'The Determinants of FDI Distribution across Manufacturing Activities in an Asian Industrialising Country: A Case of Japanese FDI in Thailand'

by

Pawin Talerngsri, B.A. (Hons), M.Sc.

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Abstract

This research identifies and investigates the 'industry-level determinants' of FDI in the context of Asian industrialising countries by using the data on Japanese foreign direct investment in Thailand. It differs from previous empirical studies for non-industrialised countries on three important aspects. Firstly, the previous studies (e.g. Lall and Mohammad, 1983) focus on the determinants of FDI in terms of monopolistic characteristics of industries in which foreign firms operate (e.g. technological intensities and scale economies). The present study, on the other hand, examines the influences of locational-specific characteristics of host industries such as factor endowments, trade costs, and policy factors. More distinctively, it examines the effects of vertical (input-output) linkages among Japanese firms. These effects have rarely been investigated in the context of Asian industrialising countries. Thirdly, it constructs the highly disaggregated data on FDI (4-digit ISIC level), using a broad range of information gathered from various published sources. Such data allows the present analysis to examine in detail the 'pattern' and 'determinants' of FDI distribution across segmented stages of manufacturing production rather than broadly defined industrial sectors.

On analysing descriptively the manufacturing distribution of FDI, it was found that Japanese FDI in Thailand was not evenly distributed across manufacturing activities. Some capital- / technology-intensive industries like rail equipment (ISIC 3842) and aircraft (ISIC 3845) did not receive (or host) any FDI during a

specified period (1954-1995). On the other hand, other relatively labour-intensive industries like TV, radio, and communication equipment industry (ISIC 3832) and motor vehicle industry (ISIC 3843) received disproportionately large values of FDI. Based on the locational approach to the determinants of FDI in non-industrialised countries, several hypotheses were formulated and quantitatively tested by using cross-sectional data (1985, 1990, and 1995). The empirical findings lend strong and consistent support to the postulated hypotheses. It is to be hoped that these empirical findings will not only enhance our understanding of the industry-level determinants of FDI in the context of Asian industrialising countries but also stimulate further work on this line of research.

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List of Abbreviations

AFTA	=	ASEAN Free Trade Area
ASEAN	=	Association of South East Asian Nation
BOI	=	Board of Investment (Thailand)
DCR	=	Department of Commercial Registration (Thailand)
DCs	=	Developing Countries
DMEs	=	Developed Market Economies
EU	=	European Union
FDI	=	Foreign Direct Investment
GSP	=	General System of Preferences
ISIC	=	International Standard Industrial Classification
JETRO	=	Japanese External Trade Organisation
JCC	=	Japanese Chamber of Commerce (Thailand)
MOF	=	Ministry of Finance (Japan)
MNEs	=	Multinational Enterprises
NICs	=	Newly Industrialising Countries
UNCTAD	=	United Nations Conference on Trade and Development
UNIDO	=	United Nations Industrial Development Organisation
USTR	=	U.S. Trade Representative

Chapter I

Context, Aims, and Outline

Chapter I

Research Context, Aims, and Outline

1.1 Introduction

In recent decade, there has been a growing research interest in the determinants of foreign direct investment (FDI)[1]. A considerable number of analyses has been conducted about FDI determinants, both at the macro (country) and the micro (firm / industry) level. Yet, it is apparent that a large proportion of such analyses, especially at the micro level, has been conducted in the context of industrialised rather than non-industrialised countries.

The aim of this research is to identify and investigate the key determinants of FDI distribution across manufacturing industries in an Asian industrialising country, using the author's own constructed data on Japanese FDI in Thailand. The present study differs from previous empirical studies for non-industrialised countries on three important aspects. Firstly, the former examines the influences of locational-specific factors such as factor endowments, trade costs, and policy factors. It also investigates a systematic effect of vertical input-output linkages

[1] FDI is formally defined in the IMF Balance of Payments Manual (5th edition) as 'investment that involves a long-term relationship reflecting a lasting interest of a resident entity in one economy in an entity resident in an economy other than that of the investor. The direct investor's purpose is to exert a significant degree of influence on the management of the enterprise resident in the other economy'.

among Japanese firms. Furthermore, it employs the highly disaggregated (industry-level) data on FDI, thus allowing the present study to examine in detail the 'pattern' and 'determinants' of FDI distribution across segmented stages of manufacturing production rather than broadly defined manufacturing sectors.

The remainder of this chapter is organised as follows. The following sections discuss the context, the aims, and the outline of this research, and finally the last section summarises.

1.2 Research Context

The empirical literature on the determinants of foreign direct investment (FDI) is substantial with different studies using different types of data and testing different sets of determinants. The sample data used can be classified into three broad types: country-level, industry-level, and firm-level. One common objective of studies using country-level data is to explain why FDI varies across countries (e.g. Wheeler and Mody, 1992; Head, Ries, and Swenson; 1995), and another is to explain why FDI changes over time (e.g. Bajo-Rubio and Sosvilla-Rivero, 1994; Barrell and Pain, 1996). On the other hand, the main objective of studies using industry-level data is to investigate the factors which influence the inter-industry distribution of FDI (e.g. Ratnayake, 1993; Milner and Pentecost, 1996); that is to explain why some industries receive greater amounts of FDI undertaken than others. Finally, studies using firm-level data aim to explain why some firms (in a

particular manufacturing industry) are more likely to undertake FDI than are others (e.g. Kogut and Chang, 1991; Belderbos and Sleuwaegen, 1996).

Within these types of studies, it is observed that most of those for non-industrialised countries are at the country level (see chapter IV). For example, Lucas (1993) investigated the determinants of inward FDI across 7 Asian developing countries while Woodward and Rolfe (1993) examined the distribution of FDI across Caribbean countries. Liu, Song, Wei, and Romilly (1997) recently tested the determinants of inward FDI flows into China using aggregate country-level data. One major drawback to using such aggregate data is that any research implications drawn are also confined to the country level. It is still not fully understood how FDI is distributed across industrial activities in non-industrialised countries and what determines this.

'Since 1985 Asian countries have become the largest recipients of FDI among developing countries accounting for about half of all FDI flows to the third world. Much FDI is directed to labour-intensive export-oriented industries and is mostly undertaken by Japanese multinational enterprises (MNEs)' (UNCTAD, 1997, p.14). Therefore, it would be informative to know the key determinants of the Japanese FDI that has been undertaken across Asian manufacturing industries over recent decades. To date, there are very few industry-level analyses conducted in the context of Asian countries. Lall and Mohammad (1983) and Aswicahyono and Hill (1995) are among the small number of empirical studies

examining the industry-level determinants. However, the locational-specific characteristics of Asian industrialising countries such as endowment and policy factors, as well as the industry-specific characteristics of Japan (e.g. Japanese vertical linkages), have rarely been considered. With the recent expansion of Japanese export-oriented FDI in Asia, these factors tend to be important.

1.2.1 Change in Trade and Industrial Policies

One shortcoming of previous empirical studies on Asian developing countries is that the data used were not recent. The sample periods used by Lall and Mohammad (1983) and Aswicahyono and Hill (1995) coincide with the times when Asian governments adopted an import substitution industrialisation strategy (between the mid 1950s to the early 1980s). This type of trade and industrial strategy strongly discriminated in favour of domestic production and consumption over exports (see Hatcher and Salvatore, 1991; Liang, 1992). It was aimed at protecting and promoting domestic industries through tariff, non-tariff, and exchange rate measures, directed to allocating productive resources toward manufacturing production for domestic markets. Hence, FDI undertaken during that period was likely also to be aimed at producing for local markets due to the influence of host government policies. As noted by Tran Van Tho (1989, p. 10), "the motivation of Japanese FDI in the 1960s and particularly in the 1970s had responded to the import substitution industrialisation of Asian countries. Most investment had been undertaken in downstream industries or assembling activities that substituted for final products previously exported from Japan".

However, in the more recent period (especially after the 1970s), the trade and industrialisation strategy of many Asian countries has changed to one of export promotion. In contrast to an import substitution strategy, this is aimed at encouraging manufacturing production for exports rather than for the small domestic market of the host economy. Several types of fiscal incentives, such as tax rebates, corporate tax exemption, direct subsidies, and loans at low interest rate are provided to promote and expand exporting industries. Especially, they are given to those industries where the domestic factor or natural resources to be used as key inputs are abundant (e.g. unskilled labour). As indicated in UNCTAD (1997, p. 14), "export-oriented transnational corporations (TNCs) were particularly welcomed by host Asian countries which, in the late 1970s, had begun to switch from an import-substituting to an export-promotion strategy".

With different types of FDI being undertaken at different time periods, the principle factors that determined recent FDI are also likely to be different[2]. As noted by Aswicahyono and Hill (1995, p. 115), in examining the determinants of FDI in Indonesia using a sample for 1985,

> "it would be of interest to conduct the same analysis with reference to the early 1990s. Beginning in 1985, the Indonesian government embarked on a major liberalisation programme of the trade and regulatory policy regimes...the reforms made Indonesia a very attractive location for export-oriented manufacturing. Much of this new investment flowed into labour-intensive, export-oriented plants".

[2] For the types of FDI determinants being examined by previous studies, see chapter IV.

Formally, two broad types of FDI can be identified - horizontally and vertically integrated. The former is aimed at producing for local markets while the latter is aimed at producing mainly for export (Markusen, 1995; Markusen, Venables, Konan, and Zhang, 1996) (see chapter III)[3]. Generally, FDI in developed market economies (DMEs) tends to be in the form of horizontally integrated FDI, aimed at servicing 'large' domestic markets (Markusen, 1984; Brainard, 1993; Markusen and Venables, 1998). Firms undertaking such FDI are usually large multinational firms[4] possessing strong monopolistic advantages (intangible assets), which enable them to successfully compete against local firms in these markets (Hymer, 1960; Kindleberger, 1969; and Caves, 1971). Thus, activities carried out by these firms tend to be associated with the 'monopolistic characteristics' of the industry in which they operate. On the other hand, FDI in most Asian developing countries, especially after the 1985s[5], is mostly in the form of vertically integrated FDI, aimed at exploiting differences in locational endowments rather than serving relatively small markets. According to theoretical models of vertically integrated FDI (e.g. Helpman, 1984; Zhang and Markusen, 1999), firms from DMEs tend to

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[3] Dunning (1993) classifies FDI into four types: resource seeking, market seeking, efficiency seeking, and strategic asset seeking. The first and third types resemble vertically integrated FDI while the second type resembles horizontally integrated FDI.

[4] Multinational enterprise refers to an enterprise that engages in foreign direct investment (FDI) and owns or controls value-adding activities in more than one country (Dunning, 1993, p. 3).

[5] It is recognised that the type of FDI in many developing countries (DCs) prior to 1980s was different due to import-substitution policies pursued by host governments, which encouraged foreign firms to produce for domestic market rather than for exports. Besides, at the present time, the market-seeking FDI type still dominates in some large developing countries such as India and China.

separate different stages of production according to local endowments[6]. The capital-intensive stage of production or activities is retained in the home[7] DME (with relatively large supplies of capital and skilled labour) while unskilled labour-intensive activities are relocated to host developing countries (DCs) where this type of labour is abundant. Intermediate products (e.g. equipment and components) are exported from the home DME to the host DCs to be used as production inputs there, and subsequently processed products are shipped back to serve home and other foreign markets.

Under these circumstances, it may be argued that the monopolistic advantages required for foreign firms to compete successfully with local firms in the host developing countries are less profound[8], since the former do not intend to compete against the latter inside those markets. Besides, the majority of local firms in developing countries are not able to compete against foreign firms in the first place, since they tend to lack the necessary financial and non-financial assets (e.g. technologies and managerial skills). With respect to this type of FDI, it may be argued that 'resource endowments' and 'policy factors' are important determinants of the inter-industry distribution of FDI in developing countries (see

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[6] Firms may also separate different types of product according to local endowments. For example, high-tech consumer appliances are manufactured in host DMEs while consumer appliances that have become standard products are manufactured at plants in host developing countries and re-imported to home DMEs

[7] Home (host) country refers to the country where FDI is originated (directed).

[8] Of course, firms undertaking FDI in DCs still need some specific advantages such as gaining access to financial loans for investments. This condition may be necessary but not sufficient for explaining the variation of FDI across industries in developing countries.

chapter V). Thus, while the previous studies examine the determinants of FDI in terms of industry-specific characteristics such as technological and skilled intensities, the present study considers the locational-specific determinants of FDI (e.g. factor endowment and policy factors).

1.2.2 Deepening Japanese Supply Network

Apart from that mentioned above, there is another shortcoming of the previous empirical studies. In recent periods (the mid 1980s to the mid 1990s), there has been an influx of hundreds of new manufacturing firms from Japan to Asia, particularly to Southeast Asian countries. As described by Hatch and Yamamura (1996, p. 6), the Japanese FDI stock in Asia in 1977 was roughly equivalent to that of the United States (at less than 6$ billion). However, 17 years later, her cumulative FDI had grown more than twelve-fold to $74.7 billion while American FDI had increased to only 45$.7 billion. Machado (1996, p. 46) indicates that the biggest number of Japanese firms (in 1991) is now in Asia (5,126), followed by North America (1,186), and Europe (595).

To date, the specific characteristics of Japanese FDI in the context of Asian developing (or industrialising) countries have rarely been investigated. Arguably, Japanese FDI is different from other FDI (i.e. FDI from the US/EU) in many aspects. For instance, the former tends to be shaped by the distinctive set of institutions, policies, and norms that have evolved over the history of their society (Hatch and Yamamura, 1996; Lindblad, 1998). Particularly, the extent of co-

operation between Japanese firms that belong to the same industrial group called 'Keiretsu' is substantial. Manufacturing firms within the same 'Keiretsu' group are linked to one another by sub-contracting arrangements (Aoki, 1988; Hatch and Yamamura, 1996; Miyashita and Russell, 1996). Almost 70 per cent of manufacturing activities of large Japanese producers are carried out by small and medium suppliers (Aoki, 1988). The relationship between the former and the latter tends to be long-term rather than short-term due to financial and non-financial ties between them. These include cross-shareholding, interlocking directorates, and intra-group trade, as well as capital, technology, and personnel transfers (Asanuma, 1989; Hatch and Yamamura, 1996; Miyashita and Russell, 1996).

