusted it to fit the real data. All are natural logarithms. Consequently, the interaction between the variables in the equation and the dependent variable is presented in percentages. Equation (4.1) is transformed to

$$\log(FDI_{ijt}) = \beta_0 + \beta_1 log(X_{it}) + \beta_2 log(Z_{jt}) + \delta_i + \eta_j + \lambda_t + \varepsilon_{ijt} \qquad (4.2)$$

where (*i*) represents source country, (*j*) represents industry and (*t*) represents time (year). Also, the dependent variable, *y* is the foreign direct investment (FDI) that varies over source economy, industry and time. X_{it} represents the independent variables that varies over source country and time, and Z_{jt} denotes the independent variables that varies over industry and time. Finally, ε_{ijt} is assumed to be strictly exogenous.

Equation (4.2) is a linear model with three-way error component. In the model, the error components are assumed to be correlated with the observed explanatory variables. Then, the fixed effect method is required to estimate the parameters of interest (Wooldridge, 2002 and Cameron and Trivedi, 2005).

Nevertheless, since log linearization is not defined for a zero value, the logarithm functional form possibly creates the problem if some data of the dependent or independent regressors are zero. Some researchers solved this problem by replacing zeros

with log(0). This will truncate the data sample and have the potential selection bias if the zeros are not randomly distributed. To avoid this trouble, introducing a positive constant to zero value: log(constant + FDI) is a common solution (Benassy-Quere, Coupet and Mayer, 2005). Nevertheless, this might be harmful to the quality of estimation and data distribution.

One of the potential alternatives is imposing "Inverse Hyperbolic Sine Function: IHS"[12] to the dependent variable, instead of imposing the natural logarithm function. This procedure is convincing since the IHS transformation does not eliminate the lowest values of the dependent variable (Kristjánsdóttir, 2005, and Laabas and Abdmoulah, 2009), imposing the inverse hyperbolic sine function to the dependent variable while maintaining a natural logarithm on the independent variables was originally proposed by Johnson (1949). It was used by numerous researchers such as Burbigde, Magee, and Robb (1988), Carroll, Dynan and Krane (1999), and Pence (2006) to transform the data of household wealth and saving that usually contains many zero and negative value.

The characteristic of the foreign direct investment (FDI) inflow data in Thailand across source countries and industries also has some zero values that are unable to apply the natural logarithm function. Hence, in this study, the IHS method is utilized to transform the dependent variable: FDI. In addition, Equation (4.2) is augmented by combining time-varied Thailand and global economic variables, (A_t) .

[12] Inverse Hyperbolic Sine Function is defined as : $\sinh^{-1}(x) = \ln(x + \sqrt{1 + x^2})$

Finally, Equation (4.3) is obtained as:

$$\sinh^{-1}(FDI_{ijt}) = \beta_0 + \beta_1 log(X_{it}) + \beta_2 log(Z_{jt}) + \beta_3 log(A_t) + \varepsilon_{ijt} \quad (4.3)$$

Equation (4.3) is also extended by additional determinants of FDI in the Thai manufacturing sector expressed as follows:

$$\begin{aligned}\sinh^{-1}(FDI_{ijt}) = {} & \beta_0 + \beta_1 log(GDPS_{it}) + \beta_2 log(Ind_{jt}) + \beta_3 log(X_{i,t-1}) \\ & + \beta_4 log(Trade_{i,t-1}) + \beta_5(APEC_{i,t-1}) + \beta_6(FTA_{i,t-1}) \\ & + \beta_7(BOI_{j,t-1}) + \beta_8 log(Dist_i) + \beta_9 log(Res_t) + \beta_{10} log(Inter_t) \\ & + \beta_{11}(IRP_t) + \beta_{12} log(Telecom_t) + \varepsilon_{ijt}\end{aligned} \quad (4.4)$$

where

FDI_{ijt} = The FDI inflow from source countries (*i*), into industry (*j*), at year (*t*),

$GDPS_{it}$ = GDP of source country (*i)* in year (*t)*,

Ind_{jt} = Thai Manufacturing Production of industry *j* in year *t*,

X_{it-1} = Exchange rate (Thai Baht/source country's currency (*i*) in year (*t)*,

$Trade_{it-1}$ = The total value of export and import between source country (*i*) and Thailand in year (*t)*,

$APEC_{it-1}$ = Regional Dummy variables if APEC = 1 denotes source country (*i*) is a member of APEC (Asia-Pacific Economic Cooperation) in year (*t)*,

FTA_{it-1} = Dummy variables if FTA = 1 denotes source country (*i*) and Thailand establish (bilateral) free trade agreement in year (*t)*,

BOI_{jt-1} = Policy dummy variables if BOI = 1 denotes the board of investment (BOI) specially promote industry (*j*) in year (*t*),

$Dist_i$[13] = The average distance calculated by naval and air distance between source country (*i*) and Thailand,

Res_t = The amount of international reserve of Thailand at year (*t*),

$Inter_t$ = The average of Thailand interest rate (percentage) at year (*t*),

IRP_t = Policy dummy variables if IRP = 1 denotes in year (*t*), the industrial restructuring plan is implemented,

$Telecom_t$ = The total amount of telecommunication (Telephone line, cell phone , and internet usages) in Thailand at year (*t*),

ε_{ijt} = an error term.

Since a change in some independent factors may take some time to affect foreign direct investment, the model employs some lagged exogenous variables including bilateral variables and foreign trade and investment policy regressors. Sun *et.al* (2002), Zhao (2003), and Büthe and Milner (2008) suggested including 1-year lagged determinants for bilateral variables such as international trade, investment and trade agreements, and exchange rate to investigate foreign investment in the host country. The factors like bilateral agreements and investment policies require a period of time to be implemented. Furthermore, the multinational enterprises from many source countries

[13] The geographic distance in several previous literatures reviewed in section 3.2 is measured by the great circle formula. Alternatively, to reflect the transportation and transaction costs, this study measures the distance by averaging the naval and air distance from Bangkok to the capital city of source country. However, if the capital city is inland, the naval distance will be measured from Bangkok to the most important port of each source country. Additionally, the author calculates the US distance from averaging the distance from Bangkok to New York and Bangkok to Los Angeles.

are commonly involved in both international trade and foreign investment. Then, the situation of previous international trade in the host economies will affect to current FDI determination of transnational corporations.

Nevertheless, several literature has demonstrated that the contemporaneous (no lag) of the economic size determinant including GDP of the source country and host domestic product as well as host country macroeconomic variables are influenced to inward FDI. Consequently, the FDI determinant model employs 1-year lagged exogenous variables for exchange rate, international trade, APEC, FTA and investment (BOI) policy. This also applies to the analysis of industrial FDI inflows classified by sectors and main source countries.

4.2.2 The Determinants of Manufacturing FDI Classified by Sector

The overview of the determinants of manufacturing FDI is shown by the model in the precedent section. The manufacturing sector is a substantial part of the Thai economy. Then, further examination of the FDI factors for each sub-manufacturing sector is essential. The specification used in this section is similar to Equation (4.4), but excludes some variables. First, the distance is not included because it is better to measure its specification in the whole industrial level. Trade variables (export, import, and total trade) between source country and Thailand are also excluded from the sectoral analysis due to the unavailability of the trade data.[14]

This section investigates the determinants of FDI in each industry. This provides useful information to adjust the investment promotion policy in each manufacturing sector more efficiently. Consequently, modifying Equation (4.4), the FDI inflows for each of nine sectors can be estimated as follows:

[14] The trade data of each sector are categorized by the harmonized system. They are inconsistent with the sectoral FDI data which is classified by the ISIC system.

$$\sinh^{-1}\left(FDI_{it}^{k}\right) = \beta_0 + \beta_1 log(GDPS_{it}) + \beta_2 log\left(Ind_t^k\right) + \beta_3 log(X_{it-1}) +$$
$$+ \beta_4(APEC_{it-1}) + \beta_5(FTA_{it-1}) + \beta_6\left(BOI_{t-1}^{k}\right) + \beta_7 log(Res_t) +$$
$$+ \beta_8 log(Inter_t) + \beta_9(IRP_t) + \beta_{10} log(Telecom_t) + \varepsilon_{it} \qquad (4.5)$$

where (*k*) represents sector; *k* = 1,2,…, 9 ; and

FDI_{it}^{k} = The FDI inflow to sector *k* from source countries (*i*), at year (*t*),

$GDPS_{it}$ = GDP of source country (*i*) in year (*t)*,

Ind_t^k = The Manufacturing production of industry (*k)*, at year (*t*),

X_{it-1} = Exchange rate (Thai Baht/source country's currency (*i*) in year (*t*),

$APEC_{it-1}$ = Regional Dummy variables if APEC = 1 denotes source country (*i*) is a member of APEC (Asia-Pacific Economic Cooperation) in year (*t*),

FTA_{it-1} = Dummy variables if FTA = 1 denotes source country (i) and Thailand establish (bilateral) free trade agreement in year (*t*),

BOI_{t-1}^{k} = Policy dummy variables if BOI = 1 denotes the Board of Investment (BOI) specially promote industry (*k*) in year (*t*),

Res_t = The amount of international reserve of Thailand at year (*t*),

$Inter_t$ = The average of Thailand interest rate (percentage) at year (*t*),

IRP_t = Policy dummy variables if IRP = 1 denotes in year (*t*), the industrial restructuring plan is implemented,

$Telecom_t$ = The total amount of telecommunication in Thailand at year (*t*),

ε_{it} = an error term.

4.2.3 The Determinants of Manufacturing FDI Classified by Major Source Countries

Besides investigating the determinants in sectoral level, it is also important to further examine the FDI factors of major source countries. This information is beneficial to the Thai government to implement the appropriate investment strategies for the investors from major source countries.

The model selects four countries and one economic group which are of Japan, Hong Kong, Singapore, USA, and the EU-5[15] to investigate the determinants of FDI. During 2004 – 2008, the FDI inflows from the selected economies are accounted for almost three quarters of the total FDI inflows to the Thai manufacturing sector. Then, applying the equation (4.4), the determinants of FDI inflows of each the five important source economies can be estimated as follows:

$$\begin{aligned}\sinh^{-1}\left(FDI_{jt}^{c}\right) = {} & \beta_0 + \beta_1 log(GDPS_t^c) + \beta_2 log\left(Ind_{jt}\right) + \beta_3 log(X_{t-1}^c) + \\ & + \beta_4(FTA_{t-1}^c) + \beta_5\left(BOI_{jt-1}\right) + \beta_6(Res_t) + \\ & + \beta_7(Inter_t) + \beta_8(IRP_t) + \beta_9(Telecom_t) + \beta_{10} log(Ex_{t-1}^c) + \\ & + \beta_{11} log(Im_{t-1}^c) + \beta_{12} log(Trade_{t-1}^c) + \varepsilon_{jt} \end{aligned} \quad (4.6)$$

where (*c*) denotes source countries which representing EU-5, Singapore, Hong Kong, Japan, and the U.S., respectively.

[15] EU-5 comprises of Germany, UK, France, Netherlands, and Belgium

FDI_{jt}^{c} = The FDI inflow from source countries (*c*) to sector (*j*), at year (*t*),

$GDPS_{t}^{c}$ = GDP of source country (*c*) in year (*t*),

Ind_{jt} = The Manufacturing production of industry (*j*), at year (*t*),

FTA_{t-1}^{c} = Dummy variables if FTA = 1 denotes source country (*c*) and Thailand establish (bilateral) free trade agreement in year (*t*),

BOI_{jt-1} = Policy dummy variables if BOI = 1 denotes the board of investment (BOI) specially promote industry (*j*) in year (*t*),

Res_{t} = The amount of international reserve of Thailand at year (*t*),

$Inter_{t}$ = The average of Thailand interest rate at year (*t*),

IRP_{t} = Policy dummy variables if IRP = 1 denotes in year (*t*), the manufacturing restructuring plan is implemented,

$Telecom_{t}$ = The total amount of telecommunication in Thailand at year (*t*),

Ex_{t-1}^{c} = The value of export between source country (*c*) and Thailand in year (*t*),

IM_{t-1}^{c} = The value of import between source country (*c*) and Thailand in year (*t*),

$Trade_{t-1}^{c}$ = The total value of export and import between source country (*c*) and Thailand in year (*t*),

ε_{jt} = an error term.

The details of methodology employed to estimate the FDI determinants in the Thai manufacturing sector are discussed in the next section.

4.3 Empirical Methodology

The FDI determinants model employs a panel data analysis to estimate the determinants of FDI in Thai manufacturing sectors. Panel data method offers several advantages for econometric studies. Hsiao (2003) suggested that panel data estimation provides a large amount of data and increases the degrees of freedom. It also helps to reduce the collinearity among independent regressors resulting in improving the efficiency of econometric estimation. Additionally, Wooldridge (2002) and Cameron and Trivedi (2005) confirmed that, besides the increase in the number of observations, an advantage of using panel data is to manage the omitted unobserved problem.

Two common ways to solve this problem are Random Effects (RE) and Fixed Effects (FE) methods. The term "Fixed" and "Random" effects are often misleading. Wooldridge (2002) stated that the fixed effects do not mean that the unobserved effects are treated as nonrandom. Rather, it means the unobserved effects are allowed to be correlated with the observed explanatory regressors. Similarly, Lee (2002) recommended calling the term fixed effects as "related effects" (with the regressors) and random effects as "unrelated effects" to prevent the misunderstanding.

If the model satisfies the condition that all heterogeneities are independent of exogenous variables, both RE and FE estimators are consistent. In this case, the RE estimator is chosen since its estimation gives more efficient result (Wooldridge, 2002). In contrast, if the unobserved effects are correlated with exogenous regressors, only the FE estimator is consistent (see Table 4-2).

Table 4-2: Linear Panel Model: Common Estimators and Models

Estimator of β	***Assumed Model***		
	Pooled	Random Effects	Fixed Effects
Pooled OLS (POLS)	consistent	consistent	inconsistent
Fixed Effects (FE)	consistent	consistent	consistent
Random Effects (RE)	consistent	consistent	inconsistent

Source: Cameron and Trivedi (2005)
Note: This table considers only consistency of estimator of (β)

There are three unobserved effects in the main determinants of the FDI model comprising of source countries effects, industries specific effects, and time unobserved effects. Then, the model has the three-dimensional or three-way error components. Importantly, it is not correct to assume that all exogenous variables are uncorrelated with all three unobserved variations. In this situation, the random effects method will provide an inconsistent estimation. Thus, the fixed effects model is employed to estimate the results. The concept of the three-way fixed effects model and its specification are examined in the next section.

Three-Way Fixed Effects Model

To understand the panel data with three-way fixed effects model and the way to solve the unobserved heterogeneity, a trivial linear three-way error components equation is considered.

$$y_{ijt} = \alpha + \beta X_{ijt} + u_{ijt} \tag{4a}$$

where $u_{ijt} = \delta_i + \eta_j + \lambda_t + v_{ijt}$ $\quad i = 1,.....N ; j = 1,.....,M ; t = 1,.....,T$

$\delta_i , \eta_j \; and \; \lambda_t$ are unobserved effects and $v_{ijt} \sim IID(0, \sigma_v^2)$ are the idiosyncratic disturbances. The exogenous variables X_{ijt} are assumed to correlate with unobserved components for *i*, *j* and *t*. Then, Equation (4a) becomes a three-way fixed effects model (Baltagi, 2005). In addition, the three fixed effects assumptions are strict exogeneity, full rank condition, and system homoskedasticity and serially uncorrelated assumption[16] are satisfied (Wooldridge, 2002).

A usual method to consistently estimate the parameter, β under the above assumptions is the within or fixed effects estimation. The three-way within estimation is discussed in 4.3.1.

[16] If the last assumption does not hold, the robust variance estimators based on the FE residuals are implemented (Wooldridge, 2002).

4.3.1 Three-Way Within or Fixed Effects Estimation [17]

The within or fixed effects model is the transformed model obtained by subtracting the dimension - average (for instance, time – average) from equation (4a). After transformation, all unobserved effects are eliminated. Then, applying OLS (Ordinary Least Squares) estimation to the transformed model yields the consistent estimator for the fixed effects model (Cameron and Trivedi, 2005).

The within three-way model and its transformation can be derived as follows. Initially, the term u_{ijt} in the first equation can be written in a vector form as

$$u = Z_\delta \delta + Z_\eta \eta + Z_\lambda \lambda + v \qquad (4b)$$

where

$Z_\delta = (\iota_M \otimes I_N \otimes \iota_T)$ is the matrix of '*i*' dummies that one may include in the regression to estimate the δ, if they are fixed parameters

$Z_\eta = (I_M \otimes \iota_N \otimes \iota_T)$ is the matrix of '*j*' dummies that one may include in the regression to estimate the α, if they are fixed parameters

$Z_\lambda = (\iota_M \otimes \iota_N \otimes I_T)$ is the matrix of '*t*' dummies that one may include in the regression to estimate the λ, if they are fixed parameters

where ι_k; *k = N,M and T,* is a vector of ones of dimension k, I_k is an identity matrix of dimension k and $\otimes$ denotes the Kronecker product.

[17] The method used in this section can be applied to equation 4.5 and 4.6 (a two-way FE model)

Thus, the fixed effects estimates of β can be obtained by performing the within transformation given by Wallace and Hussain (1969), Baltagi (1987), and Davis (2002):

$$Q = (I_T \otimes I_N \otimes I_M) - (I_T \otimes \bar{J}_N \otimes \bar{J}_M) - (\bar{J}_T \otimes I_N \otimes \bar{J}_M) - (\bar{J}_T \otimes \bar{J}_N \otimes I_M) + \\ + 2\,(\bar{J}_T \otimes \bar{J}_N \otimes \bar{J}_M) \qquad (4c)$$

where "I" is the "within transformation", J_k ; k = *N,M and T* , is a matrix of ones of dimension k and $\bar{J}_k = J_k/\mathrm{k}$.

Then, Equation (4a) is rewritten in the vector form and multiplied by Q to get the transformed model:

$$Qy = QX\beta + Qv \quad , \quad \text{or} \quad \tilde{y} = \tilde{X}\beta + \tilde{v}. \qquad (4d)$$

Interestingly, this transformation "Q" sweeps out all three unobserved effects: μ_i , α_j *and* λ_t (Baltagi; 1987, 2005).

In fact, $\tilde{y}$ = Qy has a typical form as: $\tilde{y}_{ijt} = y_{ijt} - \bar{y}_{i.} - \bar{y}_{j.} - \bar{y}_{.t} + 2 * \bar{y}_{...}$ and $\tilde{X}$ = QX has a typical form as: $\tilde{X}_{ijt} = X_{ijt} - \bar{X}_{i.} - \bar{X}_{j.} - \bar{X}_{.t} + 2 * \bar{X}_{...}$

Hence, Equation (4d) can be written as

$$(y_{ijt} - \bar{y}_{i.} - \bar{y}_{j.} - \bar{y}_{.t} + 2 * \bar{y}_{...}) = (X_{ijt} - \bar{X}_{i.} - \bar{X}_{j.} - \bar{X}_{.t} + 2 * \bar{X}_{...})\,\beta + \\ + (v_{ijt} - \bar{v}_{i.} - \bar{v}_{j.} - \bar{v}_{.t} + 2 * \bar{v}_{...}) \qquad (4e)$$

Equation (4e) can be derived from 4 separate average models of the equation (4a)

(1) Between "*i*' model: $\bar{y}_{i.} = \alpha + \beta\bar{X}_{i.} + \delta_i + \bar{v}_{i.}$; $\sum_{t=1}^{T}\lambda_t = 0, \sum_{j=1}^{M}\eta_j = 0$

(2) Between "*j*" model: $\bar{y}_{j.} = \alpha + \beta\bar{X}_{j.} + \eta_j + \bar{v}_{j.}$; $\sum_{t=1}^{T}\lambda_t = 0,\ \sum_{i=1}^{N}\delta_i = 0$

(3) Between "*t*" model: $\bar{y}_{.t} = \alpha + \beta\bar{X}_{.t} + \lambda_t + \bar{v}_{.t}$; $\sum_{i=1}^{N}\delta_i = 0\ , \sum_{j=1}^{M}\eta_j = 0$

(4) Total average model: $\bar{y}_{...} = \alpha + \beta\bar{X}_{...} + \bar{v}_{...}$

$$; \sum_{i=1}^{N}\delta_i = 0\ , \sum_{j=1}^{M}\eta_j = 0, \sum_{t=1}^{T}\lambda_t = 0$$

Therefore, the within three-way model, eq. (e) is created by

Eq. (4e) = Eq. (4a) - (1) - (2) - (3) + 2*(4)

Significantly, the restrictions $\sum_{i=1}^{N}\delta_i = \sum_{j=1}^{M}\eta_j = \sum_{t=1}^{T}\lambda_t = 0$ are imposed to avoid the dummy variable trap or perfect collinearity. Then, performing OLS on Equation (4e) gives β, the within estimator for three-way fixed effect model.

In practice, there are several ways to estimate the three-way fixed effects models. The first common approach is the Least Squares Dummy Variables (LSDVs) that includes all necessary dummy variables to account for the three heterogeneities. Furthermore, the OLS estimation will be applied to estimate Equation (4e). To avoid perfect collinearity between all three sets of dummies, the constant term is included, but one dummy term is deleted from each of the three sets of dummies (Greene, 2003).

Nevertheless, if the members of each dimension are large, there will be too many dummy variables in the regression, causing a huge loss in degrees of freedom. In addition, this might not be efficient since inverting a large matrix is time and resource consuming.

Another approach is called "Spell Fixed Effects: SFEs" (Andrews *et.al.* 2005). This method eliminates one unobserved effect by using dummy variables or demeaned for one dimension making the remaining model a two-way fixed effects model. Then, other effects are swept out by within or fixed effect transformations. Consequently, this approach is more feasible and also consumes less resources and time. However, the SFEs may not be useful if $\delta_i,\ \eta_j\ and\ \lambda_t$ are required to be estimated separately.

Unfortunately, a major limitation of the within estimation is the inability to estimate the coefficient of time-invariant or individual-varying variables (Cameron and Trivedi, 2005). The fixed effects transformation not only wipes out unobserved effects but also eliminates all these variables. Essentially, this study includes the variables that change only in a single dimension: only time-varying variables[18] such as the host country economic variables, and an only country-varying variables, the distance between host and source countries. Consequently, the coefficients of these regressors are undefined in the (within) model.

Many strategies are utilized to overcome this obstacle. One way is to employ the pooled OLS instead of using the FE model. This method can estimate time-invariant regressors, but it causes a serious problem, the omitted variable bias. Thus, it is not likely to get an unbiased result from this method. Another technique that might work better than pooled OLS is the random effects estimator. Nevertheless, it is hard to assume the

[18] In a one-way or two-way error component model, the term "time-invariant variable" refers to the variable that does not change over time or only changes over individual group. However, this study employs three-way error components (source country, industry, and time). Hence, to follow the same concept and avoid the misunderstanding, the new term is generated: "only dimension-varying variable"; for instance, "only time-varying variable" implies the variable that only changes over time (not in other dimensions). Similarly, "only country-varying variable" is the variable that only changes over the source country (not in other dimensions).

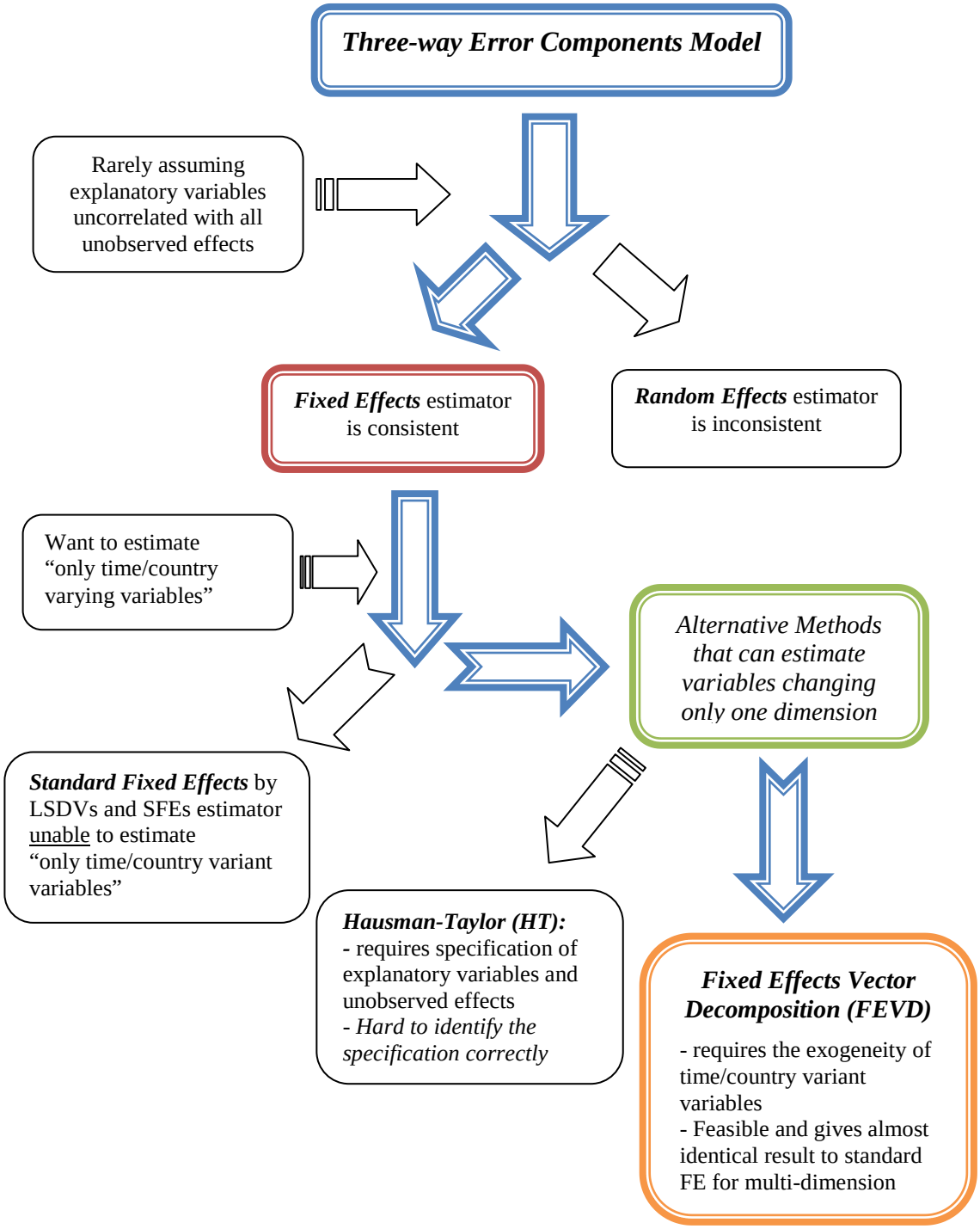
explanatory variables are independent of all three unobserved heterogeneities. Hence, the RE estimator would be inconsistent and possibly biased.

One of the potential procedures to estimate only dimension-varying variables is the Hausman-Taylor model (1981). The Hausman-Taylor (HT) estimator is an IV estimator combining the characteristics of both the random effects and fixed effects method (Cameron and Trivedi, 2005 and Breusch.*et.al*, 2010). This method divides the exogenous variables (both regressors that change in multiple dimensions and only change in one dimension) in two categories. Variables in the first group are assumed to be correlated with the unobserved effects, otherwise are not. Interestingly, HT estimation provides the consistent estimator like the FE model does and can also estimate only dimension-varying variable. Nonetheless, the main restriction of the HT procedure is that it requires the specification of which independent variables are exogenous or endogenous to the unobserved effects (Cameron and Trivedi, 2005). Practically, it is difficult to identify them correctly.

Recently, Plümper and Troeger (2007) developed the three-stage method called "Fixed Effects Vector Decomposition" (FEVD) to efficiently estimate the fixed effects model with time-invariant variables. Unlike the HT model, FEVD requires fewer restrictions on explanatory regressors.[19] Thus, it is widely utilized in several empirical studies presently.(Davies, Ionascu, and Kristjánsdóttir, 2007, Belke and Spies, 2008, and Sova *et.al*, 2009) The procedure of the three-way FEVD model is discussed in 4.3.2.

[19] Breusch.et.al (2010) compared both HT and FEVD estimator by Monte Carlo simulation and found that neither HT nor FEVD uniformly dominates the other. The FEVD is superior to HT when the endogeneity of time-invariant and unobserved effects is mild or absent. Otherwise, HT is more efficient. However, FEVD now becomes more popular since researchers do not need to decide which explanatory variables are correlated or uncorrelated with the unobserved effects.