Consequently, when Japanese manufacturing producers undertake investment overseas, Japanese intermediate suppliers also tend to follow the former in order to supply key intermediate products (Hatch and Yamamura; 1996; Machado, 1996; Jomo et al., 1997; Lindblad, 1998) (see chapter VI). As indicated in Hatch and Yamamura (1996, p. 162), in 1994, 59% of Japanese assemblers in ASEAN countries were buying more parts and components from local suppliers than they had a year earlier. However, what the statistics do not reveal is that a large and growing number of local suppliers used by Japanese manufacturers in Asia are actually Japanese affiliates[9]. By the same token, Japanese suppliers in the host ASEAN countries admitted that

[9]It is defined as an incorporated or unincorporated enterprise in which a foreign investor has an effective voice in management (UNCTAD, 1997, p. 47).

"for several years, our (Japanese) customers in Southeast Asia asked us to come and support them. They asked and asked, and finally we came. We had no choice really. Even though we thought we might lose money, at least at first, we had a responsibility (sekinin) to come. To survive in Japan, a supplier must serve his customers and make them happy. That's the Japanese way" (Hatch and Yamamura, 1996, p. 162)

Unfortunately, the postulated relationship between Japanese vertical linkages and FDI in Asia is based on descriptive rather than quantitative analyses; there is almost no quantitative analysis conducted on such relationship. Furthermore, those few analyses conducted (in the context of non-Asian countries) are at the firm-level (e.g. Belderbos and Sleuwaegen, 1996). There is still little understanding about the systematic effects of Japanese input-output linkages on FDI at the industry-level. In other words, the relationship between the vertical linkages among parent firms[10] in Japan and the variation in FDI undertaken (by those parent firms) across manufacturing industries in a host Asian industrialising country has rarely been investigated (see chapter VI).

To summarise, the industrial aspect of FDI determinants in the context of Asian industrialising countries has not been fully addressed by the previous empirical studies due to the data limitations, the recent and the change in the nature of FDI, as well as the expansion of Japanese foreign direct investment. It is an intention of the present analysis to examine the effects of locational and linkage factors in detail.

[10] A parent enterprise is defined as an incorporated or unincorporated enterprise (or group or enterprise) which has a direct investment enterprise operating in a country other than that of the parent enterprise (UNCTAD, 1997, p. 47).

1.3 Research Aims

The general aim of this research is to examine the effects of locational and linkage factors on the distribution in Japanese FDI across manufacturing industries in an Asian industrialising country over the recent period (the mid 1980s to the mid 1990s). Specifically, these will be identified and investigated in the context of Japanese direct investment in Thailand.

There are three reasons why the case study of Japanese FDI in Thailand is used for the present research. Firstly, the stock of Japanese FDI in Thailand is quite substantial, accountable for more than 40% of the total stock of FDI undertaken there (Board of Investments of Thailand, 1995; Hatch and Yamamura, 1996, p. 6). Between the mid 1980s and the mid 1990s, Japanese FDI increased substantially due to the appreciation of Japanese Yen against the US dollar, which was mainly associated with the chronic trade surplus of Japan with its major trading partners (USA and Europe)[11]. The Yen appreciation partly reduced the competitiveness of some Japanese firms in exporting industries where products were price sensitive, and thus induced them to relocate their production bases overseas, especially in low cost countries like Thailand (Ministry of Foreign Affairs, Thailand, 1996; Krongkaew, 1997). Hence, with the significant increase of Japanese FDI in Thailand during 1985-95, there is a good opportunity for the present analysis to examine in detail the pattern and determinants of vertically integrated activities of

[11] A G7 meeting, the so-called 'Plaza Accord', forced the Japanese Yen to adjust upward in 1985.

Japanese firms. Particularly, the study will be able to investigate the vertical linkages between home and host (Japanese) companies.

Secondly, an analysis of a single country (as opposed to a multi-country analysis) is viable because it is very difficult to obtain the comprehensive and consistent data on both the industrial and geographical distribution of Japanese FDI. As noted by Farrell (2000),

> "the underlying statistical database often limits an explanation of the industrial and geographical distribution of Japanese FDI. While the Ministry of Finance statistical series on Japanese FDI is the most commonly used data source, detailed information on investment by industry and country has not been easily available for long time periods or even particular years" (Farrell, 2000, abstract)

Thirdly, Thailand is chosen because the author is familiar with the available local data sources, as well as having access to business and government organisations.

As with other studies for developing countries, the present study encounters with data problems. In Thailand, there is no comprehensive or systematically recorded FDI data at the disaggregated industry level. The industry-level data on Japanese FDI are thus constructed by the author using a broad range of information gathered from various published sources. Although a considerable amount of time and effort has been devoted to constructing such data, weaknesses associated with that data are unavoidable. These are due to the limitations of the information, as well as the inadequate recording system in Thailand (see chapter

II). Nonetheless, it is to be hoped that some useful implications can be drawn with respect to the industry-level determinants of Japanese FDI in this country.

1.4 Research Outline

The outline of this thesis is as follows. Firstly, chapter II analyses descriptively the industry distribution of Japanese FDI in Thailand. It first discusses the procedure used to compile FDI data and the weaknesses associated with such data. Then it carries out an analysis of the industrial distribution of Japanese FDI, using such constructed data. Two main measures for FDI are used, the value of authorised share capital and the count (number) of Japanese companies. The former reflects the size of investment while the latter reflects the incidence of investment.

Chapter III reviews and evaluates the different theoretical explanations of foreign direct investment; its characteristics *(What is FDI?)*, its motivation *(Why is there FDI?)*, and its direction *(Where is there FDI?)*. The chapter recognises that the theoretical literature is fragmented with different theories focusing on different types of FDI. Therefore, it seeks to group the explanations according to the approaches used, namely the capital market, the firm/industry-organisation, and the locational approaches. Finally, it explains why the locational approach is suitable for the present analysis of Japanese FDI in Thailand.

Chapter IV reviews empirical studies that have tested the various hypotheses derived from theories using the above mentioned approaches. The chapter compares and contrasts the different types of hypotheses tested, the characteristics of the data and methodologies used, and the general findings obtained by those studies. Finally, it discusses the links between the previous empirical studies and the present study.

In the light of the theoretical and empirical reviews of FDI determinants, chapter V investigates the determinants of the inter-industry distribution of Japanese FDI in Thailand. Based on the locational approach to FDI determinants in the context of developing countries, five hypotheses are reviewed and subsequently tested using the cross-sectional sample data (recorded at 1985, 1990, and 1995). This chapter describes the data and the measures used for both dependent and independent variables before using the Heckman 2-stage procedure as the main econometric methodology.

Having examined the general determinants of FDI (in the context of developing countries), chapter VI examines the relationship between the vertical linkages among firms in Japan and the extent of FDI undertaken by such firms (across manufacturing activities) in Thailand. It firstly explains and discusses the relationship between Japanese industrial linkages and FDI, and subsequently examines that relationship both qualitatively and quantitatively (using the same estimation procedure).

Lastly, chapter VII summarises the main results, draws implications, and provides suggestions for future research.

1.5 Summary

The empirical literature on FDI determinants is substantial with different studies investigating different types of determinants both at the macro and the micro levels. Yet the micro (industry) aspect of FDI determinants in the context of Asian developing or industrialising countries has not been fully addressed. This is because of the data limitations and the recent change in the trade and industrial policies, which encourages different forms of direct investment to be undertaken. In recent decades, there have been the significant expansion and diversification of Japanese (export-oriented) FDI activities in Asia. The locational-specific factors such as endowment and policy factors, together with Japanese vertical (input-output) linkages, are argued to play important roles in determining this FDI.

The aim of this research is to investigate the effects of locational and linkage factors on the manufacturing distribution in Japanese FDI in an Asian industrialising country, specifically in the context of Thailand. The study begins by describing the pattern of Japanese FDI undertaken across manufacturing activities in Thailand, assessing different theoretical and empirical studies of FDI, and finally examining the determinants of Japanese direct investment. Finally, it draws implications and provides suggestions for further research.

Chapter II

Japanese FDI in Thailand: Data and Description

Chapter II

Japanese FDI in Thailand: Data and Description

2.1 Introduction

The main problem encountered by empirical studies for developing countries is the lack of disaggregated data on FDI – the dependent variable, which is the starting point in any quantitative analysis (Aswicahyono and Hill, 1995, p. 140). As with other studies, the present study is encountered with such problem. Despite there being available data sources, the data on Japanese inward FDI in Thailand are neither comprehensive nor adequately recorded.

For instance, the Board of Investment (BOI) of Thailand keeps only an information of domestic and foreign companies that are promoted by the BOI; the companies that are granted with tax and tariff concessions. Although the Department of Commercial Registration, Ministry of Commerce, keeps officially declared records of all domestic and foreign companies registered in Thailand, an information is not easily accessible. The DCR is unable to provide a detailed information on Japanese-owned companies (companies of which Japanese hold parts of authorised share capital), unless the registered name of each company is first known. Due to the inadequate recording system of the DCR, it is difficult to directly sort all the names of Japanese-owned companies from the DCR's database. Likewise, the Department of Industrial

Works (Ministry of Industry) keep officially declared records of all manufacturing plants established in Thailand. However, the names and the information of Japanese-owned production plants are not easily accessed, due to the same reason mentioned above – the inadequate recording system.

The list of Japanese companies in Thailand is also available at non-government sources, namely the survey of Japanese companies in Asia by Japanese External Trade Organisation (JETRO). Again, each source is not comprehensive in terms of its coverage. Some do not provides an information regarding dates of establishments, types of manufacturing activities, and amounts of share capital invested.

The intention of this chapter is twofold. First is to discuss the procedure used to compile the industry-level data on Japanese FDI in Thailand, and second is to describe the manufacturing distribution of such FDI using the constructed data. The reminder of this chapter is organised as follows. Section 2.2 describes the data sources and the procedure used to construct FDI data, section 2.3 analyses descriptively the manufacturing distribution of Japanese FDI, and section 2.4 summarises.

2.2 Industry-level Data on Japanese FDI

The industry-level data on Japanese FDI are aggregated from the company-level data collected from various sources. In this analysis, a Japanese

company is defined as a company of which a single Japanese investor (a legal entity) holds at least 10%[1] of a company's authorised share capital - the maximum amount of money that a company seeks to raise from the issue of shares. All companies are those engaged mainly in manufacturing activities.

2.2.1 Procedure

Faced with the limited available data, the industry-level data on Japanese direct investment in Thailand are constructed in line with the procedure shown in figure 2-1. Firstly, the list of Japanese companies is gathered from various published sources: (1) the BOI, (2) the Japanese Chamber of Commerce in Thailand (JCC), (3) the directory of factory in Thailand, (4) the Japan-Thailand trade directory, and (5) the survey of Japanese companies in Asia (JETRO). Subsequently, the detailed information is cross-checked at the Department of Commercial Registration (DCR), Ministry of Commerce. Finally, the company-level data are aggregated up to the industry-level data, grouped according to the industrial classification used for the Thailand's Input-Output table. This classification is very much similar to the UNIDO International Standard Industrial Classification (ISIC) at the 4-digit level, only that some industries are more aggregated or disaggregated (see appendix 2-1). Because the ISIC code is internationally recognised, hereafter the classification used in this analysis is referred as the ISIC at the 4-digit level[2].

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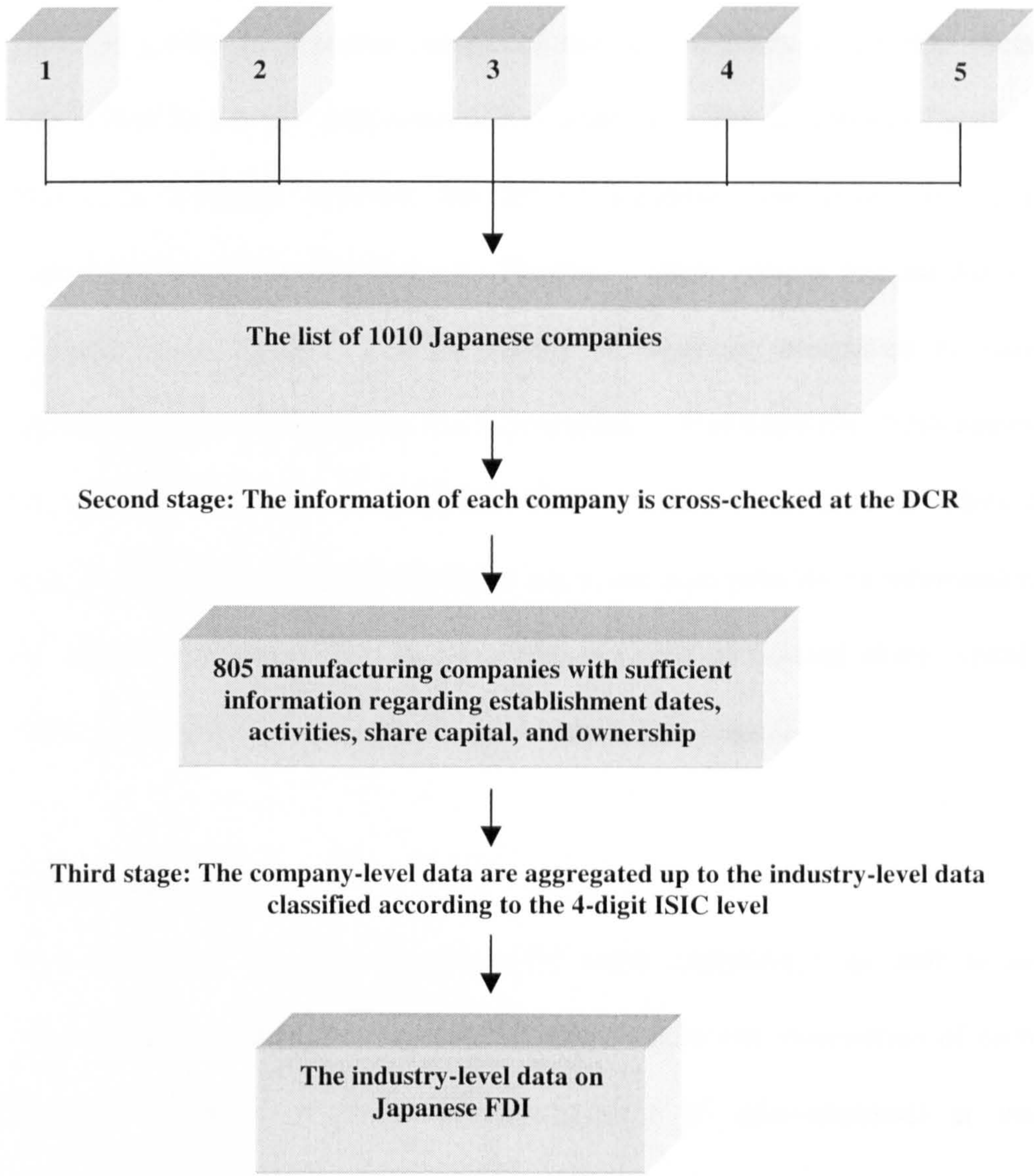
[1] In the past, the BOI defined a company as a foreign if a single foreigner owned at least 1% of a company's authorised share capital. However, the definition has been recently modified to be consistent with the IMF, which defines a company as foreign if a foreigner owns at least 10% of a company's share capital.