Figure 4.1: Summary of the Three-Way Error Components Estimation Utilized in the Dissertation



Note: 1. This figure is created by compiling the panel data concept from Woodridge (2002), Hsiao (2003), Baltagi (2005), Cameron and Trivedi (2005), and Plümper and Troeger (2007).
2. The thick arrows denote the path of the estimation utilized in this study.

4.3.2 Three-Way Fixed Effects Vector Decomposition (FEVD)

FEVD estimation is by Plümper and Troeger (2007) to estimate time-invariant regressors in the fixed effects model. This procedure is comprised of three stages. The first stage applies the standard within or fixed effects estimation to estimate the unit fixed effects. Also, the time-invariant variables and unobserved effects are excluded in this step. Significantly, these estimated unit fixed effects consist of both unobserved and observed time-invariant variables. The second stage decomposes the estimated unit effects obtained from the first stage into two parts: an explained (time-invariant) and unexplained (residuals) part by OLS. The last stage estimates the full model by pooled OLS including time-varying variables, time-invariant regressors and unexplained part from the second stage.

The FEVD procedure gives almost identical results to the FE method for time-varying variables and provides the estimation for time-invariant variables. Essentially, the third stage requires the assumption that the time-invariant variables are exogenous of unobserved unit effects. If this assumption does not hold, the estimated coefficient of time-invariant regressors would be biased and inconsistent (Plümper and Troeger, 2007; Davies, Ionascu, and Kristjánsdóttir, 2007).

Since the model of inward FDI in the Thai manufacturing sector consists of only time-varying and only country-varying regressors that are unable to estimate in the standard fixed effects model, the FEVD method is a feasible solution. Then, this empirical analysis applies the FEVD procedure of time-invariant variables to estimate only dimension-varying variables.

In sum, the FEVD technique carries out by using the following algorithms.

(1) Estimate the model by performing the standard three-way within model. Since several statistical programs such as SAS or STATA cannot operate three-way within transformation at once[20]. Thus, this step requires a newly written program to transform (demean) each dimension (source country, industry and time dimension) separately.

   a. First, transform the model by demeaning in source country and industry dimension. The industry and source country unobserved effects will be eliminated.

   b. Second, the transformed model becomes a one-way fixed effects model. Therefore, it is practicable to apply basic commands in a statistical program to estimate the model (in STATA, XT-command).

(2) Then, save the time specific effect from Step (1b). Now, the obtained effects still include both only time-variant (observed) and time unobserved effects.

(3) The third step is to separate only time-variant to time unobserved effects by regressing (OLS) the time specific effects from the second stage on all only time-varying variables. Then, the residuals represent the time unexplained effect.

(4) The fourth step then applies the pooled OLS to the FDI model with all multi-dimension varying explanatory variables, only time-variant variables, and time unobserved part acquired from the third step. Furthermore, this step requires controlling heteroskedasticity and serial correlations. Then, the

[20] SAS and STATA basic commands are built for one-way and two-way error components model.

estimated coefficients of all exogenous regressors (include only time-variant regressors) are obtained.[21]

(5) In the last step, to estimate an only country-varying variables (the distance between host and source country), repeats (1) – (4) by selecting only country-variant instead of only time-variant variables. Finally, the FEVD procedure gives the coefficients of all explanatory variables for the three-way fixed effects model.

The summary of three-way error components procedure employed in the Dissertation is presented in Figure 4-1.

[21] The author estimated the standard FE model by the LSDVs method to check the coefficients of explanatory variables that do not vary in one dimension. The results from FEVD and LSDVs for these variables are almost equivalent.

4.4 Data Sources of the FDI Determinants Model

Data on foreign direct investment inflow employed in this dissertation are obtained from the Bank of Thailand (BOT) and the Board of Investment of Thailand (BOI). These data are classified by ISIC and cover nine manufacturing sectors including food industry, textiles and clothing, metal and non-metallic, electrical appliances, machinery and transportation equipment, chemicals, petroleum products, construction materials, and other sectors during 19 years between 1990 and 2008.

There are 14 different source countries [22] including Japan, Taiwan, Hong Kong, South Korea, Singapore, Malaysia, China, the United States, Australia, the United Kingdom, Germany, France, Belgium, and the Netherlands. Inward FDI from these investing countries (2004-2008) was about 85 percent of the total inflows to the Thai manufacturing sector.

Data for independent variables are collected from several Thai and international organizations. Source countries' GDPs and exchange rates are obtained from the IMF, UN, and the World Bank. The distance between Thailand and its source economies is collected from various websites (www.timeanddate.com, www.portworld.com/map/, and www.distances.com). Trade variables, international reserves, Thai interest rates, APEC membership, and FTA status data are from the Bank of Thailand, the Ministry of Commerce, and the Ministry of Finance of Thailand.

Furthermore, data of sectoral production, industrial restructuring program, and BOI policy are collected from the Ministry of Industry, the National Economic and Social Development Board (NESDB), and the Board of Investment (BOI). Finally, the amount

[22] There are 25 source countries in the data bank, but 14 are selected since the data of the remaining countries are discontinuity or have the short range.

of telecommunication such as telephone line, mobile phone, and internet usages in Thailand is collected from the Ministry of Information and Communication Technology (ICT) and the National Statistic Office (NSO). The summary of data sources and descriptive statistics are shown in Appendix A.

4.5 The Empirical Results

Section (4.3) and (4.4) provide the data and methodology used to investigate the determinants of inward FDI in the Thai manufacturing sector. This section demonstrates the results of the estimation on FDI determinants for the total manufacturing sector. Then, the estimated results of FDI factors categorized by industrial sectors and major source economies are presented.

4.5.1 The Determinants of FDI Inflows to Overall Manufacturing Sector

This section presents the estimated results of the FDI determinants to the Thai manufacturing sector. These are derived from Equation (4.4) employing the three-way fixed effects procedure. Data are obtained from 14 source countries, 9 industries, and 18 years (1990 – 2008). Hence, there are 2,394 observations used in this model.

Table 4-3 presents the results from Equation (4.4) including 14 exogenous variables: source country's GDP, manufacturing production of Thailand, exchange rate, trade between source countries and Thailand, APEC membership, FTA status, interest rate, geographic distance, telecommunication, BOI policy, industrial restructuring plan, and international reserve. Since a change in some independent factors may take time to

affect FDI determination, this thesis employs 1-year lagged exogenous regressors including exchange rate, trade, APEC membership, AFTA status, and BOI policy.

Model 1 and 2 utilize the economic variables which vary more than one dimension. Then, a standard fixed effects method is employed to investigate FDI factors. Model 1 reveals four main FDI determinants consisting of the GDP of the source country, manufacturing production, exchange rate, and trade between investing partners and Thailand. In addition, to examine the importance of economic cooperation and investment policy to inward FDI, dummy variables, APEC and FTA representing multi and bilateral agreements and investment policy dummy (BOI) are included in Model 2. Interestingly, Model 3, 4, and 5 contain additional variables which vary only in one dimension. Thus, the fixed effects vector decomposition (FEVD)[23] procedure is employed to estimate these models. The geographic distance is presented in Model 3. Other macroeconomic determinants of Thailand's including international reserve, interest rate, policy dummy for industrial restructuring plan, and telecommunication as a proxy of infrastructure are contained in Model 4 and 5.

The estimated results indicate that source country's GDP, manufacturing production, exchange rate, FTA, BOI policy, international reserve, industrial restructuring plan, and telecommunication are positively determining FDI inflow to Thailand. All these variables are statistically significant and have consistent signs with the model hypothesis[24]. The estimated geographic distance between the source country and Thailand has a negative sign and is significant following the hypothesis. It is worth noting that the coefficient of trade variable contradicts the expected sign, showing that

[23] The concept of fixed effects vector decomposition (FEVD) is discussed in section 4.1.3.2
[24] Summary of the expected signs for each factor is presented in Table 4-1

trade between a source economy and Thailand is negatively determining FDI inflow to Thailand. Nevertheless, both APEC membership and interest rate of Thailand are statistically insignificant.

Table 4-3: Determinants of FDI in the Thai Manufacturing Sector (Overall Sector)

(Independent variable: FDI)

Variable / **Model**	**Coefficients (Robust)**				
	1	**2**	**3**	**4**	**5**
GDP (source)	0.6341*	0.5482*	0.5482*	0.5482*	0.5482*
Manuf. Production	0.2201**	0.1956**	0.1956**	0.1956**	0.1956**
Exchange rate	0.6402**	0.6113**	0.6113***	0.6113**	0.6113***
Trade[4]	-0.3027*	-0.3866**	-0.3866**	-0.3866***	-0.3866***
APEC		-0.2613	-0.2613	-0.2613	-0.2613
FTA		0.3408**	0.3408***	0.3408***	0.3408**
BOI		0.2073*	0.2073*	0.2073*	0.2073**
Distance[5]			-1.4408**		
Reserve				0.2064**	
Interest rate				0.1241	
IRP				0.3543***	0.2134***
Telecom					0.1429**
Observations	2,394	2,394	2,394	2,394	2,394
R-squared	0.5692	0.6215	0.6215	0.6215	0.6215
LR test[6] (Prob>chi2)		253.99 0.1233			

Notes: 1. ***, **, and * denotes significance levels of 1%, 5%, and 10%, respectively.

2. Model 1 and 2 are standard FE Model. Model 3, 4, and 5 utilize FEVD procedure.

3. Exchange rate, Trade, APEC, FTA and BOI are (1 year) lag variables.

4. When replacing (1-year lagged) Export and Import to Trade in the model, the results of other variables are similar. The coefficient of Export is positive (0.2467**), but Import is negative (- 0.2513**). Both of them are statistically significant.

5. When employing the geographic distance measured by the great circle formula collected by CEPII research center, the coefficient is also negative (-1.3213**) and statistically significant.

6. LR test is for testing the interaction country-time specific effects. Chi2 (234) = 253.99, prob>chi2 = 0.1233

The determinants of FDI from Table 4-1 can be illustrated to 14 factors. First, the economic size of the source and host countries consists of the source country GDP and manufacturing production of Thailand. These factors represent the market potential of both home and host country and have positive effects to inward FDI. An increasing in GDP of the source country augments the investing capital and demand for goods. This will raise outward FDI in order to gain more profit from exploiting capital and producing goods back to their countries. Similarly, an increase in the manufacturing production of Thailand denotes the high potential of the manufacturing product market. The coefficients of the source country GDP and manufacturing production are positive and statistically significant. Thus, both determinants enhance Thai manufacturing FDI.

Secondly, the coefficient of exchange rate is also positive and significant. The result suggests that the depreciation of the Thai Baht relative to a source country currency attracts industrial foreign direct investment in Thailand. The appreciation of source country currency increases the wealth of MNCs and reduces the business cost in the host country. This allows the source country's entrepreneurs to increase their foreign investment.

Another important FDI determinant is the bilateral trade between the source country and Thailand. Table 4-3 demonstrates that the sign of total trade variable is negative, which is opposite to the results from previous literature. Furthermore, when replacing the variable trade with export and import, the coefficient of export is positive, but the coefficient of import is negative. Both of them are statistically significant. The results of trade factors suggest that the exports from Thailand to investing partners is

a compliment to industrial FDI, but the import [25] and total bilateral trade are substitutes to manufacturing FDI.

Next, the economic integration through multi and bilateral agreements of home and host country is also examined in the analysis. The agreements encourage the FDI due to the reduction of several restrictions that impede the foreign investment and trade between members of the agreement. The model results indicate that only the free trade agreement (FTA) is positive and significant, but APEC (Asia-Pacific Economic Cooperation) shows no influence to FDI. This suggests that a bilateral agreement has more impact to attract manufacturing FDI to Thailand.

Another industrial FDI factor is the geographic distance between Thailand and a source country. It reflects the transaction and transportation costs and different culture effects. Then, the investors from greater distances will have more difficulty in operating business in Thailand. The model results indicate that geographic distance by the average approach (see section 4.2.1) is negative and statistically significant, consistent with prior literature. Alternatively, I employ the geographic distance measured by the great circle formula. The coefficient of distance obtained from this formula is also negative and statistically significant similar to the one from the average approach.

The next FDI factor to be investigated is the amount of the Thai telecommunication as a proxy of infrastructure facilities. Generally, foreign companies prefer to invest in a host country that has good infrastructure since it helps to facilitate their production, reduce transaction costs, and prevent uncertain communication risks. In particular, the manufacturing sector requires a lot of good facilities such as electricity,

[25] Gopinath and Echeverria (2004) suggested that the host country import (the export from source country) is a substitute to the FDI.

water supply, telecommunication, the transportation system, etc. Therefore, the infrastructure is an important factor to FDI determination. The estimated result indicates that the improvement of the infrastructure facilities in Thailand attracts foreign investment to the industrial sector.

Furthermore, the results of the governments' policies including the BOI investment policy and the industrial restructuring plan[26] indicate that both factors enhance FDI inflows to the industrial sector. These policies have been issued to support domestic and foreign entrepreneurs in the manufacturing sector. Thus, the results confirm that the Thai government should continue to improve industrial and investment policies to induce more foreign investment.

Additionally, the international reserves of Thailand are utilized as a proxy to investigate the effect of economic stability. Generally, the government requires having adequate international reserves to smoothly operate financial and economic policies. The foreign reserves also reflect the economic atmosphere and national wealth. The larger reserves will attract more manufacturing FDI. The estimated result shows that a Thai international reserve is a positive industrial FDI determinant.

The final FDI determinant is the Thai interest rate representing the borrowing cost of Thailand. Table 5.1 shows that the coefficient of interest rate is negative. However, it is statistically insignificant. Then, the interest rate of Thailand has no negative impact on FDI to the Thai manufacturing sector.

[26] The details of BOI policy and industrial restructuring plan are presented in Chapter 2

In summary, there are nine positive determinants to attract the industrial FDI consisting of GDP of source countries, manufacturing production, exchange rate, FTA, BOI policy, international reserves, industrial restructuring plan, export and telecommunication. The negative factors comprise of the geographic distance, import, and total bilateral trade. However, the interest rate and APEC have no influence to FDI. Thus, to enhance the industrial foreign investment, the Thai government should implement the policies to support the manufacturing production and its export. They should also open more FTA with the FDI partners as well as improve domestic infrastructure. Essentially, the economic organizations of Thailand such as Bank of Thailand, Ministry of Industry, and Ministry of Finance should cooperate to maintain economic stability, improve investment and industrial policies, and control Thai currency to be less inflated

4.5.2 The Determinants of Manufacturing FDI Inflows Classified by Sector[27]

This section presents the sectoral estimated result of FDI determinants, following the specification of Equation (4.5), which contains nine sectors discussed earlier in 4.2.2. The trade variables (export, import, and total trade) between the source country and Thailand are excluded from this analysis due to data incompatibility. Table 5-2 summarizes the results classified by sector. (The result tables for each manufacturing sector are presented in the Appendix B).