[2] A reason for using the classification of the Thai I-O table rather than the ISIC is that the former is more adjusted to suit the Thai manufacturing structure.

Figure 2-1: Procedure used to Compile the Industry-level Data on Japanese FDI



a) First Stage

Each source of FDI data does not provide the comprehensive coverage of the Japanese manufacturing companies. The list of Japanese companies is thus

gathered from five different sources. The main sources are the BOI, the Japanese Chamber of Commerce, and the directory of Japanese factories in Thailand. The BOI provides the list of Japanese companies granted with tax and tariff privileges. The Japanese Chamber of Commerce (JCC) (Thailand) provides the list of Japanese companies that are members of the JCC (both BOI-promoted and non BOI-promoted companies)[3]. The directory of Japanese factory in Thailand provides the list of Japanese companies that have established manufacturing plants in Thailand. Other sources like the Japan-Thailand trade directory and the survey of Japanese companies in Asia (JETRO) provide an additional list of companies. Consequently, 1010 names of Japanese companies are obtained; these companies had been established during 1954-1995. Among these sources, some also provide an information on dates of establishments, business activities, and authorised share capital. However, the information is inconsistent across data sources.

b) Second Stage

With a lack of detailed information (of many companies), as well as an inconsistency of information across the data sources, the information of each Japanese owned company is checked (and / or cross-checked) at the Department of Commercial Registration (DCR), the Ministry of Commerce. The DCR keeps the officially declared records of all business companies registered in Thailand, including the dates of establishment[4], the core

[3] From an interview with the JCC director, about 80% of Japanese companies in Thailand are the members of the JCC.

[4] It refers to the year in which each company had registered as a legal entity at the Department of Commercial Registration (DCR) before starting its business.

activities, the authorised share capital, the changes in authorised share capital (from one year to another), and the percentages of foreign ownership[5]. Due to the inadequate recording system of the DCR, the information of all Japanese companies can only be checked (and / or cross-checked) provided that the names of these companies are known first.

From the sample of 1010 companies, it is found that many companies are not manufacturing companies but wholesale / retail trading companies, as indicated by their core activities reported at the DCR. Furthermore, some are companies of which Japanese own less than 10% of companies' authorised share capital. Lastly, some companies are not found, possibly due to changes in companies' names. All of those companies are excluded from the sample[6]. Finally, the sample size decreases to 805 manufacturing companies of which the information regarding the initial amounts of authorised share capital, the changes in the amounts of authorised share capital, the dates of establishments, and the percentages of share capital (owned by Japanese) are obtained.

c) Third Stage

With the sample of 805 companies (established between 1954-1995), the amounts of authorised share capital of these companies are aggregated up to the industry-level, classified according to the 4-digit ISIC levels (Thai I-O

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[5] It is a percentage of the total amount of money put into a company by Japanese shareholders.

6 There are few companies that are not registered in Thailand but carry out their business operations in Thailand. These companies are also excluded from the sample data due to a lack of information.

table). A 'Guide Book of Industrial Classification' obtained from the National Accounting Division, the Board of Social and Economic Development, Thailand, is used to assign each company into appropriate manufacturing industries. Due to the fact that some Japanese companies are multi-product companies – companies that produce several kinds of manufacturing products, a 'principle product criterion'[7] is applied to allocate those companies into appropriate industrial groups.

Following the procedure described above, the cumulative stocks of authorised share capital of Japanese companies across 85 Thai manufacturing industries are obtained (see appendix 2-1 for the detail of the industrial classification). The cumulative stock of Japanese FDI in industry j in 1995 is defined as the total amount of authorised share capital of all companies operating in that industry recorded at the year-end of 1995. The changes in the amounts of authorised share capital of Japanese companies over years (an increase or a decrease of share capital) are also taken into account. Finally, this value (FDI stock) is converted to the US dollar, using the bilateral exchange rate (market rate) of 1995 obtained from the IMF Financial Statistical Yearbook[8].

2.2.2 Data Weaknesses

Although the constructed industry-level data described above serve the purpose of the present analysis, there are potential weaknesses associated with

[7] Firms are classified into appropriate industries according to their main products.
[8] This is for a consistency in terms of a unit value of measurement between a dependent variable (FDI) and independent variables (see discussions in chapter V).

such data. Firstly, the term 'authorised share capital' is quite broad, defined as the amount of money that a company seeks to raise by issuing shares. According to Thai business law, two main classes of share can be issued; ordinary and preference share. Ordinary share is a fixed unit of a company's share capital that provides a profit (dividend) related to the declared total profits of the company, and that carries a voting right in the company. Preference share, on the other hand, is a fixed unit of a company's share capital that provides a fixed rate of interest. It is paid before the dividends are paid on ordinary shares and first repaid if the company is liquidated. In contrast to ordinary shares, preference shares carry no voting rights. Concerning the information obtained on authorised share capital, there is a problem in identifying whether shares issued are preference or ordinary shares. Ideally, the use of data on ordinary share would serve the objective of FDI analysis since it involves the potential control by foreign investors of a company. By checking on the balance sheets of Japanese companies between 1994-1995 (operating years), it is found that all shares issued were ordinary shares. However, the classes of shares issued prior to such periods are not known due to a lack of historical records. Thus, caution must be used when aggregating up the amount of share capital of each Japanese company because there may be a mixture of preference and ordinary shares issued.

The second problem is concerned with a difference between the value of authorised share capital (the amount of money aimed to acquire) and the value of paid up share capital (the actual amount of money received). Even though the Thai business law requires that all authorised shares must be issued (BLC,

1995), they can be issued at par value, premium value, or discount value. To illustrate, when shares are issued at par value, it means that a share of 100 Baht at nominal value would be issued for 100 Baht. However, when shares are issued at premium value, a share of 100 Baht at nominal value would be issued greater than 100 Baht. On the other hand, if shares are issued at discount value, they are issued below par. From the data on authorised share capital, it is difficult to identify the true price of shares being issued. It is not known for certain whether shares had initially been issued at par value. Likely, the value of paid up share capital may have been either below or above par. Therefore, by using the values of authorised share capital, there is a potential problem of over- and / or under-recording of the true value of the starting (and / or expanding) share capital of each Japanese company.

Thirdly, although there is no minimum requirement for the starting share capital according to Thai business law (BLC, 1995), the amount of invested capital may be overstated due to the criteria set by the BOI for project approval. To clarify, an investment activity promoted by the BOI is subject to certain requirements if the starting value of share capital is less than 200 million Baht. For example, value added must be at least 20% of the total sale, modern machinery and production processes must be used, and adequate environmental protection systems must be installed. In this regard, some companies might over-report the stating values of their investment projects in order to be exempted from the BOI requirements. Nonetheless, by checking from the list of BOI promoted companies, it is found that the amounts of invested share capital by the majority of Japanese companies are below 100

million Baht.

In relation to that mentioned above, there may also be a problem of underreporting of companies promoted by the BOI. In other words, some companies with the values of invested share capital below the minimum requirement (200 million Baht) may also be exempted from the BOI requirements due to specific reasons (e.g. bureaucratic corruption). Therefore, they are not officially reported under the list of BOI promoted companies.

The fourth problem is concerned with the percentage of share capital owned by Japanese investors. Specifically, the information obtained from the DCR is the percentage of authorised share capital held by Japanese investors in 1995, not the years when the businesses had been started. Hence, it may be a case that historical changes in authorised share capital (increasing and decreasing share capital) led to some changes in the proportion of authorised share capital held by Japanese investors (i.e. buying new shares or selling old shares). Within the sample of 805 Japanese companies, some companies might not have been originally owned and controlled by Japanese.

Fifthly, pertaining to the point made above, for those companies not originally owned by Japanese, the proportion of share capital currently owned may not truly reflect Japanese interests in gaining control over the companies. In other words, Japanese investors might have bought several shares with an expectation for future capital gain and did not have strong interests in gaining controls over decision-makings nor management of those companies. The

obvious case is when a business organisation is in a form of public limited company. Within the sample of Japanese companies used in the present analysis, about 10 out of 805 companies are registered as public companies.

Lastly, although the present sample consists of Japanese companies established between 1954 and 1995, all of these companies were in operation in 1995. Potentially, there could be several companies that had either gone out of business or left Thailand before 1995. Unfortunately, it is not possible to identify those companies due to the inadequate recording system of the DCR. Besides, the published sources of Japanese companies used are only available at the recent times, and thus it is difficult to trace back the names and the financial records of those companies.

2.3 Descriptive Analysis

Using the constructed data described above, this section analyses descriptively the manufacturing distribution of Japanese FDI in Thailand. The section is separated into two parts. Before proceeding to the descriptive analyses of Japanese FDI in Thailand, the first part looks at a broader picture of what has happened to Japanese FDI in Asia, other regions, and the world as a whole. Then, the second part describes the manufacturing pattern of Japanese FDI in Thailand, classified at the 2-, 3-, and 4-digits ISIC level. For simplicity, the manufacturing activities classified according these 2-, 3-, and 4-digits are named as sectors, sub-sectors, and industries respectively.

2.3.1 Japanese FDI in Global Perspective

There are three episodes of the remarkable growth of Japanese outward FDI after the post war period (Machado, 1996, p. 42-43). The first boom period began in the late 1960s though out the mid 1970s. This was the period when Japan experienced a healthy economic situation in terms of a rapid economic growth, a surplus on the balance of payments, and an appreciation of the Yen. An elimination of controls on capital movements also encouraged Japanese firms to seek business opportunities abroad. The second period was between the late 1970s and the mid 1980s when there was a restructuring of manufacturing industry in Japan. Due to an increase in labour costs, firms in labour-intensive industries had lost their competitive cost advantages and thus sought new locations where they could still exploit such advantages. In addition, the continued trade frictions between Japan and the USA had led some firms to undertake FDI in the USA in order to avoid trade barriers. The recent boom period began after the mid 1980s throughout the early 1990s, mainly due to the appreciation of the Japanese Yen against the US Dollar. This was mainly associated with the chronic trade surplus of Japan with its major trading partners (the USA and Europe). A G7 meeting (the so-called 'Plaza accord') forced Japanese Yen to adjust upward in 1985. One of the effects of this currency appreciation on FDI was that the increase in the value of the Yen reduced prices of foreign assets in relation to domestic ones. This thus increased the ability of Japanese firms to acquire those assets aboard. Partly, Japanese purchases of overseas assets appeared in forms of FDI (see Froot and Stein, 1991; Klein and Rosengren, 1994). The Yen appreciation

also reduced the competitiveness of some Japanese firms in exporting industries, where products were price sensitive. Hence, the rising price of exports induced manufacturing firms from Japan to relocate their production bases overseas, especially in low cost countries to minimise their production costs[9]. Apart from the exchange rate appreciation, the trade barriers imposed by the USA and the EU, together with the global strategies of large Japanese companies to expand their world market shares, were also important causes of Japanese 'outward' FDI.

Table 2-1 shows the geographical distribution of Japanese 'outward' FDI. It is apparent that Japanese FDI was not uniformly undertaken across regions during the boom periods. The North American region received the largest cumulative stock of Japanese FDI (202,690 million US Dollar), accounting for more than 40 per cent of the total FDI. This was followed by FDI in Europe (89,867 million US Dollar) and Asia (76,216 million US Dollar).

Although the stock of Japanese FDI in Asia was smaller than that in Europe, the number of projects undertaken in this region was greater (23,963 vs. 9,560), accounting for more than 30 per cent of the total project undertaken world-wide. From the relatively small value of FDI in Asia, it may be inferred

[9] As noted by Kawai and Urata (1998, p.256), "to cope with the rising price of exports and costs of labour, Japanese firms in the tradable sector had three choices. First, they could allocate their productive resources (capital, labour, R&D stocks, and managerial resources) away from the tradable sector to the non-tradable sector. Second, they could upgrade their technology and productivity within the tradable sector and increase the proportion of high value-added products. The third choice was that Japanese firms could move their production base from the home market to foreign countries where production costs were lower".

that the average size of Japanese FDI in this region was relatively small, as compared to that in North America or Europe.

Table 2-1: Japanese Outward FDI (1961-1994) by Region (Million of US Dollar)

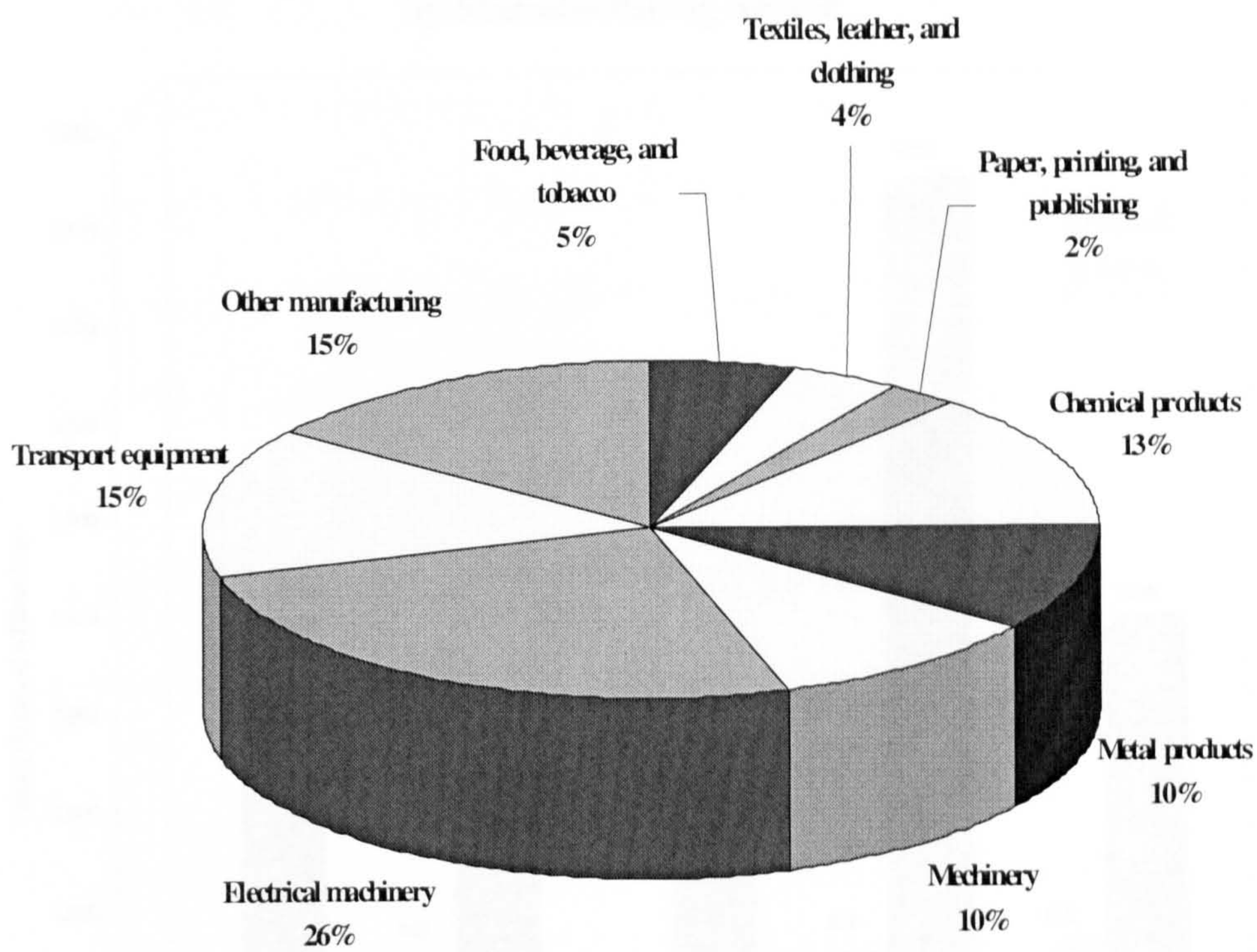
Region	No. of Project	% of Total	Value	% of Total
North America	28,684	37.0	202,690	43.7
Latin America	8,424	10.9	55,148	11.9
Asia	23,963	30.9	76,216	16.4
NICs	11,898	15.4	32,681	7
Korea	1,984	2.6	5,268	1.1
Taiwan	2,615	3.4	3,997	0.9
Hong Kong	4,371	5.6	13,881	3
Singapore	2,928	3.8	9,535	2.1
ASEAN	8,447	10.9	33,339	7.2
Indonesia	2,374	3.1	16,981	3.7
Thailand	**3,106**	**4.0**	**7,184**	**1.5**
Malaysia	1,899	2.5	6,357	1.4
Philippines	1,068	1.4	2,817	0.6
China	2,931	3.8	8,729	1.9
India	213	0.3	462	0.1
Vietnam	81	0.1	2,383	0.5
Middle East	394	0.5	4,737	1
Europe	9,560	12.3	89,867	19.4
Africa	1,644	2.1	7,698	1.7
Occeania	4,838	6.2	27,250	5.9
Total	**77,507**	**100.0**	**463,606**	**100**

Source: Monthly Financial Review, Ministry of Finance, Japan (various issues). The data are recorded by fiscal year that begins in April. FDI includes money lending from Japanese commercial banks to Japanese subsidiaries overseas, acquisition of securities, and equity transfer from parent companies. For more details, see Farrell (2000, pp. 18-19).

Within the Asian region, Indonesia received the largest stock of FDI (16,981 million US Dollar), followed by Hong Kong (13,881 million US Dollar), and Singapore (9,535 million US Dollar). Although Thailand ranked the fifth in terms of the invested value after China (7,184 million US Dollar), the number of projects initiated in Thailand was relatively large (3,106); the largest figure

recorded for Asian industrialising countries apart from Hong Kong. Among the ASEAN countries, it is also observed that the average value of FDI in Thailand was relatively small (2.3 million US Dollar), as compared to Indonesia (7.2 Million US Dollar). Possibly, the difference in the average size of investment is due to dissimilar types of FDI activities being carried out. The relatively large capital-intensive activities might have been carried out in Indonesia (particularly in petroleum and mining industries).

Figure 2-2: Japanese Outward FDI (1982-1996) by Manufacturing Sector

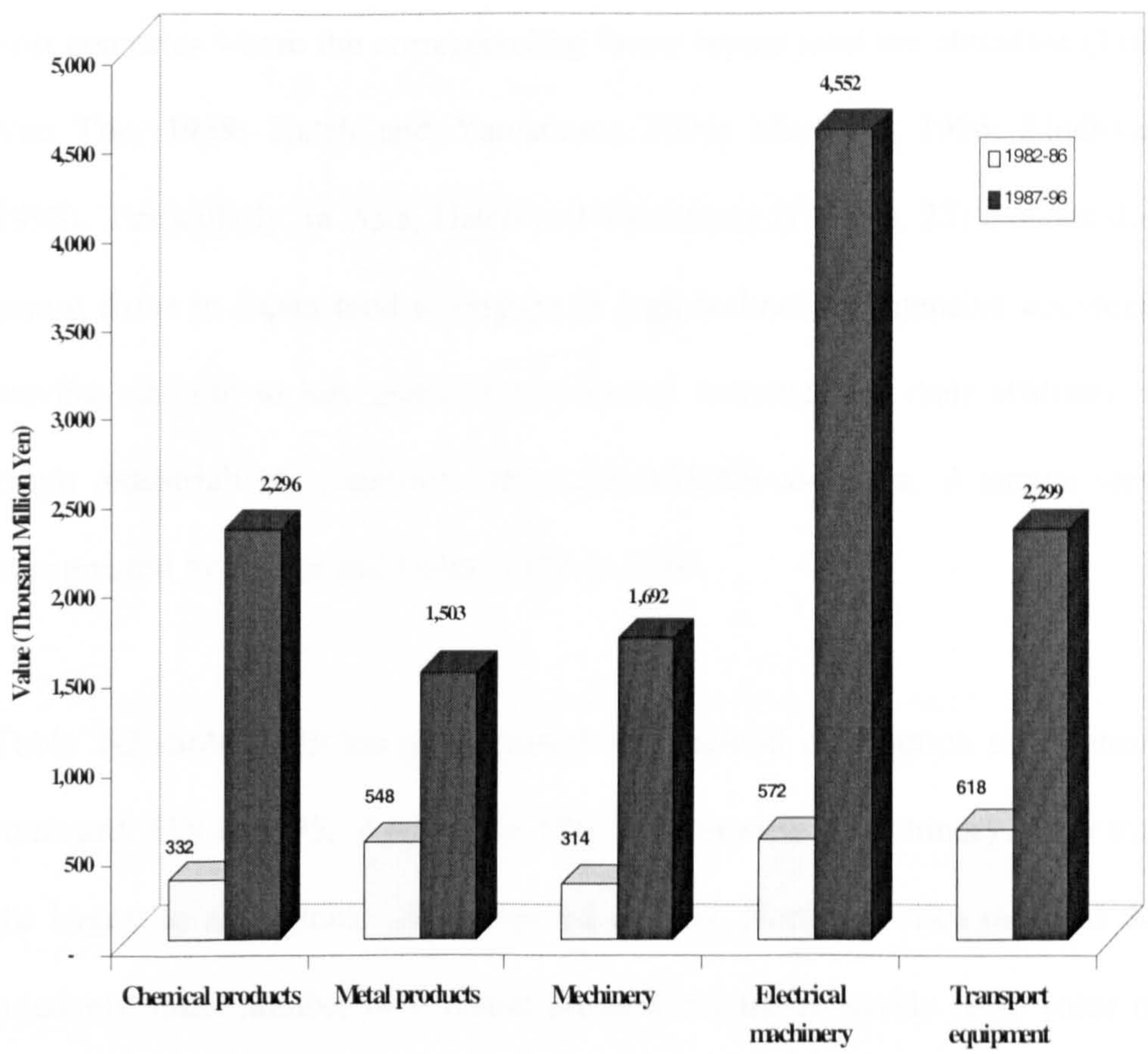


Source: Ministry of Finance, Japan

Figure 2-2 shows the sectoral distribution of Japanese 'outward' FDI. It is apparent that FDI varied across the major manufacturing sectors and tended to be more concentrated in some sectors than others. During 1982-1996,

Japanese outward FDI was mostly concentrated in the electrical machinery sector (5,123 hundred million Yen), followed by the transport equipment sector (2,916 hundred million Yen), and the chemical sector (2,627 hundred million Yen). FDI in these sectors accounted for almost 60 per cent of the total manufacturing 'outward' FDI undertaken in that period. Since the most recent boom period for Japanese FDI was during the mid 80s through out the early 90s, figure 2-3 compares the values of investment undertaken in two different periods, 1982-86 and 1987-96.

Figure 2-3: Japanese Outward FDI (1982-1986 and 1987-1996) by Manufacturing Sector



Source: Ministry of Finance, Japan

It is apparent that, prior to 1987-96, FDI in the five most important manufacturing sectors varied but not to a great extent. The largest FDI was in the transport equipment sector (617 hundred million Yen), whereas the smallest was in the industrial machinery sector (314 hundred million Yen). Yet, in the second period, FDI in the electrical machinery sector rose disproportionately, more than six-fold. This consequently led to a large concentration of 'outward' FDI in this sector in the second period. Arguably, such sector tends to be multi-production process sector with different stages of production requiring different types of factor inputs. It is possible that Japanese firms seek to locate different production activities in a wide range of host countries where the corresponding factor inputs used are abundant (Tran Van Thu, 1989; Hatch and Yamamura, 1996; Machado, 1996; Lindblad, 1998). Particularly, in Asia, Hatch and Yamamura (1996, p. 23) indicate that parent firms in Japan tend to engage in high technology-intensive activities, leaving medium to low technology-intensive activities for their affiliates in newly industrialising countries (NICs) and ASEAN countries. A similar view is expressed by Kawai and Urata (1998, p. 266).

Table 2-2 shows both the geographical and sectoral distribution of Japanese 'outward' FDI in 1995. Apparently, FDI in the electrical machinery sector was the largest in all regions. As compared to Asia, North America received the relatively small number of invested projects but the relatively large value of investment. Particularly, in the electrical machinery sector, despite the smaller number of projects being undertaken in North America than in Asia (61 vs. 139), the value of investment was larger (3,732 hundred million Yen in North

America vs. 2,059 hundred million Yen in Asia). Also, when considering all manufacturing industries, it is observed that the number of FDI projects undertaken in North America was smaller than in Asia (226 vs. 826), but the value of investment was greater (9,904 vs. 7,466 hundred million Yen). This implies that Japanese FDI in North America tends to be relatively more capital intensive than that in Asia. In contrast to North America and Asia, Europe received the relatively small volume of investment undertaken, whether measured in terms of the value or the number of projects initiated. Yet, the average value of investment in Europe was still greater than that in Asia (30.8 vs. 9 hundred million Yen).

Table 2-2: Japanese Outward FDI (1995)
by Region and Manufacturing Sector (Hundred Million Yen)

Industry/ Region	North America		Asia		Europe	
	No. Project	Value	No. Project	Value	No. Project	Value
All industries	226	9,904	826	7,466	105	3,234
Electrical machinery	61	3,732	139	2,059	15	873
Transport equipment	21	2,559	81	897	13	732
Metal products	22	699	125	1,068	7	66
Chemical products	14	721	61	1,004	12	551
Machinery equipment	32	490	71	625	19	438
Food	11	169	37	314	6	221
Pulp and paper	1	399	31	258	7	15
Textiles	18	75	166	403	18	160
Others	46	1,060	115	839	8	178

Source: Ministry of Finance, Japan

In summary, when FDI is measured by the value of investment projects, the level of Japanese outward FDI in Asia was relatively small, as compared to that in North America and Europe. In contrast, when measured by the number of projects initiated, Japanese FDI in Asia was relatively large. It may be inferred that the characteristics of FDI activities carried by Japanese firms in

the Asia and the North America / Europe are not the same. FDI in the former is likely to be relatively labour-intensive and mostly undertaken by small- and medium-size firms (Machado, 1996). By contrast, FDI in the latter is likely to be relatively capital- and technology-intensive investment. From figures 2-2 and 2-3, it is observed that FDI was mostly concentrated in the electrical machinery and transport equipment sectors. These sectors tend to be multi-production process sectors with different stages of production requiring different types of factor inputs. It is possible that Japanese firms aim to establish production plants in different host locations according to local endowments (or comparative advantages).

With an overview of manufacturing the 'outward' FDI from Japan, the next section analyses descriptively the manufacturing distribution of Japanese 'inward' FDI in Thailand, using the constructed data discussed in section 2.2.