The estimated results indicate that the respective sectoral production, BOI policy, and industrial restructuring plan are positively important determinants to attract FDI in most sectors. Source country's GDP is also important in textile, electrical appliance, chemical products, petroleum, and construction industries. Also, the free trade agreement is a positive factor to attract inward investment to food, metal and non-metallic, machine and transportation equipments, construction, and other sector.

When considering the industrial sector individually, the model results of the food industry suggest that the exchange rate, FTA, BOI policy, interest rate, industrial restructuring plan, and telecommunication are positive FDI determinants. Notably, both economic size factors: food production and source country's GDP are statistically insignificant. This implies that the foreign investors in the food industry emphasize on the government policies, financial factors, and infrastructure.

[27] The details of the model and variables are discussed in section 4.1.2.2

Table 4-4: Summary of the Determinants of FDI in the Thai Manufacturing Sector (Overall and Classified by sector)

Variable / Industry	FDI in Manufacturing Sector									
	Overall (3-way)	**Food**	**Textile**	**Metal**	**Electric**	**Machine &Transport**	**Chemical**	**Petroleum**	**Construct**	**Others**
GDP (source)	+		+		(+)		+	+	+	
Manuf. Production	+			+	+	+				+
Exchange rate[5]	+	+	(+)	+		+				+
APEC [5]		(-)	-							-
FTA [5]	+	+		+		+			+	+
BOI [5]	+	+		+	+	+				
Trade [4]	-									
Distance	-									
Reserve	+					+		(+)		+
Interest rate		+		+	+					+
IRP	+	+	+	+	+	+	+	+		
Telecom	+	+			+	+				+

Notes: 1. Tables of the determinant results for each industry are presented in the appendix.

2. The bracket (.) denotes that the variables are statistically significant in some model.

3. For each sector, the trade variable is excluded due to the data system conflict (ISIC and Harmonize system).

4. When replacing Export and Import to Trade. Export has positive [+] sign, but import has negative [-] sign.

5. Exchange rate, Trade, APEC, FTA and BOI are (1 year) lag variables.

For the textile and clothing industry, source country's GDP, industrial restructuring plan, and exchange rate are positive significant FDI determinants. Nevertheless, APEC has a negative effect on FDI in this industry. Finally, manufacturing production and BOI policy have no influence on foreign investment.

In the metallic and non-metallic industry, the estimated FDI results indicate that domestic production, exchange rate, FTA, interest rate, BOI policy, and industrial restructuring plan attract foreign direct investment. In addition, the FTA and exchange rate are strongly significant at 1% level.

The machine and transportation equipment industry and electrical appliance industry are two largest sectors that absorb foreign direct investment in the manufacturing regime. In 2008, the FDI from both sectors are approximately 50 percent of total manufacturing FDI in Thailand. The estimated results for the electrical appliance industry indicate that electrical production, BOI policy, industrial restructuring plan, interest rate, and telecommunication are positive FDI factors. In addition, the positive determinants of FDI in machine and transportation equipment consist of domestic production, exchange rate, FTA, international reserve, BOI policy, industrial plan, and telecommunication. In summary, foreign investors in both sectors are interested in industrial production, exchange rate, government policies, and infrastructure facilities.

The estimated results of FDI determinants in the chemical industry are similar to the petroleum product industry. Source country's GDP and the industrial restructuring plan have positive effects on inward FDI. However, the international reserve is positive, but not strongly significant in the petroleum product industry. Surprisingly, many FDI

factors are insignificant for both sectors. A possible explanation is FDI in both sectors may strongly relate to trade factors which are excluded from the analysis.

In the construction sector, source country's GDP and FTA are positive factors for FDI. Finally, the estimated results of FDI for other sectors demonstrate that manufacturing production, exchange rate, free trade agreement, international reserves, interest rate, and telecommunications are positive FDI determinants while APEC is a statistically negative determinant.

4.5.3 The Determinants of Manufacturing FDI Inflow Classified by Major Source Countries[28]

This section discusses the estimated results of FDI determinants classified by selected four countries and one group of economy as mentioned earlier in 4.1.2.3. This provides the better understanding on country specific FDI determinants. The estimated results using Equation (4.6) are summarized in Table 5-3. The tables of respective source countries results (Table 4-15 to 4-19) are shown in the Appendix B.

The estimated results indicate that the determinants attracting manufacturing FDI from EU-5 are source country's GDP, manufacturing production, exchange rate, BOI policy, and industrial restructuring plan. In addition, the results of trade variables show that total bilateral trade between each EU-5 country and Thailand has a negative effect on FDI. But when considering the export from Thailand to EU-5 economies, it has a positive impact on FDI while the import is insignificant. This implies that the aggregate trade with EU-5 is a substitute to FDI, but the export is a compliment to foreign investment.

Factors inducing Singaporean investors to invest in the Thai manufacturing sector are economic size factors, industrial restructuring plan, FTA, telecommunication, and export from Thailand to Singapore. It is worth noting that the BOI policy is insignificant. This suggests that Singaporean MNCs are not responsive to current investment promotion plans. Thus, the Board of Investment has to improve investment policies to attract more FDI from Singapore. (If FDI from Singapore is desirable, the BOI should adjust the investment privileges to suit Singaporean investors)

[28] The details of the model used are presented in 4.1.2.3

Table 4-5: Summary of the Determinants of FDI in the Thai Manufacturing Sector (classified by major source countries)

Variable / **Countries**	**FDI by major country**				
	EU-5[3]	**Singapore**	**HK**[3]	**Japan**	**USA**
GDP (source)	+	+	+	+	+
Manuf. Production	+	+		+	
BOI[4]	+		+	(+)	+
Interest rate			+		+
IRP	+	+		+	+
Exchange rate[4]	+			+	
Telecom		+	+		(+)
FTA[4]		+			
Reserve				(+)	+
Export	+	+	+	+	-
Import				+	
Trade	-		+	+	-

Notes: 1. Tables of determinants by each important country are presented in the appendix.

2. The bracket denotes that the variables are statistically significant in some models.

3. EU-5 consists of Belgium, Germany, France, Netherlands, and UK. In addition, HK denotes Hong Kong.

4. Exchange rate, Trade, FTA and BOI are (1 year) lag variables.

The estimated determinants of FDI from Hong Kong indicate that the Hong Kong GDP, BOI policy, interest rate, and telecommunication are significant and positive. Furthermore, both total trade and exports from Thailand to Hong Kong are compliments to the manufacturing FDI and consistent with the hypothesis. However, the industrial restructuring plan which is an important determinant for other major source countries has no influence on FDI from Hong Kong.

Japan is the largest investing country in the Thai manufacturing sector. Over the past five years, Japanese investment has been about 40 percent of total manufacturing FDI. The estimated results demonstrate that Japanese GDP, industrial production, exchange rate, and industrial restructuring plan are positive FDI inflows factors. Interestingly, all trade variables (export from Thailand to Japan, import, and total trade between Thailand and Japan) attract Japanese direct investment to the manufacturing sector. Estimated coefficient of BOI policy and international reserves are also positive, but not strongly significant.

The positive FDI determinants from the United States consist of the U.S. GDP, BOI policy, interest rate, international reserves, and industrial restructuring plan. The infrastructure is also positive, but not strongly significant. In contrast, the total bilateral trade and export from Thailand to U.S. are substitutions to the U.S. direct investment.

In summary, source country's GDP is a positively significant FDI determinant for all main source economies. The Thai manufacturing production has positive impact on FDI from EU-5, Singapore, and Japan. The exchange rate is a significant and positive factor for EU-5 and Japan. However, it has no influence on Singapore, Hong Kong, and the U.S. investment. A plausible explanation of this result is that Thai currency was almost fixed to U.S. dollar for a long time (up until 1997)[29]. Additionally, Singapore and HK currency also follow U.S. dollar (Hong Kong currency is fixed to U.S. dollar). Hence, the investors from these countries may not consider the exchange rate as an important FDI determinant. The results on international reserve suggest Japanese and U.S. MNCs are interested in Thai economic stability. The Singaporean, HK, and U.S. investors pay attention to the infrastructure facilities.

The result of bilateral trade suggests both total trade and exports (from Thailand to source or vice versa)* are important FDI factors. The export is positive and significant determinants for EU-5, Singapore, Hong Kong, and Japan, but is negative for the United States. Furthermore, the results show that aggregate bilateral trade between a source country and Thailand is a compliment to FDI from Hong Kong and Japan, but is a substitute to the investment from EU-5 and the United States.

[29] Before July 2nd, 1997, Thai Baht utilized the basket of currency system. The most influence currency in the currency basket is the U.S dollar. Now, Thailand employs the floating exchange rate system. (Siamwalla *et.al*, 1999; UNIDO, 2002)

4.5.4 The Impacts of the 1997 Economic Crisis on Inward FDI in the Thai Manufacturing Sector

The 1997 Asian economic crisis caused tremendous damage to the Thai economy. The GDP growth was negative for first two consecutive years: -1.4 percent in 1997 and -10.8 percent in 1998. The manufacturing sector grew slightly at 1.6 percent in 1997, and then plunged down to -11.2 percent in 1998. The exchange rate also rapidly depreciated from 26 Baht per U.S. dollar at the beginning of 1997 to 40 Baht per U.S. dollar in 1998.[30] In addition, Thailand's international reserves was enormously reduced from 38.7 billion U.S. dollar in January 1997 to 2.5 billion in July 1997 (Siamwalla *et.al*, 1999), forcing Thailand to receive a bailout package from the IMF (International Monetary Fund).

However, the foreign direct investment was not affected by the economic crisis. Inward FDI substantially increased during the recession. Before the crisis, the manufacturing FDI was about 1 billion U.S. dollars a year, but it augmented to 2.3 billion U.S. dollars in 1997 and almost 3 billion U.S. dollars in 1998.[31] Interestingly, the level of manufacturing FDI inflows has increased continuously and achieved the maximum amount of 9.7 billion U.S. dollars in 2006. This indicated that the manufacturing FDI escalated more than four times after the crisis. Therefore, it is crucial to investigate the factors behind this incidence.

The relationship between the 1997 economic crisis and the inward foreign direct investment in the Thai manufacturing sector is examined. Table 4-3 is used to analyze this issue. Thomsen (1999), Athukorala (2003), and Min (2006) suggested that the

[30] The data are from the website of Bank of Thailand : http://www.bot.or.th/English/Statistics
[31] The data of manufacturing FDI are presented in Table 2-2

economic liberalization, new investment incentives, and exchange rate depreciation encouraged the FDI in Asian countries during and after the economic crisis. Min (2006) analyzed the pattern of FDI in South Korea and found that the crisis caused the government to remove several FDI restrictions and strengthened incentives significantly. These improvements rapidly recovered foreign investor confidence. The devaluation of Korean Won is also important to induce FDI. Similarly, Thomsen (1999) and Athukorala (2003) examined the FDI in South East Asia and East Asia after the crisis and suggested that the change in investment policies and business impediment reduction contributed to the outstanding inflows of FDI after the economic turmoil. (see section 3.2.2)

Estimated results from Table 4-3 are consistent with previous studies. The exchange rate, investment (BOI) policy, and industrial restructuring program are positively and significantly attracting FDI into the Thai manufacturing sector. During the economic crisis, there was the massive decline in domestic demand and local investment causing closure of several hundred firms. To restore the manufacturing sector, the government of Thailand announced the urgent policies to promote manufacturing production and investment[32]. The new BOI investment promotion provided both fiscal and non-fiscal incentives and reduced foreign investment restrictions. In addition, the Ministry of Industry launched the programs to support the industrial entrepreneurs to assist them to survive during the crisis and enhance their competitiveness in the future.

[32] The details of BOI policy and industrial restructuring plan are reviewed in Chapter 2

The Chow test [33] is employed to examine the structural break of the manufacturing FDI caused by the Asian economic crisis. The test is based on Equation (4.4) under the null hypothesis that the patterns of industrial FDI in Thailand are indifferent before and after the crisis (see Appendix C). Under Chow test[34], the null hypothesis is rejected, indicating there has been a structural change in manufacturing FDI inflows after the 1997 crisis.

Table 4.6 presents the estimated results of the two manufacturing FDI structures using the selected break year, 1997. The results indicate that after the crisis, the coefficients of source country GDP and exchange rate are smaller, but the coefficients of manufacturing production and telecommunication are greater. All of them are positive. Interestingly, the bilateral total trade (insignificant before the crisis) becomes a statistically significant and negative FDI factor after the 1997 crisis. Moreover, the international reserve, which is a negative factor before the crisis, is a positive FDI factor after the crisis. Nevertheless, the coefficients of interest rate and APEC are insignificant for both FDI structures.

In conclusion, the Asian economic crisis provided the great opportunity for foreign investors to gain more benefits in Thailand. The 38 percent depreciation of Thai Baht increased the relative purchasing power of foreign enterprises. The new industrial and investment packages also facilitated MNCs to start new firms and expand their existing businesses in Thailand. Subsequently, there has been an enormous amount of inbound FDI to the manufacturing sector after the crisis. FDI inflows associated with

[33] The Chow Statistic is an F statistic for testing the equality of regression parameters across different groups or time periods (see Wooldridge, 2006; chapter 7).

[34] The result of the Chow test is F (9, 2376) = 12.80 (Prob > F = 0.0000). Thus, the null hypothesis is rejected. The details of the Chow test are presented in Appendix C.

industrial strategies helped the manufacturing sector to recuperate. The growth of manufacturing production returned positive figures of 12.3 percent in 1999 and 6.0 percent in 2000.

Table 4-6: The Estimated Results of the Manufacturing FDI Inflows Structure before and after crisis

(The Structural Break Year = 1997)

	(a) if year $\leq$ 1997	(b) if year > 1997
Source Country GDP	0.6597*	0.2150**
Manuf. Production	0.0981**	0.4696**
Trade	0.1192	-0.3950*
Exchange Rate	0.9645**	0.6139***
APEC	0.0293	-0.1732
Interest Rate	0.1839	0.3029
Inter. Reserves	-0.0746*	0.3182*
Telecommunication	0.0609**	0.1904*

Notes: 1. ***, **, and * denotes significance levels of 1%, 5%, and 10%, respectively.