2.3.2 Manufacturing Distribution of Japanese FDI in Thailand

The movements of Japanese FDI in Thailand can be categorised into three periods. The first period was prior to 1980 when much FDI was in form of import substituting FDI; raw materials and intermediate parts were imported from Japan and assembled in Thailand for the propose of domestic market sales. The number of FDI projects initiated was not significant, and much FDI was undertaken in three main activities, automobiles, household electronic appliances, and textiles (Ministry of Foreign Affairs, 1996). The second wave of Japanese FDI was due to the appreciation of Japanese Yen pressuring

several Japanese firms to move abroad seeking a cheaper production base. This happened after the mid 1980s and through the early 1990s. When the Yen once again appreciated due to the US trade imbalance with Japan in the early 90s, the third wave began in 1993 till 1996. The value and number of investment projects undertaken by Japanese dropped substantially in 1997-98 due to the economic instabilities resulting from the crisis in financial sector in Thailand. It is aware that the investment situation in this recent period was not typical and could not be taken as a part of the normal investment trend.

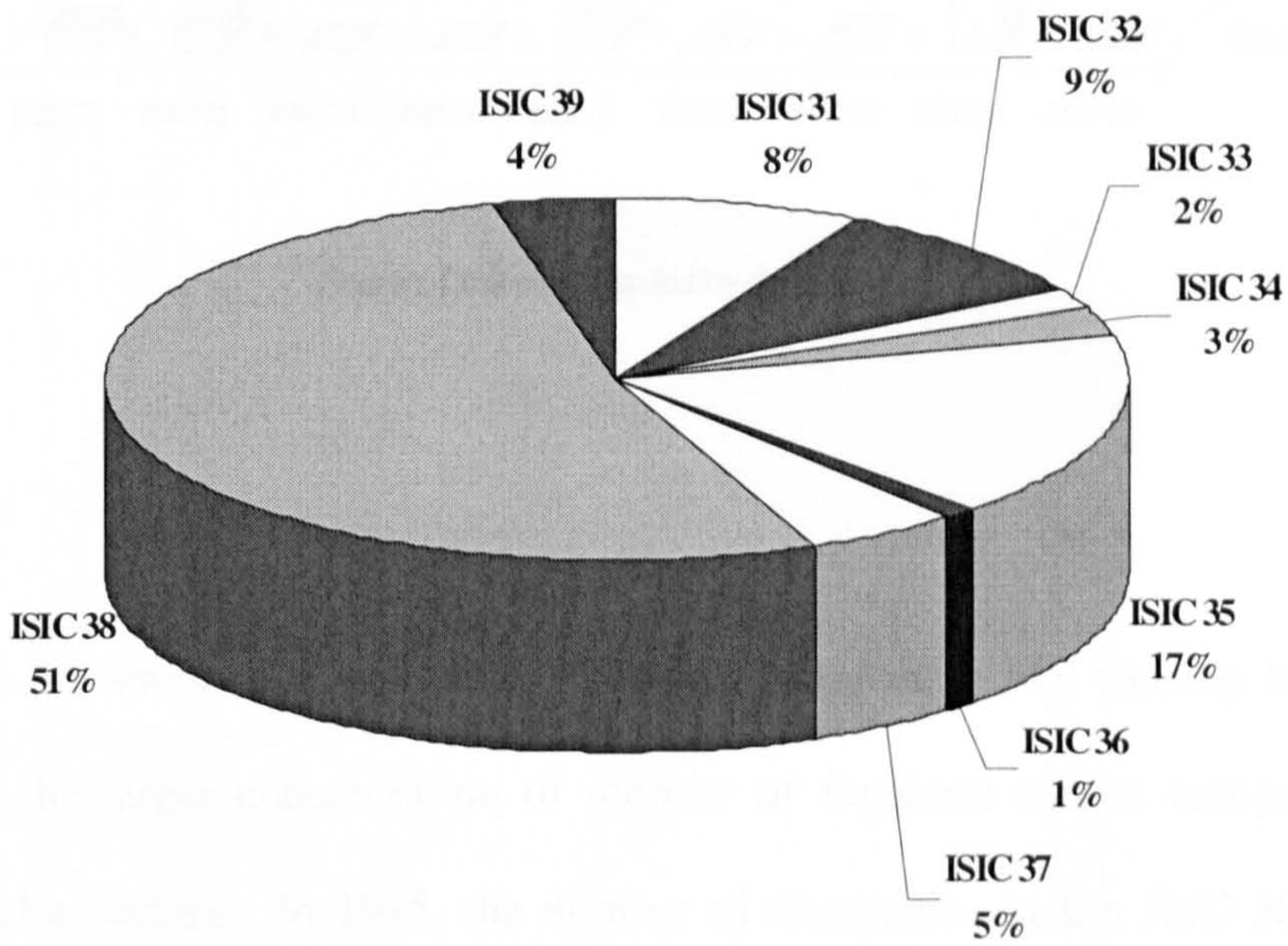
As previously seen from table 2-1, Japanese FDI in Thailand was relatively small as compared to the total outward FDI (1.5 % of the total). However, despite the small size of investment, Japanese FDI accounted for more than 40 per cent of the total inward FDI stock in this country (the Board of Investment of Thailand, 1995). Therefore, the importance of Japanese FDI (in relation to non-Japanese FDI) in Thailand cannot be neglected. The following parts discuss the manufacturing pattern of Japanese FDI in Thailand, measured by the number, the value of share capital, and the employment of Japanese-owned companies. FDI is classified at three different levels: the sectoral level (2-digit), the sub-sectoral level (3-digit), and the industry-level (4-digit).

a). FDI Measured by the Number of Japanese Companies

At the 2-digit ISIC level, figure 2-4 shows the sectoral composition of Japanese FDI measured in terms of the number of new Japanese companies established during 1954-1995. It is apparent that Japanese FDI was not evenly distributed across manufacturing sectors but more concentrated in some

sectors than others. As observed from figure 2-4, more than half of the total Japanese companies (used in this study) were concentrated in the fabricated metal products, machinery, and equipment sector (ISIC 38), and 17 % of these companies was in the chemical, petroleum, rubber, and plastics sector (ISIC 35). By contrast, there were very few companies operating in the wood products and furniture (ISIC 33) and non-metallic mineral products sectors (ISIC 36).

Figure 2-4: Number of Japanese Companies (1954-1995) by Manufacturing Sector (2-digit ISIC Level)

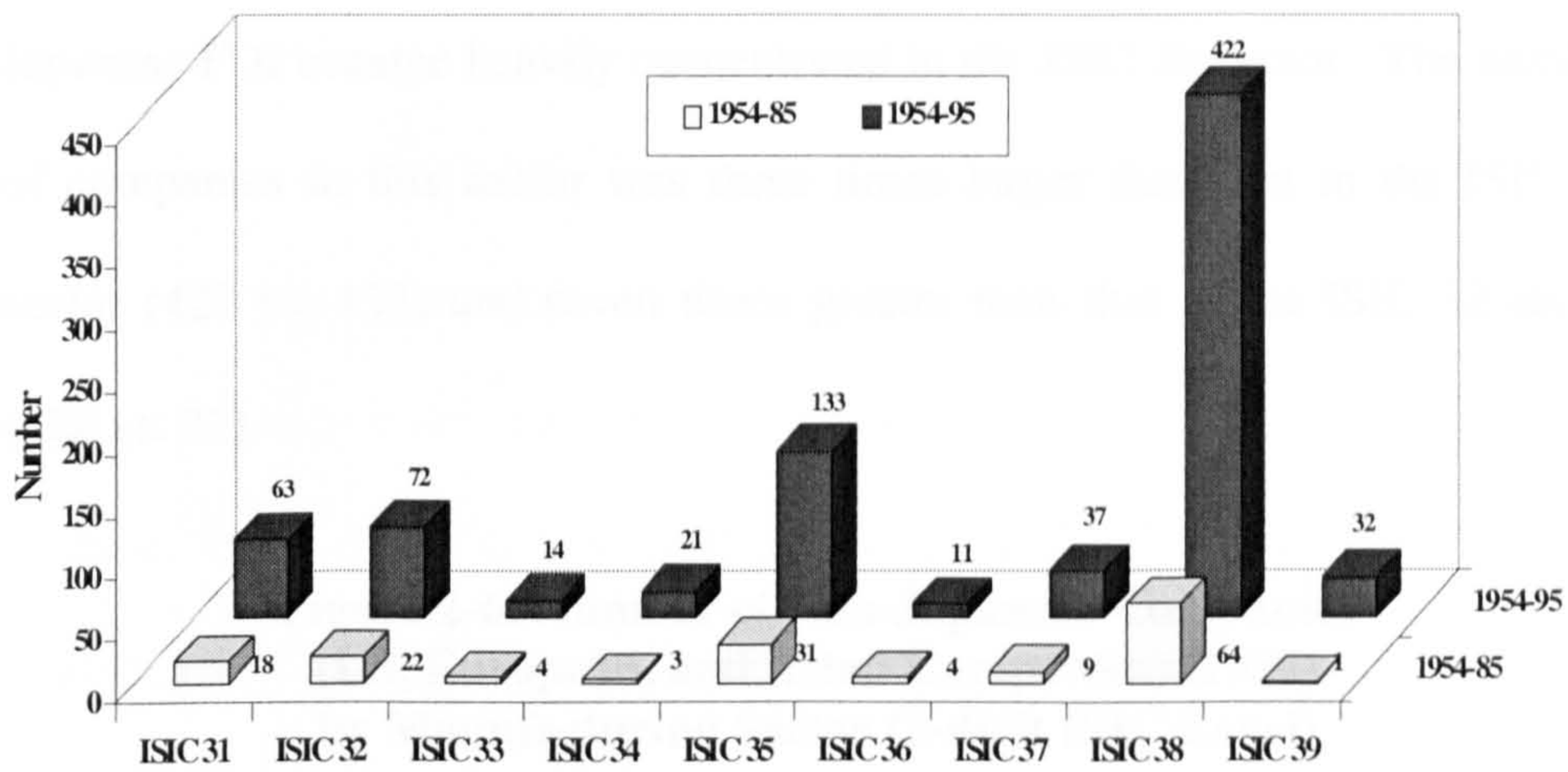


Source: Data are compiled by the author

Separating between the two periods, figure 2-5 compares the cumulative number of Japanese-owned companies at the year-end of 1985 and 1995. As mentioned earlier, Japanese FDI increased substantially after the mid 1980s

due to the Yen appreciation and rising costs of labour in Japan.

Figure 2-5: Number of Japanese Companies (1954-1985 and 1954-1995) by Manufacturing Sector (2-digit ISIC Level)

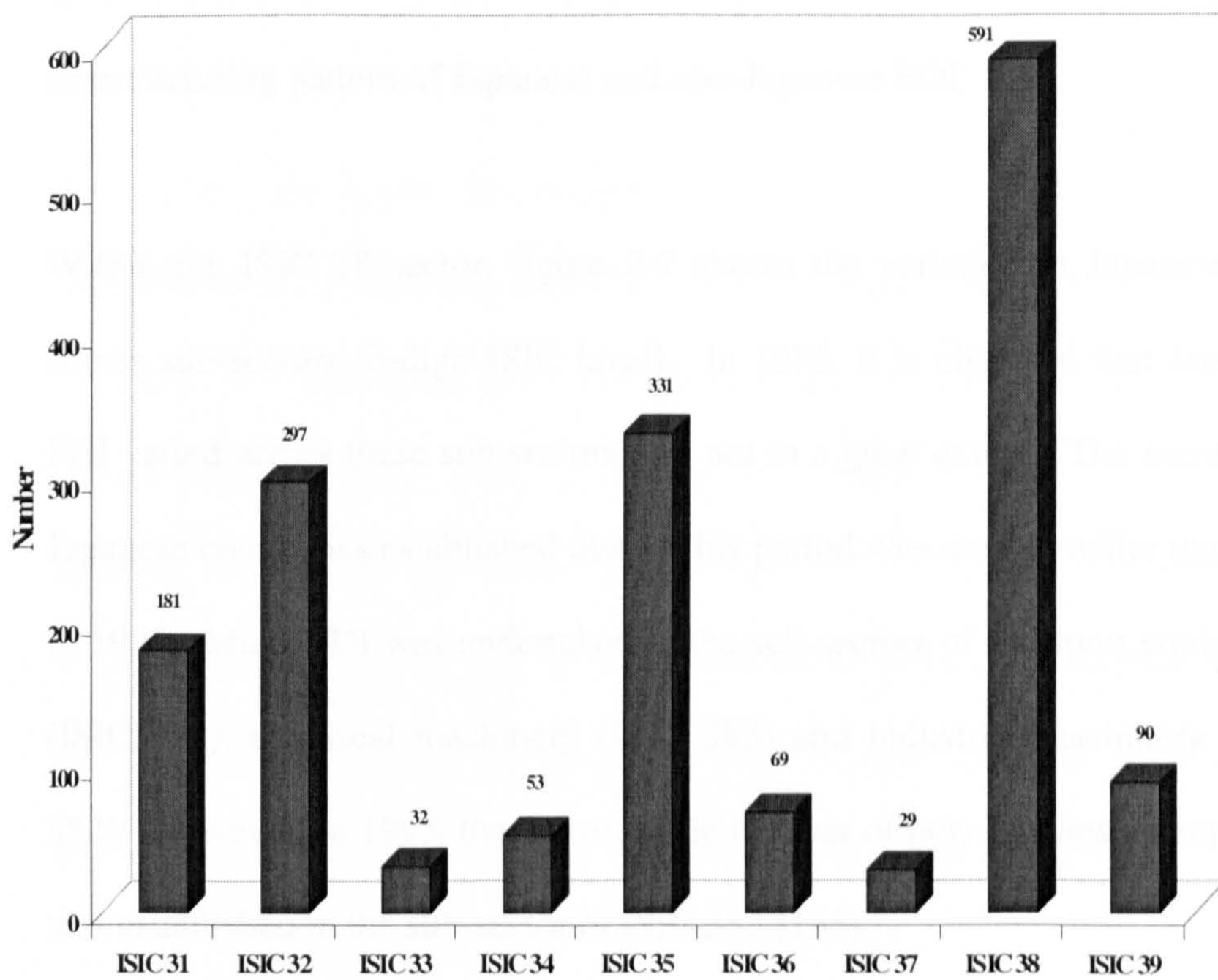


Source: Data are compiled by the author

Figure 2-5 shows that such recent increase in Japanese FDI (during 1986-95) led to the larger concentration of number of Japanese owned companies in particular sectors. In 1985, the number of companies in the ISIC 38 sector (fabricated metal products, machinery, and equipment) was twice as large as that in the ISIC 35 sector (chemicals, petroleum, and plastic products), and three times larger than that in the ISIC 32 sector (textiles, wearing apparel, leather, and footwear). However, in 1995, the number in the ISIC 38 sector rose tremendously, more than five-fold (64 companies in 1985 vs. 422

companies in 1995). Those in the ISIC 35 and the ISIC 32 also increased but to the lesser extents (31 companies in 1985 to 133 companies in 1995 for the ISIC 35 sector and 22 companies in 1985 to 72 companies in 1995 for the ISIC 32 sector). By contrast, the number of companies in the wood products and furniture (ISIC 33) and the non-metallic mineral sectors (ISIC 36) remained relatively small (14 companies and 11 companies respectively). In this period, Japanese FDI became heavily concentrated in the ISIC 38 sector. The number of companies in this sector was three times larger than that in the ISIC 35 sector (422 vs. 133) and seven times greater than that in the ISIC 32 sector (422 vs. 72).