2. More details about the FDI structure are discussed in Appendix C.

CHAPTER 5

THE IMPACTS OF FDI INFLOWS ON THAI ECONOMC GROWTH

Foreign direct investment is an important engine of growth in the host country economies. Not only providing new physical capital, FDI transfers modern technology, management, and skill improvements. Borensztein *et.al* (1998), Alfaro (2003), Johnson (2005), and Wang (2009) have suggested the role of FDI to economic growth comes from the spillover of technology associated with human capital. The spillover creates positive externalities leading to a long-run growth of the host economy.

Nevertheless, both technology and human capital are difficult to define. Some researchers employ proxy variables to measure them. If the selected variables are not good proxies, the result will be easily misleading. To avoid this problem, the author, then, adopts the concept of growth accounting to investigate the impacts of FDI on Thai economic growth.

5.1 Growth Accounting Approach

Growth accounting explains the observed economic growth within two elements (Barro, 1998; Romer, 2001). One part is the change in factor inputs and another is the total factor productivity (TFP) or Solow residual representing technological progress, productivity and other factors. There are two approaches for growth accounting. The first method is called the standard primal approach[35] focusing on the growth rate of inputs.

[35] The concept of primal approach is explained in Barro (1998) and Romer (2001). Also, it is briefly illustrated in the Appendix D.

The rate of technology and productivity progress or TFP is derived from the difference between the economic growth rate and the growth rate of factor inputs.

The second method is called a dual approach to growth accounting. Hsieh (1998 and 2002) proposed the alternative way to calculate the TFP from the growth rate of factor prices instead of the growth rate of factor inputs. The concept of the dual approach can be illustrated as follows:

Starting with the basic national income equation, the economic output (*Y*) is equivalent to the factors of production expenditure: labor (*L*) and capital (*K*)

$$Y = rK + wL \tag{5.1}$$

where (*r*) is rate of return of capital and (*w*) is rate of return of labor, wage.

Then, differentiate both sides of Equation (4.7) with respect to time and divide by Y and obtain

$$\frac{\dot{Y}}{Y} = \alpha_K . \left[\frac{\dot{r}}{r} + \frac{\dot{K}}{K}\right] + \alpha_L . \left[\frac{\dot{w}}{w} + \frac{\dot{L}}{L}\right] \tag{5.2}$$

where α_K = *rK*/*Y* and α_L = *wL*/*Y* are respective factor income shares. Rearrange Equation (5.2) by placing the growth rate of input on the left hand side. The Equation (5.3) is obtained.

$$\left[\frac{\dot{Y}}{Y} - \alpha_K . \frac{\dot{K}}{K} - \alpha_L . \frac{\dot{L}}{L}\right] = \alpha_K . \frac{\dot{r}}{r} + \alpha_L . \frac{\dot{w}}{w} \tag{5.3}$$

The left hand side of Equation (5.3) represents the Solow residual or TFP. Thus, TFP by a dual approach can be derived as $TFP = \alpha_K.\frac{\dot{r}}{r} + \alpha_L.\frac{\dot{w}}{w}$ [36]

In a discrete form, TFP can be written as

$$TFP_{dual} = \alpha_K.\frac{\Delta r}{r} + \alpha_L.\frac{\Delta w}{w} \quad (5.4)$$

Hsieh (1998, 2002) also recommended that the advantages of this approach are the lack of need for further assumptions such as the production function pattern, bias of technological progress, market structure, or relationship between factor prices and their social marginal products.

5.2 The Relationship of Inward FDI, Real Wages, and Economic Growth

A dual approach to growth accounting acts a tool to investigate the FDI effect on economic growth. Since both foreign and domestic firms share the same rate of return of capital (*r*), Equation (5.4) suggests that FDI impacts on the host country growth can be explored through the wage (*w*) channel. If FDI raises the host country wage growth, the host total factor productivity (TFP) will increase, leading to the increasing of the host country's economic growth.

FDI empirically augments the real wages of host economies. Lipsey and Sjöholm (2004) studied the FDI in Indonesia and found that MNCs create the positive impact on

[36] The basic concept of the dual approach is that an increasing in the production possibilities frontier by any technology progress will also cause an increase in the factor price frontier. In other words, the increasing of factor prices can be sustained only if output is increasing for given inputs. Thus, the TFP growth can be measured by the weighted average of the factor prices growth (see Barro, 1998 and Hsieh, 2002).

domestic average wages and also enhance the wages of the local firms. Velde and Morrissey (2002) measured the FDI effect to labor skill and wage in East Asia. They found that FDI augments the host country's wages for both skilled and unskilled labors. Similar findings are also confirmed by Mutscu and Fleischer (2009) and Onaran and Stockhammer (2008).

Consequently, this dissertation attempts to examine the impacts of FDI on Thai economic growth through a dual approach. If the results demonstrate that FDI causes the real wages of Thailand to increase, FDI will enhance Thai economic growth. To test this relationship, the panel Granger causality test [37] is employed.

The causality test applying from Judson and Owen (1999) and Nonnemberg and Mendonca (2004), starts with two separate panel dynamic equations of inward FDI and the real wage (RW) of Thailand.

$$\log(RW_{it}) = \alpha_1 . \log(RW_{it-1}) + \beta_1 . \log(FDI_{it-1}) + \delta_{1i} + \epsilon_{1it} \qquad (5.5)$$

$$\log(FDI_{it}) = \alpha_2 . \log(FDI_{it-1}) + \beta_2 . \log(RW_{it-1}) + \delta_{2i} + \epsilon_{2it} \qquad (5.6)$$

where (i) represents the economic sectors of Thailand[38] and (t) denotes year.

Note: under the null hypothesis of $\beta_i = 0$

If the null hypothesis is rejected, the test indicates there is a causality effect between both variables. The direction of causality depends on the sign of the result.

[37] The Granger causality test is proposed by Granger (1969). It is initially operated in the time series analysis and has been developed by many researchers to a panel data procedure. The basic concept of this method can be found in Wooldridge (2006), chapter 18.

[38] Six economic sectors comprising of manufacturing, services, trade, construction, mining, and other sector are included in the model.

The panel vector autoregression (PVAR) approach is applied to estimate causality equations. Nevertheless, the estimators by a standard fixed effects approach are inconsistent (Wooldridge, 2002; Cameron and Trivedi, 2005). Since individual heterogeneities are correlated with the regressors due to the lags of the dependent variable, the mean-differencing procedure commonly utilized to eliminate fixed effects would generate biased results. To solve this problem, this study employs the forward-mean differencing or Helmert procedure proposed by Arellano and Bover (1995). This transformation preserves the orthogonality between transformed variables and lagged variables. Thus, we can employ lagged variables as instruments and efficiently estimate the coefficients by system GMM based on Holtz-Eakin *et.al* (1988) procedure.[39]

The next section presents the data source and the results of FDI - wage Granger causality test.

[39] This dissertation uses the STATA program written by Love, Inessa (see Love and Zicchino, 2006) to estimate the Panel Vector Autoregression (PVAR) by a system GMM approach.

5.3 Data Source of FDI-Wage Granger Causality Test

Data on foreign direct investment inflow used in this chapter are obtained from the Bank of Thailand (BOT) and the Board of Investment of Thailand (BOI). In addition, data on the Thai real wages are obtained from the Ministry of Labor, the Bank of Thailand, and National Economic and Social Development Board (NESDB). These data include six economic sectors consisting of manufacturing, services, trade, construction, mining, and other sectors during the period of 19 years from 1990 to 2008. The summary of data sources and descriptive statistics are demonstrated in Appendix A.

5.4 The Results of the Impacts of Inward FDI on the Economic Growth of Thailand

The model utilizes the procedure called a dual approach to growth accounting. The FDI impacts on growth will be caused by the increasing in total factor productivity (TFP) or Solow residuals that can be measured by the growth rate of factor prices. If FDI causes host country wage growth, it will also enhance host country total factor productivity. Therefore, the model employs the panel Granger causality test to investigate the FDI-wage relationship. Six economic sectors consisting of industries, services, trade, construction, mining, and other sectors are included in the panel Granger analysis.

Table 5-1 presents the results of panel Granger test. The results indicate that there is a causal relation in which FDI inflows positively affect the real wage of Thailand. The results of the real wage equation show that the coefficients of both RW_{it-1} and FDI_{it-1} are positive and statistically significant. On the contrary, the results of the FDI equation indicate that the real wage has no Granger impact on inward FDI in Thailand. The coefficient of FDI_{it-1} is positive and significant, but the coefficient of RW_{it-1} is positive and statistically insignificant even at the 10 percent level.

Additionally, the impulse-response function (IRF) of FDI and real wage is also estimated. The impulse-response function describes the reaction of one variable to the innovation (shock) of another variable in the system while holding all other shocks constant (Hamilton, 1994). Figure 5.1 demonstrates the impulse-response results. The IRF graph also supports the Granger causality results. A shock in FDI has a positive impact to the real wage of Thailand. The positive effect is substantial (increase in the first two year, then it starts to decline gradually) and are persistent.

Thus, the estimated results indicate that inbound FDI increases the real wage of the host country which is similar to several prior literatures aforementioned. Consequently, by a dual approach to growth accounting, the foreign direct investment improves Thai total factor productivity. Then, the augmentation of TFP supports the economic growth of Thailand.

The growth of domestic real wage due to FDI reflects an increasing of labor productivity. The advanced techniques of production, management, and training systems augment the productivity in foreign firms and also crowd out domestic firms, resulting in labor productivity improvement for the host economy. Moreover, the higher wage also

increases the labor wealth, causing the greater demand for domestic goods and services. This will enhance the domestic production, management, logistic system, and research and development (R&D) for all economic sectors. Consequently, these improvements associated with higher labor productivity and the innovations from transnational firms upgrade the total factor productivity and generate economic growth.

In summary, the model suggests that the inward foreign direct investment augments the Thai real wage and improves total factor productivity supporting the economic growth of Thailand.

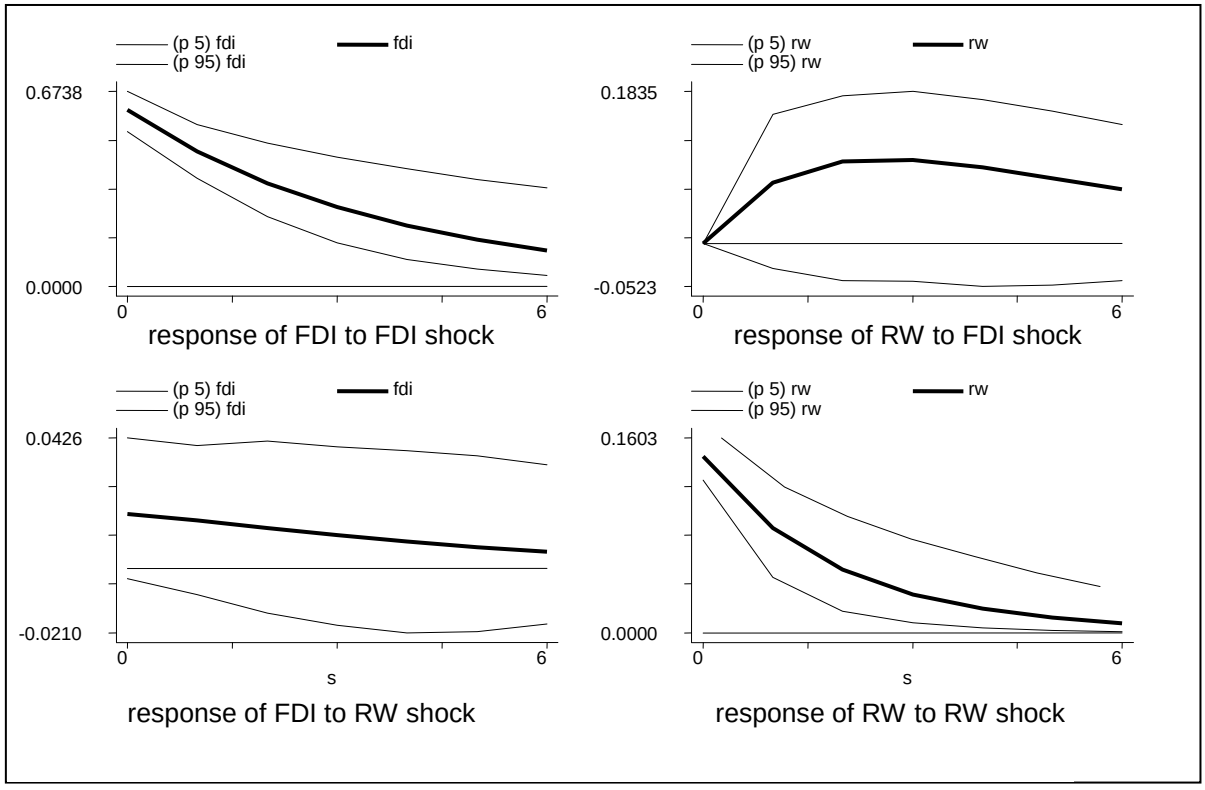
Table 5-1: The Panel Granger Causality Test (FDI and Real Wage of Thailand)

Variables	FDI_{it-1}	RW_{it-1}
FDI_{it}	0.4512* (α_2)	0.0844 (β_2)
RW_{it}	0.1532** (β_1)	0.5954** (α_1)

Note: 1. ***, **, and * denotes significance level of 1%, 5%, and 10%, respectively. Significance implies that the column variable Granger causes the row variable.

2. The panel vector autoregression (PVAR) by a system GMM approach is applied to estimate the results.

Figure 5.1: The Impulse Response Function of FDI and Real Wage (RW) of Thailand



Note: Confidence bands are the 5th and 95th percentile

CHAPTER 6

CONCLUSIONS

6.1 Research Summary

The main purpose of this dissertation is to investigate the determinants of inward FDI in the Thai manufacturing sector. It also examines the impacts of FDI inflows to the economic growth of Thailand. The FDI determinants model collected the data from 14 source countries and 9 manufacturing industries during 1990 – 2008. Hence, the model consists of three unobserved effects to be eliminated to obtain consistent estimation. The panel data analysis through a fixed effects approach is introduced to the analysis. Nevertheless, the model consists of some one-dimensional varying variables (only time or source country). These regressors cannot be estimated by a standard fixed effects method. The Hausman-Taylor is a possible method to manage this problem, but it is difficult to identify variable specification correctly. Consequently, this thesis applies the method developed by Plümper and Troeger (2007), fixed effects vector decomposition (FEVD) to estimate the results.