Figure 2-6: Number of Non-Japanese Companies (US, European, and Asian Companies) (1996) by Manufacturing Sector (2-digit ISIC Level)

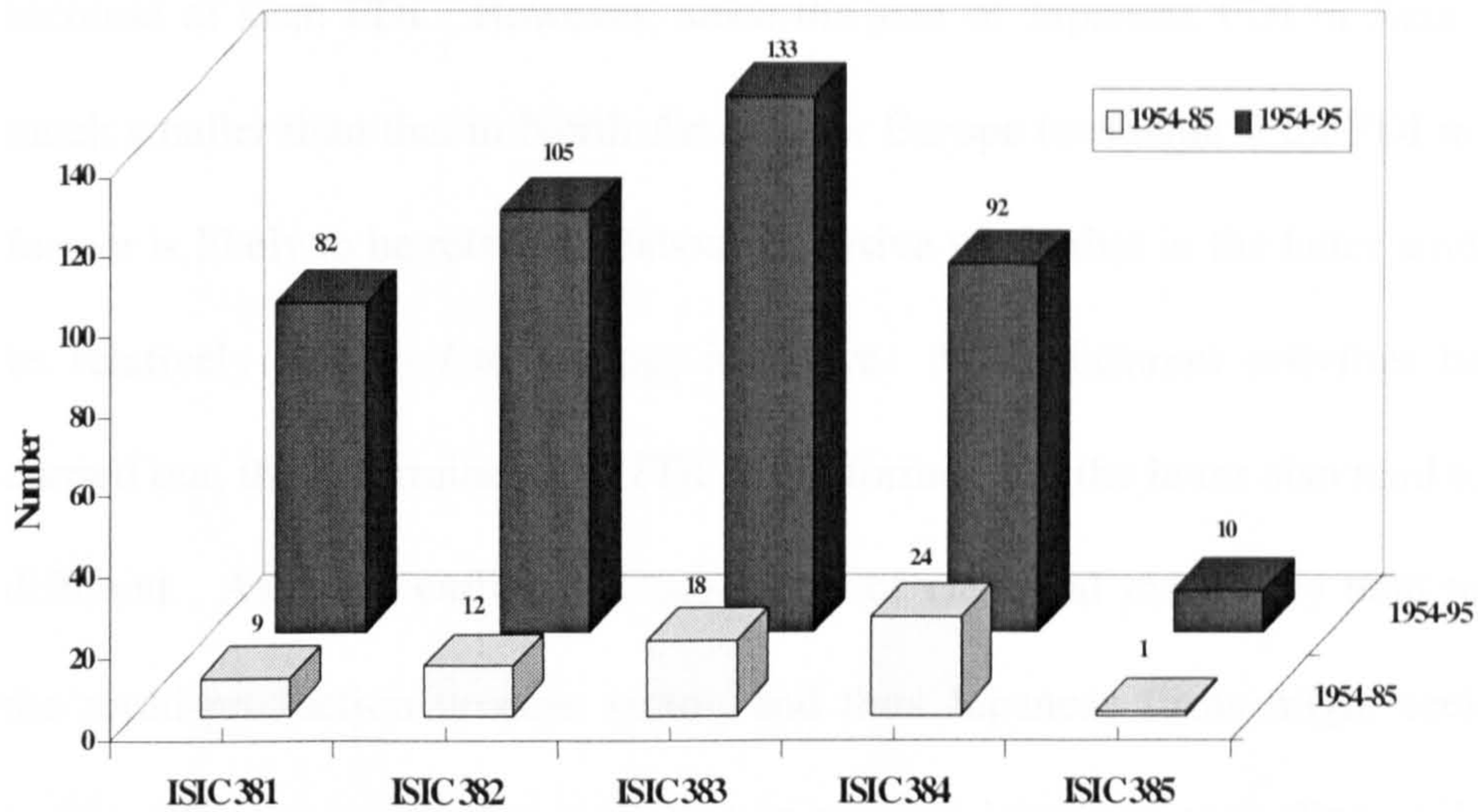


Source: Office of National Statistics, 1997

So far, the manufacturing pattern of non-Japanese FDI has not been shown. One may wonder whether the pattern of Japanese FDI just described (figure 2-5) differ from that of non-Japanese FDI in Thailand. Thus, figure 2-6 shows the sectoral variation in the number of non-Japanese companies (2-digit) operating in Thailand in 1996. On comparing figure 2-5 with figure 2-6, it is observed that they are very similar. The number of non-Japanese companies was largely concentrated in the fabricated metal products, machinery, and equipment sector (ISIC 38), and to a lesser extent in the chemicals, petroleum, rubber, and plastic products sector (ISIC 35). Similar to figure 2-5, figure 2-6 shows that there were fewer companies operating in the wood products and furniture (ISIC 33), the basic metal products (ISIC 37), and the non-metal products sectors (ISIC 36). With this similarity, one may argue that locational-specific factors of Thailand played important roles in determining the manufacturing pattern of Japanese and non-Japanese FDI.

Within the ISIC 38 sector, figure 2-7 shows the variation in Japanese FDI across sub-sectors (3-digit ISIC level). In 1985, it is observed that Japanese FDI varied across these sub-sectors, but not to a great extent. The number of Japanese companies established during this period was much smaller than that in 1995. Much FDI was undertaken in the sub-sectors of transport equipment (ISIC 384), electrical machinery (ISIC 383) and industrial machinery (ISIC 382). However, in 1995, the considerable number of new Japanese companies was established in the sub-sector of ISIC 383 (155).

Figure 2-7: Number of Japanese Companies (1954-1985 and 1954-1995) within the ISIC 38 sector (3-digit ISIC Level)



Source: Data are compiled by the author

Significantly, the number of companies in this sub-sector rose more than eight-fold from 1985. In this period (1954-1995), Japanese FDI was concentrated in the ISIC 383 sub-sector (133 companies), and to a lesser extent in the fabricated metal (ISIC 381), the industrial machinery (ISIC 382), and the transport equipment sub-sectors (ISIC 384) (82, 125, and 92 companies respectively). However, FDI in the sub-sector of scientific equipment (ISIC 385) remained relatively low despite a large increase from the low base of 1985 (an increase from 1 company in 1985 to 10 companies in 1995).

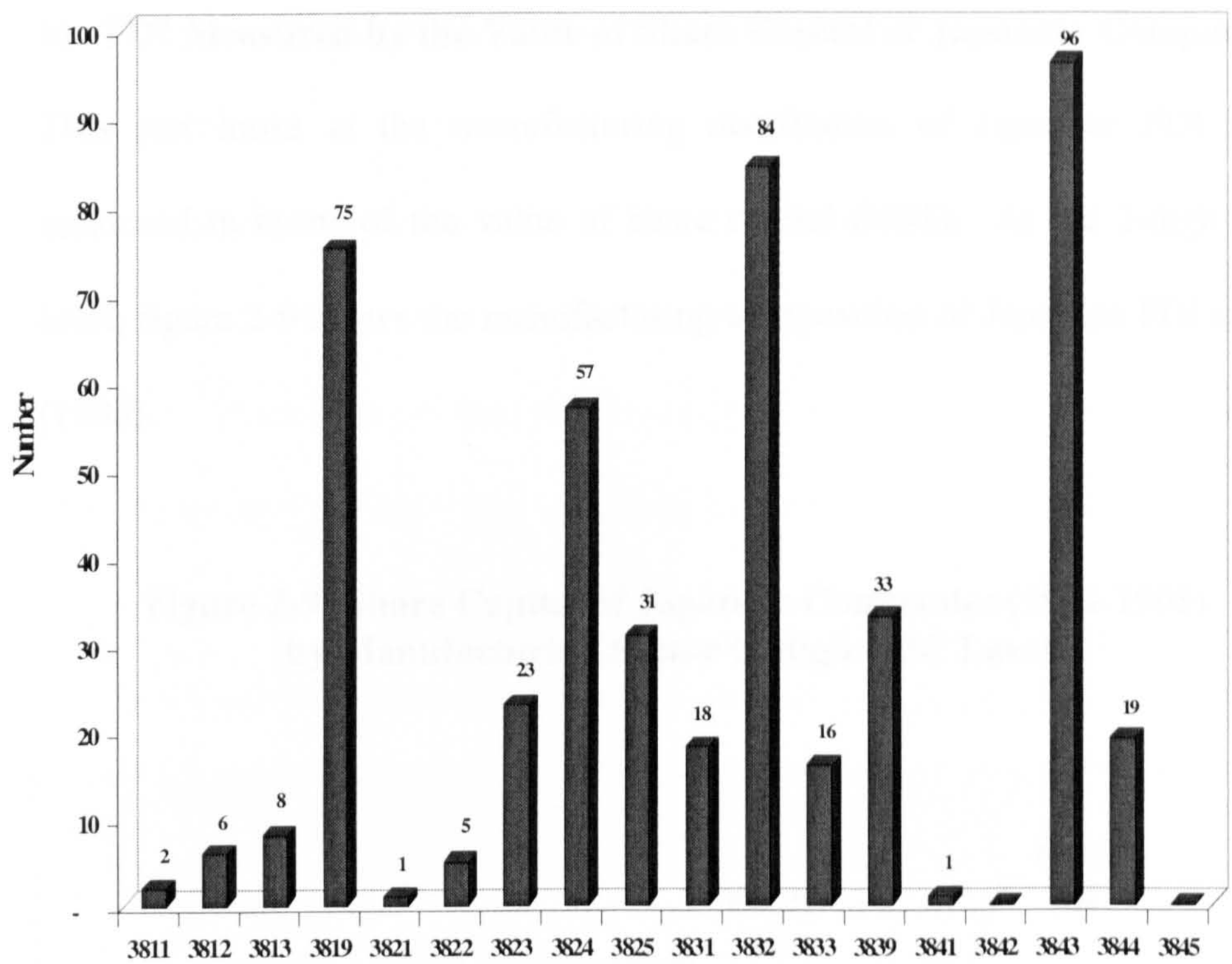
Referring back to figure 2-2, it is found that the 'outward' Japanese FDI during

1986-1996 was also the greatest in the sub-sector of electrical machinery. It is possible that there were some common factors (e.g. the Yen appreciation and / or Japanese industrial competitiveness) which influenced the significant increase of such FDI. However, since the size of Japanese FDI in Asia was much smaller than that in North America or Europe (see table 2-2), FDI in the former is likely to be relatively labour intensive while that in the latter tends to be relatively capital- / technology-intensive. With different activities being carried out, the determinants of FDI in the former and the latter also tend to be different. As noted earlier, the sub-sector of electrical machinery tend to be the multi-production process sector, and thus Japanese firms might seek to locate different production activities in various locations according to local endowment or comparative advantages. It is possible that the comparative advantages of Thailand lie in terms of cheap unskilled labour as well as fiscal incentives provided by the Thai government.

At the more disaggregate level within the ISIC 38 sector, figure 2-8 shows that Japanese FDI varied greatly from one industry (4-digit ISIC level) to another. Some manufacturing industries did not receive (or host) any FDI during the specified period (1954-1995) while others received the disproportionately large amounts of FDI. For instance, the capital-intensive industries like railroad equipment industry (ISIC 3842) and aircraft industry (ISIC 3845) did not receive any FDI. Furthermore, there was only the small number of companies in the engines and turbines industry (ISIC 3821) and ship building industry (ISIC 3841). On the other hand, the large number of companies was concentrated in the relatively labour-intensive industries such as fabricated

metal products industry (ISIC 3819), radio, television, and communication equipment industry (ISIC 3832) and motor vehicle industry (ISIC 3843). Apparently, the ISIC 3843 industry received the greatest number of Japanese companies (96 companies), followed by the ISIC 3832 industry (84 companies), and the ISIC 3819 industry (75 companies).

Figure 2-8: Number of Japanese Companies (1954-1995) within the ISIC 38 Sector (4-digit ISIC Level)



Source: Data are compiled by the author

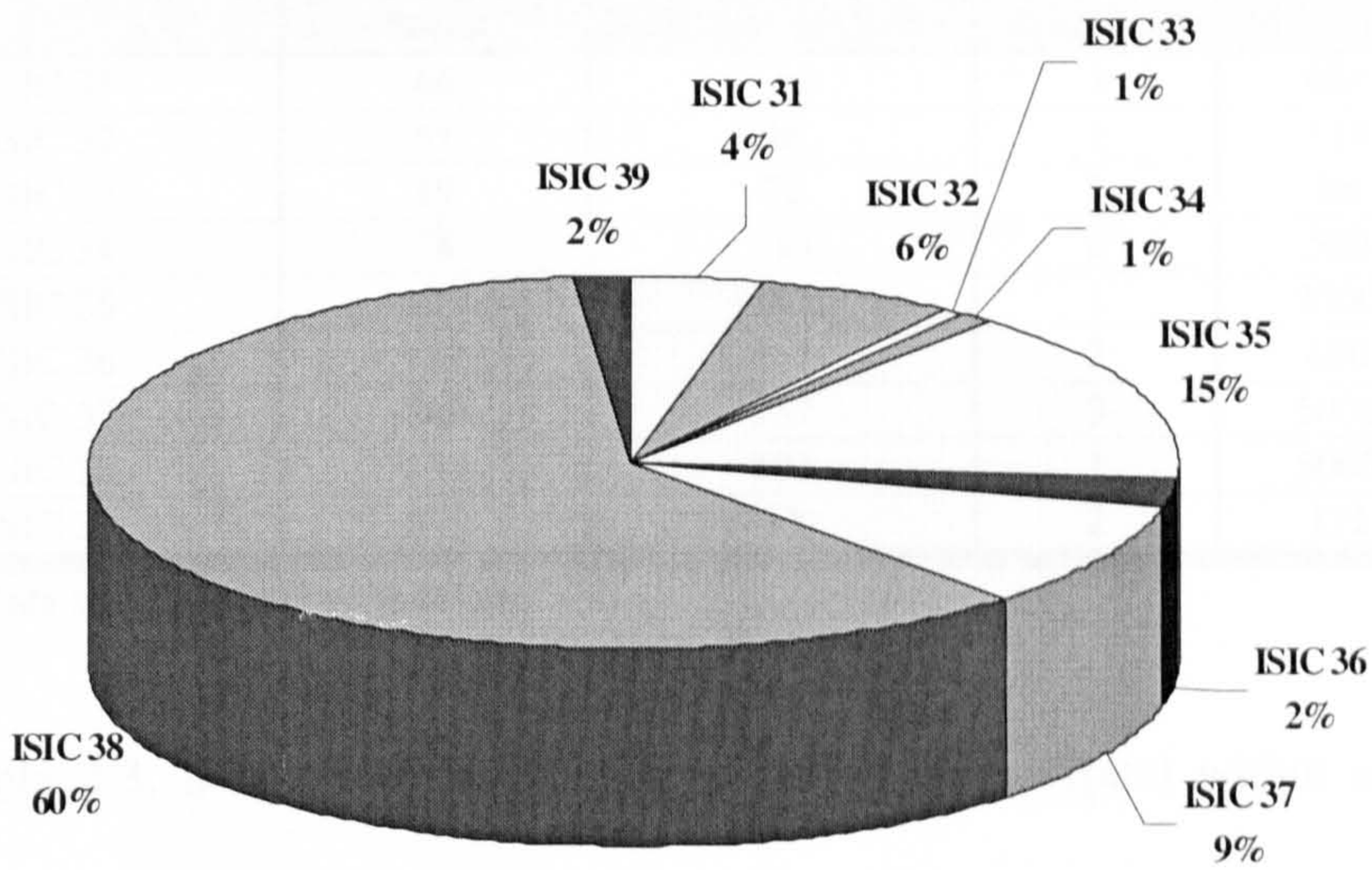
In summary, Japanese FDI in Thailand was unevenly distributed across manufacturing sectors; it tended to be concentrated in the fabricated metal products, machinery, and equipment sector (ISIC 38). Within such sector, the electrical machinery and transport equipment sub-sectors (3-digit ISIC level) received the greatest number of Japanese firms. At the industry level (4-digit

ISIC level), the number of Japanese investment varied greatly from one industry to the next. Some industries did not receive any FDI during the specified period while others received the disproportionately large amounts of FDI. Japanese FDI was mostly undertaken in the fabricated metal products industry (ISIC 3819), the radio, television, and the communication equipment industry (ISIC 3832) and the motor vehicle industry (ISIC 3843)

b). FDI Measured by the Value of Share Capital of Japanese Companies

This part looks at the manufacturing distribution of Japanese FDI stock measured in terms of the value of share capital (US$). At the 2-digit ISIC level, figure 2-9 shows the manufacturing composition of Japanese FDI stocks (1995).

Figure 2-9: Share Capital of Japanese Companies (1954-1995) by Manufacturing Sector (2-digit ISIC Level)



Source: Data are compiled by the author

Apparently, it is similar to that shown in figure 2-4 (FDI measured by the number of Japanese-owned companies). As observed from figure 2-9, the ISIC 38 sector (fabricated metal products, machinery, and equipment) received the largest stock of FDI (60% of the total share capital), followed by the ISIC 35 sector (chemicals, petroleum, rubber, and plastic products) (15%). There were smaller amounts of FDI stocks in the ISIC 33 sector (wood products and furniture), the ISIC 34 sector (paper, printing, and publishing), and the ISIC 36 sector (non-metallic mineral products). However, in contrast to figure 2-4 (FDI measured by the number of Japanese-owned companies), figure 2-9 shows that the FDI stock in the ISIC 37 sector became relatively large (9 percent of the total) while that in the ISIC 31 became relatively small (4 percent). These indicate that the average size of investment undertaken in the ISIC 37 sector was larger than that in the ISIC 31 sector.

Table 2-3: Share Capital of Japanese Companies (Million Thai Baht) between 1954-1995 by Manufacturing Sector (2-digit ISIC Level)

Industry	Share Capital			
	Mean	Standard deviation	Minimum	Maximum
ISIC 31	66	110	1	664
ISIC 32	61	96	1	518
ISIC 33	19	22	2	88
ISIC 34	78	114	2	500
ISIC 35	122	343	1	3500
ISIC 36	139	162	2	600
ISIC 37	240	757	3	5000
ISIC 38	136	303	1	5000
ISIC 39	41	43	2	172

Sources: Data are compiled by the author.

From table 2-3, it is observed that the values of share capital within each manufacturing sector varied considerably, with a minimum share capital of 1 million Baht to over 1000 Baht. The dispersion of standard deviation over

mean indicates that there were various scales of investment projects undertaken in each sector. The difference in the size of investment may be partly explained by the different types of business activities, the different size of parent companies, and the different investment strategies (i.e. some companies might use FDI as a regional production base). On average, the size of Japanese investment was not large; the largest investment was in the basic metal products sector (ISIC 37) (240 million Baht or only about 10 million US Dollar). Furthermore, despite the large number of companies in the ISIC 38 sector, the average share capital in this industry was relatively small as compared to that in the ISIC 37 sector.

Looking further at the average size of investment of non-Japanese companies in Thailand, it is observed that the mean of share capital invested by the US and other European companies (BOI-promoted) was also small, below 100 million Baht in most industries (table 2-4).

Table 2-4: Average Share Capital of BOI-promoted US and European Companies (Million Thai Baht) between 1960-1994 by Manufacturing Sector (2-digit ISIC Level)

Industry	Germany	UK	USA
ISIC 31	50	41	20
ISIC 32	6	37	25
ISIC 33	6	10	10
ISIC 34	0	0	388
ISIC 35	33	41	99
ISIC 36	21	164	68
ISIC 37	96	0	0
ISIC 38	14	136	78
ISIC 39	10	8	15

Sources: Board of Investment of Thailand, 1995.

Furthermore, it is observed that the average size of FDI undertaken by these

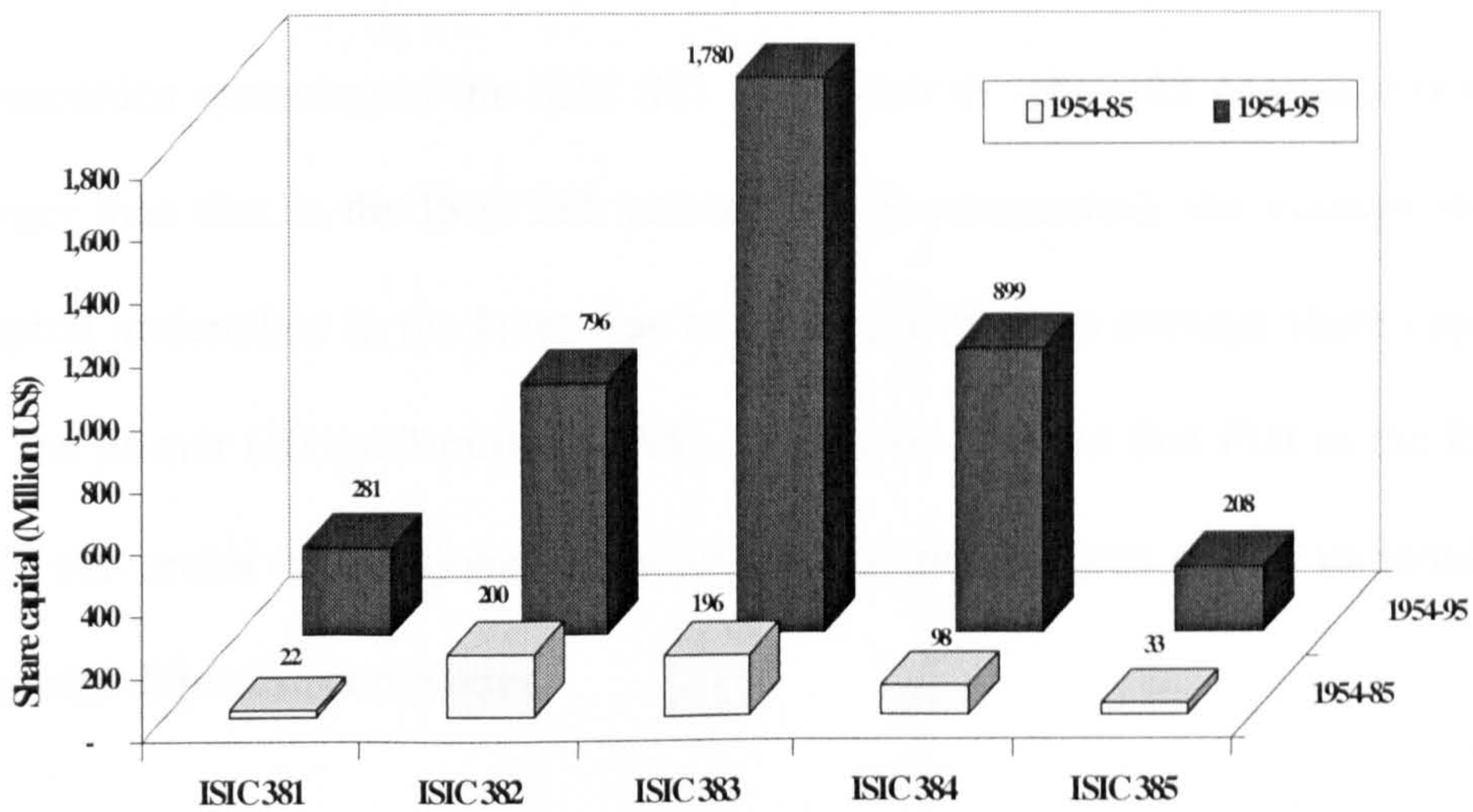
companies (in some industries) was even smaller than that undertaken by Japanese companies. For instance, in the chemicals, petroleum, rubber, and plastic products sector (ISIC 35), the average share capital invested by German, US, and UK companies were 33, 41, and 99 million Thai Baht respectively, while that invested by Japanese companies was 122 million Thai Baht. However, from both tables 2-3 and 2-4, it may be inferred that FDI in Thailand in general is not capital-intensive and the size of investment is quite small. Nevertheless, caution must be used, since the US and European companies presented are only BOI-promoted companies, not all the US and European companies operating in Thailand. These companies may be accountable for only a small fraction of the total population[10].

Within the ISIC 38 sector, figure 2-10 shows the variation in FDI across sub-sectors (3-digit ISIC level). In 1985, it is observed that the pattern of Japanese FDI distribution was slightly different from that presented in figure 2-7. When measured in terms of the number of Japanese owned companies (figure 2-7), FDI was concentrated in the sub-sector of ISIC 384 (transport equipment) (24 companies), and to a lesser extent in the sub-sectors of ISIC 383 (electrical machinery) (18 companies) and ISIC 382 (machinery) (12 companies). However, when measured in terms of the value of share capital (figure 2-10), the largest stock of FDI was in the sub-sector of ISIC 382 (200 million US$), followed by the ISIC 383 (196 million US$) and the ISIC 384 (98 million US$). These indicate that the average size of investment undertaken in the

[10] The information on share capital of all the US and European companies operating in Thailand is not available.

ISIC 382 sub-sector was larger than that in the ISIC 384 sub-sector.