The results of the aggregate manufacturing analysis suggest that source country GDP, industrial production, FTA, infrastructure, economic stability, export from Thailand to FDI source country, and government policies for both industrial and investment promotion have a positive influence on FDI inflows. All these variables have the expected signs consistent with prior FDI literature. In contrast, the geographic distance representing the transaction cost and difference in culture shows a negative impact on inward FDI. Surprisingly, the total bilateral trade between source countries and

Thailand has a negative influence on manufacturing FDI. This information contrasts to the research hypothesis and some previous works. This result supports the idea that international trade is a substitute to inbound foreign direct investment.

The results of sectoral FDI analysis are similar to the aggregate manufacturing sector. However, the international trade variables are excluded because trade data for sectoral level are unavailable. The manufacturing production, BOI policy, and industrial restructuring program are crucial determinants to attract inward FDI in most sectors. Source country's GDP is also a significant FDI factor in textile and clothing, electric appliance, chemical, petroleum, and construction industry.

In addition, the results of FDI analysis from five major source economies suggest that a source country's GDP is a positive and significant FDI factor for all major source economies. The manufacturing production has a positive influence on inward FDI from EU-5, Singapore, and Japan. The exchange rate is significant and positive factor for EU-5 and Japan. However, it has no influence on Singaporean, Hong Kong, and U.S. investors. Furthermore, the result of international reserve suggests that Japanese and U.S. MNCs emphasize Thai economic stability. The Singaporean, Hong Kong, and the U.S. investors underline the infrastructure facilities in Thailand. The model also indicates that both total bilateral trade and exports from Thailand to source countries are important FDI factors. The exports have positive impact on EU-5, Singapore, Hong Kong, and Japan, while it has negative effect to the U.S. FDI. Importantly, the results indicate that the total bilateral trade between FDI source economies and Thailand is a compliment to Hong Kong and Japanese direct investment, but is substituted to the direct investment from EU-5 and the United States.

This study also examines the impacts of the 1997 Asian economic crisis to the inward manufacturing FDI. Several studies reviewed in section 3.2.2 suggested that the extraordinary increase of FDI inflows after the recession were from the great depreciation of host country currency. However, this study finds that the currency depreciation is not the only one factor. The government policies including industrial restructuring plan and urgent investment promotion programs also play a significant role to attract inbound FDI and restore the growth of the manufacturing sector. Additionally, the crisis also affects the FDI inflows structure of the Thai manufacturing sector.

The last section of this empirical analysis discusses the impacts of inward FDI on the economic growth of Thailand. A dual approach to growth accounting is employed with a panel Granger causality test. This method suggests a workable procedure to analyze the FDI effects on the host country growth. The model analysis finds the evidences indicating the inward foreign direct investment increases Thai real wages and support total factor productivity of Thailand.

6.2 Policy Suggestions, Limitations, and Future Studies

This dissertation aims to provide the information to policy makers and domestic entrepreneurs in Thailand to understand the characteristics of inward FDI in the Thai manufacturing sector. The model findings suggest that to enhance the industrial foreign investment, the Thai government should implement the strategies to improve manufacturing production and its exports. Since the manufacturing sector has a large production chain, the industrial promotion should support the manufacturing as a whole for both backward and forward linkages. In addition, they should also operate more FTA with FDI partners as well as improve domestic infrastructures to reduce the transaction costs and time. For instance, the government should increase and improve the road and railway system by connecting all industrial and investment zones with sea ports and airports. The government should also invest more on telecommunication and its security to support the online international trade and investment. Importantly, the economic organizations of Thailand including Bank of Thailand, Ministry of Industry, Ministry of Commerce, and Ministry of Finance should cooperate to maintain economic stability and manage Thai currency to not appreciate too high.

Furthermore, to maximize the FDI benefits to economic growth, the Thai government should support labor productivity by augmenting the human capital investment for both academic and vocational systems. They should stimulate the technological transfer from MNCs to local enterprises by offering the incentives such as tax exemption or facilities fee reduction to foreign firms participating in the program. Moreover, the research and development sector has to be improved particularly in the

high competitive industries such as computer and electronic appliance, automobile and parts, and food processing industry.

Nevertheless, this study has some limitations. First, the FDI data utilized in the model exclude the investment data from some source countries due to the discontinuity of the data for some investing partners. Second, the data of international trade for sectoral level and the data of specific investment incentives are unavailable. In addition, the FDI analysis also excluded several important determinants such as political factors, country risk, business confidence, and other related macroeconomic factors. Thus, it would be advantageous if further studies include more data sets and FDI determinants. Finally, this dissertation emphasizes only the FDI benefits to domestic real wage and economic growth. However, there are numerous FDI impacts to the host countries such as Thailand. The future works should aim to investigate other FDI benefits such as technological transfer, employment, or the effects to regional economies.

REFERENCES

Alfaro, L. (2003). "Foreign Direct Investment and Growth: Does the Sector Matter?", Harvard University, Harvard Business School, Working Paper.

Anderson, J. E. (1979). "A Theoretical Foundation for the Gravity Equation." *The American Economic Review*, 69(1), 106.

Anderson, J.E. and Van Wincoop, E. (2003). "Gravity with Gravitas: A Solution to the Border Puzzle.", *The American Economic Review*, Vol. 93(1):170-192

Anderson, T.W and Hsiao, C. (1981). "Estimation of Dynamic Models with Error Components.", *Journal of the American Statistical Association*, Vol. 76, No. 375 : 598-606.

Ando, M. and Kimura, F. (2005), "The Formation of International Production and Distribution Networks in East Asia.", *NBER Chapters in International Trade in East Asia*, NBER-East Asia Seminar on Economics, Vol.14: 177-216.

Andrews, M. ,Schank, T. ,and Upward, R. (2006). "Practical Fixed-effects Estimation Methods for the Three-way Error-Components Model." *Stata Journal*, StataCorp LP, Vol. 6(4): 461-481

Arellano, M. and Bond, S. (1991). "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations." *Review of Economic Studies, Blackwell Publishing*, Vol. 58(2):277-97.

Arellano, M. and Bover, O. (1995). "Another Look at the Instrument Variable Estimation of Error Component Models". *Journal of Econometrics*, 68: 29-51.

Athukorala, P. (2003). "FDI in Crisis and Recovery: Lessons from the 1997-98 Asian Crisis." Departmental Working Papers 2003-04, Australian National University, Economics RSPAS.

Baltagi, B.H. (1987). "On Estimating from a more general time-series cum cross-section data structure.". *American Economists* (31):69-71.

Baltagi, B.H. (2005). "Econometric Analysis of Panel Data, (3rd ed)." Chichester, UK, John Wiley.

Banga, R. (2003b). "Impact of Government Policies and Investment Agreements on FDI Inflows.", Indian Council for Research on International Economic Relations (ICRIER).

Banga, R. (2005). “Impact of liberalization on wages and employment in Indian manufacturing industries”, WP No. 153, Indian Council for Research on International Economic Relations.

Barro R. J. (1998). “Notes on Growth Accounting.” *NBER Working Papers 6654*, National Bureau of Economic Research.

Bellac, C., Leibrecht, M. ,and Stehrer, R. (2008). “Policies to attract Foreign Direct Investment: An industry-level analysis.” No I-019, *FIW Research Reports series*, FIW.

Belke,A. and Spies, J. (2008). “Enlarging the EMU to the East: What Effects on Trade?” *IZA Discussion Papers 3647*, Institute for the Study of Labor (IZA).

Benassy-Quere, A. , Coupet , M., and Mayer, T. (2005). “Institutional Determinants of Foreign Direct Investment.” Working Papers 2005-05, CEPII research center.

Bergstrand, J. H. (1989). “The Generalized Gravity Equation, Monopolistic Competition, and the Factor-Proportions Theory in International Trade.”, *The Review of Economics and Statistics,* 71(1), 143.

Bevan, A. A., & Estrin, S. (2004). “The Determinants of Foreign Direct Investment into European Transition Economies.” *Journal of Comparative Economics*, 32(4), 775.

Borensztein, E., De Gregorio, J. ,and Lee, J-W. (1998). “How does foreign direct investment affect economic growth?”, *Journal of International Economics*, Elsevier, vol. 45(1):115-135.

Breusch, T., Ward, M.B. , Nguyen, H., and Kompas, T. (2010). “On the Fixed-Effects Vector Decomposition.” *MPRA Paper 21452*, University Library of Munich, Germany, revised Jul 2010.

Brimble, P. and Sibunreung, A. “ Foreign Direct investment: Performance and Attraction: The Case of Thailand, Paper presented at the Workshop on Foreign Direct Investment: Opportunities and Challenge for Cambodia, Laos, and Vietnam, Hanoi, Vietnan.

Buckley, P.J. and Casson, M.C. (1976). “A Long-Run Theory of the Multinational Enterprise.”, London: Macmillan.

Burbidge, J. B., Magee, L. , and Robb A.L. (1988). “Alternative Transformations Handle Extreme Values of the Dependent Variable.” *Journal of the American Statistical Association* 83 (March 1988): 123-27.

Büthe, T. and H. V. Milner (2008). “The Politics of Foreign Direct Investment into Developing Countries: Increasing FDI through International Trade Agreements?” *American Journal of Political Science* 52(4): 741-762.

Cameron, A.C. and Trivedi, P.K. (2005), "MICROECONOMETRICS: Methods and Applications." Cambridge University Press, New York

Cantwell, J. and Narula, R. (2001). "The Eclectic Paradigm in the Global Economy." *International Journal of the Economics of Business*, Taylor and Francis Journals, vol. 8(2):155-172.

Carroll, C.D., Dynan, K.E., and Krane,S.D. (1999). "Unemployment Risk and Precautionary Wealth: Evidence from Households' Balance Sheets." *Economics Working Paper Archive 416*, The Johns Hopkins University, Department of Economics.

Caves, R.E. (1971), "International Corporations: The Industrial Economics of Foreign Investment.", *Economica*, 38: 1-27.

Chen, H. and Chen, T. (1998). "Network Linkages and Location Choice in Foreign Direct Investment.", *Journal of International Business Studies*, Vol. 29, No. 3: 445-467.

Cowling, K. and Tomlinson, P. R. (2005). "Globalization and Corporate Power.", *Contributions to Political Economy*, 24(1): 33–54.

Davies, R. B. , Ionascu, D. ,and Kristjánsdóttir, H. (2007). "Estimating the Impact of Time-Invariant Variables on FDI with Fixed Effects." Working Papers 02-2007, Copenhagen Business School, Department of Economics.

Davis, P. (2002). "Estimating Multi-Way Error Components Models with Unbalanced Data Structures." *Journal of Econometrics* 106(1): 67-95.

Demekas, D. G. ,Horvath, B., Ribakova, E. and Wu, Y. (2007). "Foreign Direct Investment in European Transition Economies--The Role of Policies." *Journal of Comparative Economics*, Elsevier, Vol. 35(2):369-386.

Dicken, P. (1998). "Global shift: Transforming the World Economy (3rd ed.).", London, Paul Chapman Publishing Ltd.

Dunning, J.H. (1980). "Explaining Changing Patterns of International Production: In Defense of the Eclectic Theory." *Oxford Bulletin of Economics and Statistics*, 41(4): 269-95.

Dunning, J. H. (1988). "Explaining International Production.", London ; Boston: Unwin Hyman.

Dunning, J.H. (2001), "The Eclectic (OLI) Paradigm of International Production: Past, Present and Future." *International Journal of the Economics of Business*, Taylor and Francis Journals, Vol. 8(2):173-190.

Dunning, J.H. and Lundan, S.H. (2008). "Multinational Enterprises and The Global Economy." (2nd ed.), Edward Elgar, Cheltenham, UK.

Farrell, R., Gaston, N. ,and Sturm, J. (2004). "Determinants of Japan's Foreign Direct Investment: An Industry and Country Panel Study, 1984-1998." *Journal of the Japanese and International Economies*, Elsevier, Vol. 18(2):161-182.

Granger, C.W.J. (1969). "Investigating Causal Relations by Econometric Models and Cross-Spectral Method." *Econometrica* 37 (3): 424–438.

Greene, W. H. (2003). "Econometric Analysis (5th ed.)." Upper Saddle River, N.J.: Prentice Hall.

Gopinath, M. and Echeverria, R. (2004). "Does Economic Development Impact the Foreign Direct Investment-Trade Relationship? A Gravity-Model Approach." *American Journal of Agricultural Economics*, Vol. 86, No. 3 (Aug 2004):782-787

Gulati, R. (1999). "Network location and learning: The influence of network resources and firm capabilities on alliance formation." *Strategic Management Journal*, 20: 397–420.

Hamilton, J.D. (1994), "Time Series Analysis", Princeton University Press.

Hausman, J.A. and Taylor, W.E. (1981). "Panel Data and Unobservable Individual Effects." *Econometrica*, Vol. 49, No. 6 (Nov., 1981), 1377-1398.

Hecox, M. , Nugent, N., Fellman, P., and Post, J.V. (2003). "Network Externalities, Evolutionary Dynamics and Firm Internationalization.", Southern New Hampshire University.

Helpman, E. (1984). "A Simple Theory of International Trade with Multinational Corporations"., *Journal of Political Economics*, 92(3), 451-471.

Helpman, E. and Krugman, P. (1985). "Market Structures and Foreign Trade: Increasing Returns, Imperfect Competition and the International Economy", Cambridge, MA: MIT Press.

Holtz-Eakein, D., Newey, W., and Rosen, H.S. (1998), "Estimating Vector Autoregressions with Panel Data". Econometrica, 56(6): 1371-1395.

Hsiao, C. (2003). "Analysis of Panel Data (2nd ed)." Cambridge, UK: Cambridge University.

Hsieh C.T. (2002). “What Explains the Industrial Revolution in East Asia?: Evidence From the Factor Markets.”, *The American Economic Review*, Vol. 92, No.3: 502-526.

Hummels, D. (1999). “Toward a Geographic of Trade Costs.” Mimieo Krannert School of Management, Purdue University.

Hymer. S.H. (1960, published 1976). “The International Operations of National Firms: A Study of Direct Foreign Investment.”, Cambridge, MA: MIT Press.

Ietto-Gillies, G. (2005), “Transnational Corporations and International Production: Concepts, Theories and Effects.”, Edward Elgar, Cheltenham,UK.

Johnson, A. (2005), “The Effects of FDI Inflows on Host Country Economic Growth.”, *CESIS Working Paper Series*, Paper No. 58, Royal Institute of Technology, Sweden.

Johnson, N. L. (1949). “Systems of Frequency Curves Generated by Methods of Translation.” *Biometrika*, 36(1-2): 149-76

Judson, R. A. and Owen, A. L. (1999), "Estimating Dynamic Panel Data Models: A Guide for Macroeconomists." Economics Letters, Elsevier, Vol. 65(1):9-15

Khaliq, A. and Noy, I. (2007). “Foreign Direct Investment and Economic Growth: Empirical Evidence from Sectoral Data in Indonesia.” Working Papers 200726, University of Hawaii at Manoa, Department of Economics.

Kimino, S., Saal, D. S., and Driffield, N. (2007). “Macro determinants of FDI inflow to Japan: An Analysis of Source Country Characteristics.” *The World Economy*, 30: 446-69.

Charles. P.K. (1973). “The World in Depression, 1929-1939.”, Berkeley, CA: University of California Press.

Kiyota, K. and Urata, S. (2004). “Exchange Rate, Exchange Rate Volatility and Foreign Direct Investment.” *The World Economy*, Vol. 27, No. 10:1501-1536.

König, M. (2003), “An Econometric Framework for Testing the Eclectic Paradigm of International Firm Activities.” *Review of World Economics* (Weltwirtschaftliches Archiv), Vol. 139, issue 3:484-506.

Kristjánsdóttir, H. (2005). “Determinants of Foreign Direct Investment in Iceland.” CAM Working Papers 2005-15, University of Copenhagen. Department of Economics. Centre for Applied Microeconometrics.

Laabas, B. and Abdmoulah,W. (2009). “Determinants of Arab Intraregional Foreign Direct Investments.” API-Working Paper Series 0905, Arab Planning Institute - Kuwait, Information Center.

Lee, M.J. (2002). “Panel Data Econometrics: Methods-of-Moments and Limited Dependent Variables.” San Diego, Academic Press.

Lipsey, R.E. and Sjöholm,F. (2004b). “FDI and Wage Spillovers in Indonesia Manufacturing.” *Journal of Development Economics*, 73(1): 415-22.

Liu, X. , Song, H., Wei, Y., and Romilly, P. (1997). “Country Characteristics and Foreign Direct Investment in China: A Panel Data Analysis.” *Review of World Economics*, Vol. 133, No. 2:313-329.

Love, V. and Zichhino, L. (2006). “Financial Development and Dynamic Investment Behavior: Evidence from Panel VAR”. Quarterly Review of Economics and Finance, 46(2): 190-210.

Markusen, J.R. (2001). “International Trade Theory and International Business.” in Rugman and Brewer (eds):69-87.

Mcmanus, J.C. (1972). “The Theory of the Multinational Firm” in G. Pacquet (ed.), Toronto: Collier, Macmillan: 66-93.

Min, B.S. (2006). “Trade and Foreign Direct Investment Patterns in the Republic of Korea in the Aftermath of the 1997Asian Financial Crisis,.” *Asia-Pacific Trade and Investment Review*, Vol. 2, No.1: 3-24.

Mitgwe, B., (2006). “Theoretical Milestones in International Business: The Journey to International Entrepreneurship Theory.”, *Journal of International Entrepreneurship*, Vol. 4: 5-25.

Mutascu, M., and Fleischer, A.M., (2009). “A VAR Analysis of FDI and Wages: The Romania’s Case.” Department of Economics Working Papers, West University of Timisoara.

National Industrial Development Committee (1998). “Industrial Restructuring Plan.” Ministry of Industry, Bangkok, Thailand.

Neumayer, E. & Spess, L. (2005). “Do Bilateral Investment Treaties Increase Foreign Direct Investment to Developing Countries?” *World Development*, Elsevier, vol. 33(10): 1567-1585.

Nguyen, N. A. and Nguyen, T. (2007). “Foreign Direct Investment in Vietnam: An Overview and Analysis the Determinants of Spatial Distribution across Provinces.” *MPRA Paper 1921*, University Library of Munich, Germany.

Nonnemberg, M.B and Mendonça, M.J. (2004). "The Determinants of Foreign Direct Investment in Developing Countries."*Anais do XXXII Encontro Nacional de Economia* [Proceedings of the 32th Brazilian Economics Meeting] 061, ANPEC - Associação Nacional dos Centros de Pósgraduação em Economia [Brazilian Association of Graduate Programs in Economics].

Onaran, Ö. and Stockhammer, E. (2006). "The Effect of FDI and Foreign Trade on Wages in the Central and Eastern European Countries in the Post-Transition Era: A Sectoral Analysis." Department of Economics Working Papers wuwp094, Vienna University of Economics, Department of Economics.

Pence, K.M. (2006) "The Role of Wealth Transformations: An Application to Estimating the Effect of Tax Incentives on Saving," *Contributions to Economic Analysis & Policy*: Vol. 5 : Iss. 1, Article 20.

Plümper, T. and Troeger, V. E. (2007). "Efficient Estimation of Time-Invariant and Rarely Changing Variables in Finite Sample Panel Analyses with Unit Fixed Effects." *Political Analysis* 15(2): 124-139.

Romer, D. (2001), Advanced Macroeconomics, 2nd ed., New York: McGraw Hill.

Sethi, D. ,Guisinge, S. E. , Phelan. S.E. , and Berg, D.M. (2003). "Trends in Foreign Direct Investment Flows: a Theoretical and Empirical Analysis." *Journal of International Business Studies*, Palgrave Macmillan Journals, vol. 34(4): 315-326.

Siamwalla, A., Vajragupta, Y., and Vichyanond, P. (1999). "Foreign Capital Flows to Thailand: Determinants and Impact." Thailand Development Research Institute, Bangkok.

Sorensen, O.J. (2009), "Economic Collaboration and Integration in a TNC-Strategic Perspective." Centre for International Business, Aalborg University, Denmark.

Sova, R. , Albu, L. L. , Stanciu, I. , and Sova, A. (2009). "Patterns of Foreign Direct Investment in the New EU Countries." *Journal for Economic Forecasting*, Institute for Economic Forecasting, Vol. 6(2):42-51.

Sun, Q. , Tong, W. , and Yu, Q. (2002). "Determinants of Foreign Direct Investment across China." *Journal of International Money and Finance*, Elsevier, vol. 21(1): 79-113.

Teece, D.J. (1977). "Technology Transfer by Multinational Firms: The Resource Cost of Transferring Technological Know-How." *The Economic Journal*, 87: 242 -61.

Thomsen, S. (1999). "Southeast Asia: The Role of Foreign Direct Investment Policies in Development." No 1999/1, *OECD Working Papers on International Investment*, OECD, Directorate for Financial and Enterprise Affairs.

UNCTAD (2009). World Investment Report 2009. Message posted to www.unctad.org/fdistatistics.

UNIDO (2002), "Tracking Manufacturing Performance : A Review of The Industrial Sector in Thailand." Occasional Papers Series, United Nations Industrial Development Organization, Bangkok, Thailand.

Velde, D.W.T. and Morrissey, O. (2002). "Foreign Direct Investment, Skills and Wage Inequality in East Asia." Paper presented at Economic and Social Research Council's Development.

Vernon, R. (1966). "International Investment and International Trade in the Product Cycle." *The Quarterly Journal of Economics*, 80:190-207.

Vijayakumar, N. , Sridharan P., and Rao, K. C. S. (2010). "Determinants of FDI in BRICS Countries: A panel analysis.", *International Journal of Business Science and Applied Management* 5(3): 1-13.

Vu, B.T., Byron, G., and Noy, B. (2006). "Is Foreign Direct Investment Good or Growth? Evidence from Sectoral Analysis of China and Vietnam." mimeo, Department of Economics, University of Hawaii-Manoa.

Wallace, T. D. and Hussain, A. (1969). "The Use of Error Components Models in Combining Cross Section with Time Series Data." *Econometrica*, 37(1):55–68.

Wang, M. (2009). "Manufacturing FDI and Economic Growth: Evidence from Asian Economies," *Applied Economics*, Taylor and Francis Journals, Vol. 41(8): 991-1002.

Wooldridge, J.M. (2002). "Econometric Analysis of Cross Section and Panel Data." Cambridge, MA, MIT Press.

Wooldridge, J. M. (2006). "Introductory Econometrics: A Modern Approach (3rd ed.)." Cincinnati, OH: South-Western College.

Zhao, H. (2003). "Country Factor Differentials as Determinants of FDI flow to China." *Thunderbird International Business Review* 45(2): 149-169.

Appendix A: Data Sources and Descriptive Statistics

A-1: Data Sources

Variable	Source
FDI Inflows to Thailand	Bank of Thailand and Board of Investment
Source Country GDP	IMF , UN Statistics Division, and World Bank
Manufacturing Production	National Economic and Social Development Board (NESDB) and Ministry of Industry
Exchange Rate	Bank of Thailand and IMF's International Statistics
Total Bilateral Trade, Export, and Import	Department of Custom and Bank of Thailand
Geographic Distance 1. Average approach 2. Great circle formula	 1. Website: www.timeanddate.com, www.portworld.com/map/, and www.distances.com 2. CEPII research center
International Reserves	Bank of Thailand
Telecommunication	Ministry of Information and Communication Technology
Interest Rate	Bank of Thailand
Industrial Restructuring Plan (IRP)	Ministry of Industry and Office of Industrial Economics (OIE)
BOI Policy	Board of Investment
FTA and APEC	Ministry of Commerce and Asia Pacific Economic Cooperation (APEC)
Real Wage of Thailand	National Statistic Organization (NSO)

A-2: Descriptive Statistics of Variables employed in FDI Determinants Model

Variable		Mean	Std.Dev	Min	Max
FDI Inflows	$sinh^{-1}(FDI_{ijt})$	1.635	1.888	0.000	8.342
Source Country GDP	$log(GDPS_{it})$	-0.578	1.371	-3.299	2.247
Manuf. Production	$log(Ind_{jt})$	1.184	1.114	-1.966	2.523
Exchange Rate (lag)	$log(X_{it-1})$	1.511	2.006	-3.506	4.299
Total Trade (lag)	$log(Trade_{it-1})$	1.417	0.918	-0.322	3.675
Export (lag)	$log(Ex_{it-1})$	0.689	0.995	-1.324	2.817
Import (lag)	$log(IM_{it-1})$	0.628	1.011	-1.431	3.218
Geographic Distance	$log(Dist_i)$	-5.614	0.801	-7.002	-4.677
International Reserves	$log(Res_t)$	-3.364	0.631	-4.710	-2.137
Telecommunication	$log(Telecom_t)$	2.521	1.240	0.482	4.444
Interest Rate	$log(Inter_t)$	2.216	0.350	1.704	2.788
Industrial Restructuring Plan	IRP_t	0.210	0.407	0	1
BOI Policy (lag)	BOI_{jt-1}	0.134	0.342	0	1
FTA (lag)	FTA_{it-1}	0.083	0.275	0	1
APEC (lag)	$\mathrm{APEC}_{\mathrm{it}-1}$	0.620	0.485	0	1

Appendix B: Table Results of FDI Determinants Model from Chapter 4

Table 4-7: Determinants of FDI in Food Industry

Variable / Model	Coefficients (Robust)		
	1	2	3
GDP (source)	-0.2272	0.0656	-0.2034
Exchange rate	1.3370**	1.0104**	1.4325**
APEC	-0.4282*	-0.6883	-0.7261
FTA	0.4785	0.5205*	0.6052**
Food Production			-1.2530
BOI		0.5674**	
Reserve		-0.2179	
Interest rate			0.7955**
IRP		0.2830*	
Telecom			0.6524**
Observation	266	266	266
R-squared	0.7209	0.7348	0.7404

Notes: 1. ***, **, and * denotes significance levels of 1%, 5%, and 10%, respectively.

2. Exchange rate, APEC, FTA and BOI are (1 year) lag variables.

3. BOI represents the BOI policy (dummy) to promote Food Industry

Table 4-8: Determinants of FDI in Textile Industry

Variable / **Model**	**Coefficients (Robust)**	
	1	**2**
GDP (source)	1.2548**	0.9303*
Exchange rate	0.5916	1.0485*
APEC	-0.7184*	-0.7545*
FTA	-0.2788	-0.2161
Text Production		0.4362
BOI		0.0454
Reserve		-0.0546
Interest rate		0.3613
IRP		0.2830*
Observation	266	266
R-squared	0.7032	0.7318

Notes: 1. ***, **, and * denotes significance levels of 1%, 5%, and 10%, respectively.

2. Exchange rate, APEC, FTA and BOI are (1 year) lag variables.

3. BOI represents the BOI policy (dummy) to promote Textile Industry

Table 4-9: Determinants of FDI in Metallic and Non-Metallic Industry

Variable / **Model**	**Coefficients (Robust)**		
	1	**2**	**3**
GDP (source)	- 0.2097	0.8239	-0.1769
Exchange rate	1.4937**	2.5876***	1.3937**
APEC	-0.1163	0.1171	-0.0128
FTA	0.8632**	0.8879***	0.9792***
Metal Production	1.5908**		
Reserve	-0.2381		
IRP	0.4267*		
Interest rate		1.0386**	
BOI		0.4545*	0.5694**
Telecom			0.0614
Observation	266	266	266
R-squared	0.6436	0.6422	0.6338

Notes: 1. ***, **, and * denotes significance levels of 1%, 5%, and 10%, respectively.

2. Exchange rate, APEC, FTA and BOI are (1 year) lag variables.

3. BOI represents the BOI policy (dummy) to promote Metal and Non-Metallic Industry

Table 4-10: Determinants of FDI in Electrical Appliance Industry

Variable / **Model**	**Coefficients (Robust)**	
	1	**2**
GDP (source)	1.137*	0.4388
Exchange rate	0.8170	0.5009
APEC	-0.4567	-0.7916
FTA	-0.3301	-0.0724
Elec Production		0.8053***
BOI	0.5950**	
Reserve		0.1123
Interest rate		0.7798*
IRP	0.5218**	0.5438**
Telecom		0.7512**
Observation	266	266
R-squared	0.7534	0.7627

Notes: 1. ***, **, and * denotes significance levels of 1%, 5%, and 10%, respectively.

2. Exchange rate, APEC, FTA and BOI are (1 year) lag variables.

3. BOI represents the BOI policy (dummy) to promote Electric Industry

Table 4-11: Determinants of FDI in Machine & Transport Equipment Industry

Variable / Model	Coefficients (Robust)		
	1	**2**	**3**
GDP (source)	-0.3723	-0.5758	-0.2839
Exchange rate	1.6172***	1.2502**	1.3947***
APEC	-0.1830	-0.2170	-0.1253
FTA	0.5332**	0.5222*	0.3377*
Machine Production	1.2879***		0.7445*
IRP	0.3746**	0.3746**	0.4904*
Reserve		0.4739**	
Interest rate		0.2192	
BOI			0.5033*
Telecom		0.4796***	
Observation	266	266	266
R-squared	0.7451	0.7502	0.7476

Notes: 1. ***, **, and * denotes significance levels of 1%, 5%, and 10%, respectively.

2. Exchange rate, APEC, FTA and BOI are (1 year) lag variables.

3. BOI represents the BOI policy (dummy) to promote Machine & Transport Equipment Industry

Table 4-12: Determinants of FDI in Chemicals Industry

Variable / **Model**	**Coefficients (Robust)**	
	1	**2**
GDP (source)	0.0849*	0.0510*
Exchange rate	-0.2725	0.7449
APEC	-0.1683	-0.1279
FTA	-0.0305	-0.1760
Chem Production	0.3435	
Reserve		-0.0216
Interest rate		0.0522
IRP	0.6501*	0.2830*
Telecom		0.2481
Observation	266	266
R-squared	0.6213	0.6036

Notes: 1. ***, **, and * denotes significance levels of 1%, 5%, and 10%, respectively.

2. Exchange rate, APEC, and FTA are (1 year) lag variables.

Table 4-13: Determinants of FDI in Petroleum Products Industry

Variable / **Model**	**Coefficients (Robust)**	
	1	**2**
GDP (source)	1.1589*	0.4579*
Exchange rate	-0.8915	-0.8774
APEC	-0.3437	-0.1185
FTA	-0.0045	0.4032
Petro Production	0.4398	0.3435
Reserve	0 .3303*	-0.0216
Interest rate	0 .4440	0.0882
IRP		0.1840*
BOI		0.4280
Observation	266	266
R-squared	0.3345	0.3324

Notes: 1. ***, **, and * denotes significance levels of 1%, 5%, and 10%, respectively.

2. Exchange rate, APEC, and FTA are (1 year) lag variables.

Table 4-14: Determinants of FDI in Construction and Other Industry

Variable / **Industry**	**Coefficients (Robust)**	
	Construction	**Other Industry**
GDP (source)	0.6881**	-0.0509
Exchange rate	-0.9200	2.1440***
APEC	-0.0405	-1.6353**
FTA	0.6962**	0.5522*
Ind. Production	-0.3074	1.9379***
Reserve	-0.0348	0.5384**
Interest rate	-0.3500	1.2985**
IRP	0 .1095	-0.1574
Telecom	0.1149	0.6594***
Observation	266	266
R-squared	0.1999	0.6753

Notes: 1. ***, **, and * denotes significance levels of 1%, 5%, and 10%, respectively.

2. Exchange rate, APEC, and FTA are (1 year) lag variables.

Table 4-15: Determinants of FDI from European Countries

Variable / Model	Coefficients (Robust)			
	1	**2**	**3**	**4**
GDP (source)	4.2447*			
BOI	0.7380**	0.6934*	0.7842**	0.6934**
Reserve	-0.2834	-0.2825	-0.4709	-0.4417
Interest rate	0.2406	0.1182	-0.9002	-0.2328
IRP	0.8945***	0.6617*	1.1910***	0.8855***
Exchange rate	1.466*			
Ind. Production	0.4974*			
Export		1.8406**		
Import			-1.0367	
Trade				-2.0374**
Telecom	0.0256			
Observation	171	171	171	171
R-squared	0.5368	0.5420	0.5312	0.5400

Notes: 1. ***, **, and * denotes significance levels of 1%, 5%, and 10%, respectively.

2. Exchange rate, APEC, FTA, BOI, and trade variables are (1 year) lag variables.

3. When trade variables are included, the results of some variables show no significant and change signs. Then, the trade effects on FDI are investigated separately to GDP source, exchange rate and industrial production. (Model 2, 3, and 4)

4. EU countries consists of Belgium, Germany, France, Netherlands, and UK

Table 4-16: Determinants of FDI from Singapore

Variable / Model	Coefficients (Robust)			
	1	2	3	4
GDP (source)	4.0049**			
Ind. Production	0.3210*	1.1727***	0.2917*	0.2472*
BOI	0.2484	0.3020	0.1304	0.1577
Reserve	-0.1357	0.2713	-0.4999	-0.3230
Exchange rate	1.5527			
Interest rate	-0.0517			
IRP		0.6176***		
FTA		0.9080***		
Export		0.8087**		
Import			1.1739	
Trade				1.8233
Telecom	0.7757	0.3265*	0.4413**	0.0850
Observation	171	171	171	171
R-squared	0.6272	0.6125	0.6069	0.6010

Notes: 1. ***, **, and * denotes significance levels of 1%, 5%, and 10%, respectively.

2. Exchange rate, APEC, FTA, BOI, and trade variables are (1 year) lag variables.

3. When import and total trade are included in the model, the results of some variables show no significant and change signs. Thus, they are tested separately to GDP source, exchange rate, industrial restructuring, interest rate, and FTA. (Model 3 and 4)

Table 4-17: Determinants of FDI from Hong Kong

Variable / Model	Coefficients (Robust)				
	1	**2**	**3**	**4**	**5**
GDP (source)	1.3105***	1.0352*			
Ind. Production	0.3524	0.3288	0.3963	0.1048	0.3655
BOI	0.6387**	0.6551**	0.7344**	0.8336**	0.7257**
Interest rate	0.7110*	0.8282*	0.7267**	0.3822	0.7245*
IRP	-0.0892	-0.0210	-0.1245	-0.0329	-0.1092
Exchange rate	-0.3362				
Telecom		0.3978**			
FTA		0.1158			
Reserve		0.0066			
Export			0.9291***		
Import				0.5857	
Trade					0.9753**
Observations	171	171	171	171	171
R-squared	0.5220	0.5224	0.5256	0.5077	0.5232

Notes: 1. ***, **, and * denotes significance levels of 1%, 5%, and 10%, respectively.

2. Exchange rate, APEC, FTA, BOI, and trade variables are (1 year) lag variables.

3. When trade variables are included in the model, the results of some variables show no significant and change signs. Thus, they are tested separately to GDP source, exchange rate, telecommunication, reserve, and FTA. (Model 3, 4 and 5)

Table 4-18: Determinants of FDI from Japan

Variable / Model	Coefficients (Robust)			
	1	**2**	**3**	**4**
GDP (source)	5.3272*	6.9759*	7.0649**	5.7324*
Ind. Production	0.1349**	0.1874*	0.1259*	0.1851*
BOI	0.5227**	0.5579*	0.4504	0.3568
Reserve	0.2772**	0.1236	0.0103	0.0228
Exchange rate	1.4556***			
IRP	0.6521***	0.3794*	0.7076***	0.5626***
FTA	0.2311			
Export		1.1248***		
Import			1.3667**	
Trade				1.4035***
Observation	171	171	171	171
R-squared	0.7784	0.7853	0.7833	0.7852

Notes: 1. ***, **, and * denotes significance levels of 1%, 5%, and 10%, respectively.

2. Exchange rate, APEC, FTA, BOI, and trade variables are (1 year) lag variables.

3. The telecom and interest rate are excluded from this table since including these variables makes other variables insignificant and change sign. Also, when we test these variables separately, both of them are statistically insignificant.

Table 4-19: Determinants of FDI from the United States

Variable / Model	Coefficients (Robust)			
	1	**2**	**3**	**4**
GDP (source)	5.1714***			
Ind. Production	0.3344	0.4103	0.3617	0.4379
BOI	0.9414***	0.5119*	1.0956***	0.7541**
Reserve	0.1713*	0.7968**	0.2682	0.5293**
Exchange rate	0.3522	1.4533		
Interest rate	1.8554*			
IRP		1.1149***	0.4645*	0.7748***
Export		-1.0914*		
Import			1.1661	
Trade				-0.9009*
Telecom		0.8152***	0.1031	0.4583*
Observation	171	171	171	171
R-squared	0.5284	0.5343	0.5235	0.5396

Notes: 1. ***, **, and * denotes significance levels of 1%, 5%, and 10%, respectively.

2. Exchange rate, APEC, FTA, BOI, and trade variables are (1 year) lag variables.

3. When trade variables are included with GDP source and interest rate, the results of some variables are insignificant and change sign. Thus, when measuring trade effects, we will not include GDP source and interest rate in the model.

Appendix C: The Chow Test (Before and After the Crisis)

First, divide the main FDI structure (equation 4.4) into two groups using the structural break year.

(a) If year ≤ 1997

$$\sinh^{-1}(FDI_{ijt}) = \beta_0 + \beta_1 log(GDPS_{it}) + \beta_2 log(Ind_{jt}) + \beta_3 log(X_{i,t-1}) + \beta_4 log(Trade_{i,t-1}) + \beta_5 (APEC_{i,t-1}) + \beta_6 log(Res_t) + \beta_7 log(Inter_t) + \beta_8 log(Telecom_t) + \varepsilon_{ijt}$$

(b) If year >1997

$$\sinh^{-1}(FDI_{ijt}) = \alpha_0 + \alpha_1 log(GDPS_{it}) + \alpha_2 log(Ind_{jt}) + \alpha_3 log(X_{i,t-1}) + \alpha_4 log(Trade_{i,t-1}) + \alpha_5 (APEC_{i,t-1}) + \alpha_6 log(Res_t) + \alpha_7 log(Inter_t) + \alpha_8 log(Telecom_t) + \varepsilon_{ijt}$$

Note: 1. FTA, BOI, and IRP are excluded since all of them are implemented after 1997. Distance is also excluded because it is constant overtime.

2. The break year is 1997 which is the year when the Asian economic crisis occurred.

- Then, perform the Chow test

  - Under the null hypothesis; H_0: $\beta_k = \alpha_k$; k = 0,1,2, …., 8

    H_1: not all equal

If the null hypothesis is rejected, the result indicates that there has been a change in the manufacturing FDI structure after the 1997 economic crisis.

- Chow test result: F (9, 2376) = 12.80, Prob > F = 0.0000

  → Reject the null hypothesis

Appendix D: A Standard Primal Approach to Growth Accounting

Section 5.1 discusses a dual approach to growth accounting. This appendix presents the other approach: A primal approach. (see Barro, 1998 and Romer, 2001)

Beginning with the neoclassical production function: Y = F(K, L, A) , where K is capital stock, L is the quantity of labor, and A is the technological progress. Then, differentiate the production function with respect to time and divide it by Y to obtain:

$$\frac{\dot{Y}}{Y} = \left(\frac{F_A K}{Y}\right) * \frac{\dot{A}}{A} + \left(\frac{F_k K}{Y}\right) * \frac{\dot{K}}{K} + \left(\frac{F_l L}{Y}\right) * \frac{\dot{L}}{L} \qquad (1)$$

Where F_i , i = A, K, and L are the factor marginal products, $\frac{\dot{K}}{K}$ and $\frac{\dot{L}}{L}$ are the growth rate of capital and the growth rate of labor respectively. Importantly, $\left(\frac{F_A K}{Y}\right) * \frac{\dot{A}}{A}$ is defined as the Solow residuals (SR) .Then, from (1), the residuals can be calculated as:

$$SR = \frac{\dot{Y}}{Y} - \left(\frac{F_k K}{Y}\right) * \frac{\dot{K}}{K} - \left(\frac{F_l L}{Y}\right) * \frac{\dot{L}}{L} \qquad (2)$$

If the factors are paid at their social marginal products, so that F_k = rental price of capital (r), and F_l = wage (w). Then, a standard primal of the rate of technological progress or total factor productivity (TFP) are presented as follows:

$$TFP_{primal} = \frac{\dot{Y}}{Y} - S_k * \frac{\dot{K}}{K} - S_l * \frac{\dot{L}}{L} \qquad (3)$$

where S_k = rK/Y and S_l = wL/Y represent the shares of factor payment in total product.

Appendix E: FDI Definitions

The FDI definitions and concepts from several sources are presented as follows:

1. International Monetary Fund (IMF)

Foreign direct investment (FDI) occurs when an investor based in one country (the home country) acquires an asset in another country (the host country) with the intent to manage that asset. The management dimension is what distinguishes FDI from portfolio investment in foreign stocks, bonds and other financial instruments. In most instances, both the investor and the asset it manages abroad are business firms. In such cases, the investor is typically referred to as the "parent firm" and the asset as the "affiliate "or "subsidiary". There are three main categories of FDI:

• *Equity capital* is the value of the MNC's investment in shares of an enterprise in a foreign country. An equity capital stake of 10 per cent or more of the ordinary shares or voting power in an incorporated enterprise, or its equivalent in an unincorporated enterprise, is normally considered as a threshold for the control of assets. This category includes both *mergers and acquisitions* and "*Greenfield*" investments (the creation of new facilities).

• *Reinvested earnings* are the MNC's share of affiliate earnings not distributed as dividends or remitted to the MNC. Such retained profits by affiliates are assumed to be reinvested in the affiliate. This can represent up to 60 per cent of outward FDI in countries such as the United States and the United Kingdom.

• *Other capital* refers to short or long-term borrowing and lending of funds between the MNC and the affiliate.

(From the report on the survey of implementation of methodological standards for direct investment, 2000)

2. World Bank

FDI is net direct investment that is made to acquire a lasting management interest (usually 10 percent of voting stock) in an enterprise operating in a country other than that of the investor (defined according to residency). The investor's purpose is to be an effective voice in the management of the enterprise. (World Bank, 2001: CD-ROM)

3. OECD

Direct investment is a category of cross-border investment made by a resident in one economy (the direct investor) with the objective of establishing a lasting interest in an enterprise (the direct investment enterprise) that is resident in an economy other than that of the direct investor. The motivation of the direct investor is a strategic long-term relationship with the direct investment enterprise to ensure a significant degree of influence by the direct investor in the management of the direct investment enterprise. The "lasting interest" is evidenced when the direct investor owns at least 10% of the voting power of the direct investment enterprise. Direct investment may also allow the direct investor to gain access to the economy of the direct investment enterprise which it might otherwise be unable to do. The objectives of direct investment are different from those of portfolio investment whereby investors do not generally expect to influence the management of the enterprise. (OECD Benchmark Definition of FDI 4th ed., 2008)

VITA

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In 2005, he received the Thai government scholarship to study the Economics for Master and Doctoral degree. Pongsak attended and completed his Master of Arts (Economics) from Michigan State University in December 2006. Then, he continued his Doctoral degree at University of Missouri in January 2007. In May 2011, Pongsak earned his Ph.D. in Economics under the supervision of Professor Shawn Ni. After graduation, he returns back to Thailand and works at the Office of Industrial Economics.