Figure 2-10: Share Capital of Japanese Companies 1954-1985 and 1954-1995 within the ISIC 38 Sector (3-digit ISIC Level)



Source: Data are compiled by the author

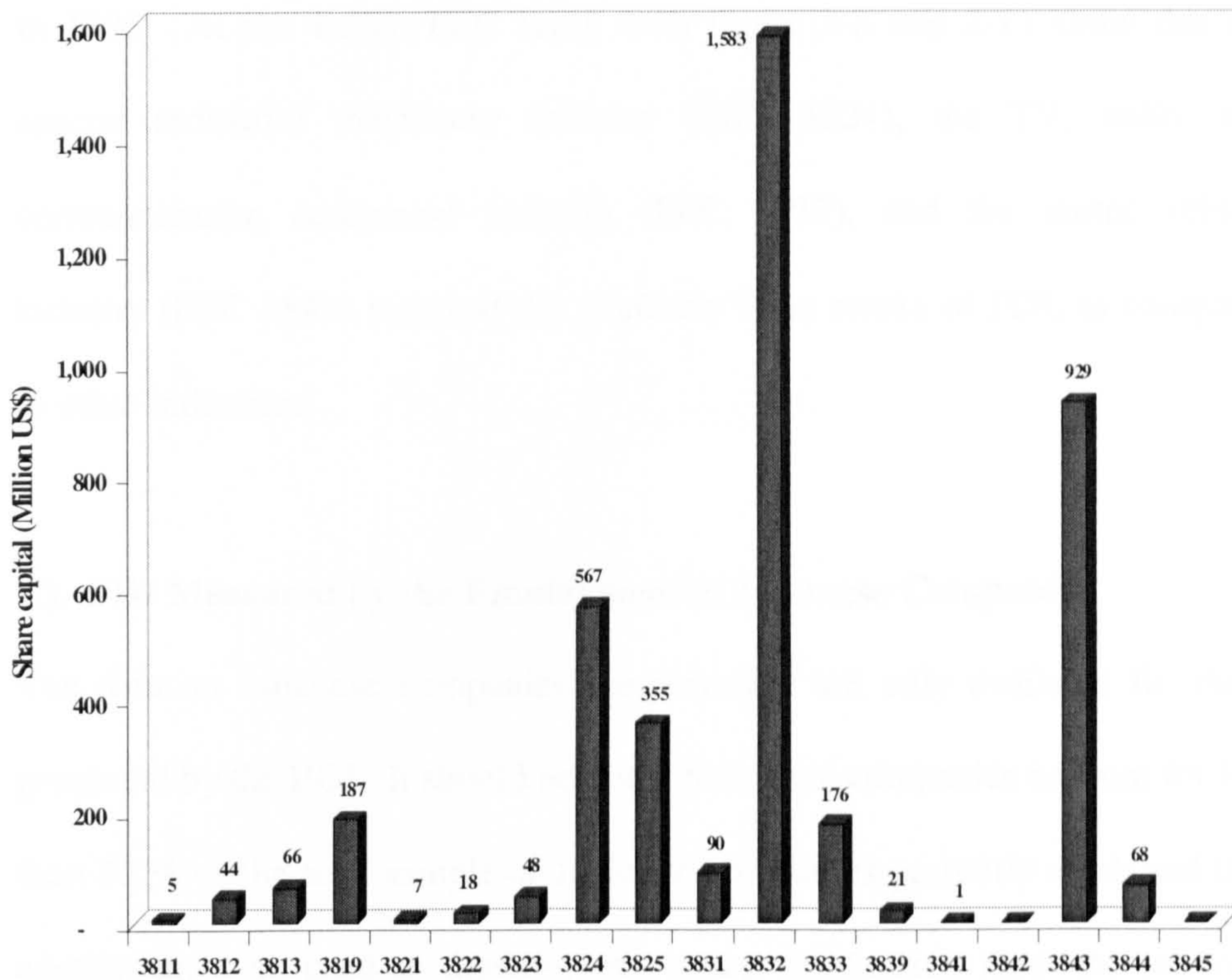
Although there was only one company operating in the ISIC 385 sub-sector (professional and scientific equipment) (figure 2-7), the amount of share capital undertaken was relatively large (33 million US$), as compared to that in the ISIC 381 sub-sector (fabricated metal products) (22 million US$) (figure 2-10). Despite the large increase in the number of new Japanese companies in the ISIC 382 sub-sector (8 folds from 1986 to 1995) (see figure 2-7), figure 2-10 shows that the amount of share capital undertaken did not increase as much (three folds from 1986 to 1995). By contrast, it is apparent from figure 2-10

that the amount of share capital undertaken in the ISIC 384 sub-sector increased substantially (eight folds from 1986 to 1995), despite the small increase in the number of companies (24 companies in 1986 to 92 companies in 1995) (figure 2-7). These indicate that the average size of investment undertaken in the ISIC 382 sub-sector during 1986-95 was relatively small as compared to that in the sub-sector of ISIC 384. Although the number of companies operating in the ISIC 381 sub-sector in 1995 (82 companies) was larger than that in the ISIC 385 sub-sector (10 companies), the average share capital undertaken in the latter was much larger than the average share capital in the former (20 vs. 3 million US$). It may be inferred that FDI in the ISIC 385 sub-sector (professional and scientific equipment) was mostly undertaken by large Japanese companies.

At the 4-digit ISIC level, figure 2-11 shows the inter-industry variation in FDI within the ISIC 38 sector. In general, the manufacturing pattern of Japanese FDI previously presented in figure 2-8 (FDI measured by the number of Japanese companies) is similar to that presented in figure 2-11. Either measured in terms of the number or the value of share capital of new Japanese owned companies, the FDI stock was relatively large in the ISIC 3824 industry (industrial machinery), the ISIC 3832 industry (TV, radio, and communication equipment), and the ISIC 3843 industry (motor vehicles). On the other hand, they were relatively small in the ISIC 3811 industry (cutlery, hand tools, and hardware) and the ISIC 3821 industry (engines and turbines). Nonetheless, the stock of FDI in the ISIC 3843 industry was much smaller than that in the ISIC 3832 industry (1,583 vs. 929 million US$), when measured in terms the value

of share capital. The former was larger than the latter when measured in terms of the number (96 vs. 84 companies). These indicate that the average investment undertaken in the ISIC 3843 industry was relatively small as compared to that undertaken in the ISIC 3832 industry.

Figure 2-11: Share Capital of Japanese Companies 1954-1995 within the ISIC 38 Sector (4-digit ISIC Level)



Source: Data are compiled by the author

Even though the number of companies in the ISIC 3819 industry (fabricated metal products) was relatively large (75 companies), the amount of share capital undertaken during 1954-1995 was very small (187 million US$), thus implying several small and medium size projects undertaken in that industry.

In summary, Japanese FDI in Thailand, either being measured in terms of the number or the value of share capital of Japanese-owned companies, was unevenly distributed. At the 2 digit ISIC level, the stock of FDI was mainly concentrated in the fabricated metal products, machinery, and equipment sector (ISIC 38), followed by the chemicals, petroleum, rubber, and plastic products sector (ISIC 35). Within the ISIC 38 sector, the electrical machinery sub-sector (ISIC 383) received the greatest stock of Japanese FDI undertaken in 1995. At the 4-digit ISIC level, both figure 2-8 and 2-11 show that the special industrial machinery industry (ISIC 3824), the TV, radio, and communication equipment industry (ISIC 3832), and the motor vehicle industry (ISIC 3843) received the relatively large stocks of FDI, as compared to other industries.

C). FDI Measured by the Employment of Japanese Companies

The data on Japanese companies' employment are only available for those promoted by the BOI. It should be noted that these companies account for less than 35 % of the total sample of Japanese companies presently used, and thus caution must be used in drawing any strong implication from the analysis. Table 2-5 shows that the number of employees hired by Japanese companies varied greatly from less than 10 to almost 6000 employees (see column 5 and 6). Even though the average number of employees during 1960s was relatively large, this could be attributable to the employment of a few large companies. To illustrate, column 6 of table 2-5 shows that one single Japanese company established during 1960-65 hired over 5900 employees, more than a quarter of the total employees hired during that period. Between 1986-90, despite there

being the large number of new companies, the average number of employees was only 246 persons, smaller than that of Japanese companies established during 1981-85 (335 persons). Thus, many companies being established in this period (1986-90) tended to undertake small and medium investment projects rather than large ones.

Table 2-5: Number of Employees of BOI-promoted Japanese Companies between 1960-1994 by Period

Year	No. Companies	Total Employee	Avg. Employee	Minimum	Maximum
1960-1965	20	23441	1172	31	5978
1966-1970	12	8706	725	116	1803
1971-1975	22	4638	210	41	760
1976-1980	16	7549	471	24	2652
1981-1985	16	5031	335	15	1141
1986-1990	286	70516	246	6	4000
1991-1994	21	6291	229	20	994

Source: Board of Investment of Thailand, 1995

However, caution must be used since the small workforce does not necessarily imply the small size of investment. Sometimes, the size of employment depends on the nature of technology used and / or the business activities being conducted. Any company with a less advanced technology and / or operating in a labour intensive industry tends to employ more workers than that operating in a capital-intensive one.

Table 2-6 supports the link between the size of investment and the number of employees by showing the positive relationship between the level of share capital being invested (column 1) and the average number of employees hired by Japanese companies (Column 4). The greater the amounts of share capital invested, the larger the average number of employees would tend to be.

Table 2-6: Number of Employees of BOI-promoted Japanese Companies between 1960-1994 by Share Capital

Share capital	No. of Companies	Total Employee	Avg. Employee	Minimum	Maximum
0-50	209	39782	190	6	5978
51-100	80	19731	247	30	1803
101-150	34	20913	615	49	4000
151-200	21	5614	267	13	1300
>200	49	40132	836	31	2917

Source: Board of Investment of Thailand, 1995

Apparently, the majority of Japanese companies tended to undertake small investment, with the amount of share capital less than 50 million Baht (column 1) and average employees less than 200 persons (column 4). Only about 10 percent of companies undertook large investment (column 2) with more than 200 million Baht of share capital invested (column 4).

Table 2-7: Number of Employees of BOI-promoted Japanese Companies between 1960-1994 by Manufacturing Sector (2-digit ISIC Level)

Industry	No. Companies	Total employee	Avg. employee	Minimum	Maximum
ISIC 31	30	7988	266	22	1591
ISIC 32	24	10741	448	43	2543
ISIC 33	7	2013	288	81	950
ISIC 34	5	546	109	18	286
ISIC 35	61	12276	201	7	1350
ISIC 36	7	3000	428	24	1000
ISIC 37	21	4218	201	13	1992
ISIC 38	217	79245	367	6	5978
ISIC 39	21	6145	293	35	1300

Source: Board of Investment of Thailand, 1995

Classified at the 2-digit ISIC level, the total number of employees in the ISIC 32, 35 and 38 sectors were relatively large, more than 10,000 persons working in these sectors (table 2-7). Yet, the average number of employees in the ISIC

35 sector and the ISIC 38 sector was not that large, smaller than that in the ISIC 36 sector. This lends a support to the earlier argument that the scale of investment projects undertaken in the ISIC 38 sector is not relatively large (see table 2-3). Also, these projects are likely to be carried out by small- and medium-size companies (Ministry of Foreign Affairs, Thailand, 1996; Krongkaew, 1997).

Table 2-8: Average Number of Employees of BOI-promoted US and European Companies between 1960-1994 by Manufacturing Sector (2-digit ISIC Level)

Industry	Germany	UK	USA
ISIC 31	363	1784	682
ISIC 32	128	949	258
ISIC 33	389	104	216
ISIC 34	0	0	487
ISIC 35	105	305	171
ISIC 36	179	156	357
ISIC 37	860	0	0
ISIC 38	109	419	519
ISIC 39	295	176	180

Source: Board of Investment of Thailand, 1995

Looking further at the average number of employees of non-Japanese companies in Thailand, it is apparent that the pattern of the US and European FDI (measured in terms of employment) are not largely different from that of Japanese FDI (table 2-8). The average number of employees tended to vary between 100 to 500 (across industries). Yet, in some sectors such as the food, beverages, and tobacco industries (ISIC 31), the average numbers of employees of the UK and the US companies were larger (1,784 for UK and 682 for the USA). Also, the average numbers of employees of UK companies in the textile industry (ISIC 32) and of German companies in the basic metal

industry (ISIC 37) were substantial (949 and 860 respectively). However, it is observed (from the sample data) that these exceptionally large average numbers were due to the significant amounts of employees hired by a few UK and German companies.

D). Form of Establishment

This final part briefly describes the forms of Japanese companies established in Thailand during 1954-95. It is apparent that the majority of Japanese companies were established in the form of joint ventures between local (Thai) and Japanese partners (table 2-9). Furthermore, most of these companies (joint venture) were minority owned by Japanese partners (i.e. 10-49% of share capital was owned by Japanese). Partly, this was due to the (old) business alien law of Thailand (BLC, 1995). The law did not allow foreign investors to own more than 49 percent of companies' share capital in certain business activities, unless exceptions were granted, i.e. Japanese investors were allowed to hold more than 49% of share capital of their affiliates when the affiliates were promoted by the BOI[11].

Table 2-9: Number of Japanese Companies (1954-1995) by Percentage of Ownership of Share Capital

Percent of Ownership (share capital)	Number of Companies
10-49%	512
50-99%	117
100%	176
Total	**805**

Source: Data are compiled by the author

[11] The law is currently modified to allow all foreign investors to hold more than 49% of companies' share capital.

From table 2-9, it is further noticed that the number of companies being *solely-owned* by Japanese investors (100% ownership) was much greater than that being *majority-owned* (50%-99% ownership). Possibly, the former might have been undertaken by large Japanese parent companies with the strong bargaining powers. These companies were able to seek several forms of privileges including exclusive rights to hold the entire amounts of share capital of their affiliates. Also, one reason why the large parent companies prefer the exclusive controls over their affiliates is that the former are able to transfer their intangible assets more efficiently when controlling the entire decision makings and managerial practices of the latter (see Siripaisalpipat and Hoshino, 2000).

2.4 Conclusions

The aim of this chapter was to describe the procedure used to compile the industry-level data on Japanese FDI in Thailand. Additionally, it analysed descriptively the manufacturing pattern of such FDI using the compiled data. Three main discussions are summarised as follows.

Firstly, regarding the compiling procedure, it involves three stages: collecting the list of Japanese companies, checking (and / or cross-checking) the information of these companies at the Department of Commercial Registration, and finally aggregating the company-level data up to the

industry-level data using the ISIC code at the 4-digit level. There are some potential weaknesses associated with the data used such as the lack of information on the classes of share capital issued and the actual value of paid up share capital.

Secondly, on comparing Japanese 'outward' FDI in Asia with that in North America / Europe, it was found that the average size of the former was smaller than the latter. This implies that the characteristics of FDI activities carried out in the former and in the latter tend to be different. Manufacturing activities in the former are likely to be relatively labour-intensive while those in the latter tend to be relatively capital- and technology-intensive. With the different types of activities being carried out, the principle factors governing the pattern of FDI in the former and the latter also tend to be different. Regarding the distribution of Japanese 'outward' FDI, it was observed that FDI was concentrated in the electrical machinery and transport equipment sectors. These sectors tend to be multi-production process sectors with different production stages requiring different types of factor inputs. Japanese firms might thus seek to establish production plants in different host locations according to local endowments (i.e. unskilled labour-intensive activities are located in developing Asian countries whereas skilled labour / technology-intensive activities are located in Japan and other industrialised countries).

Thirdly, it was found that Japanese FDI in Thailand, either being measured in terms of the count number or the value of share capital of Japanese owned companies, was mostly concentrated in the fabricated metal products,

machinery, and equipment sectors (ISIC 38) (during 1954-1995). To a lesser extent, much FDI was also undertaken in the chemicals, petroleum, rubber, and plastic products sector (ISIC 35). The concentration of FDI in these sectors (ISIC 38 and ISIC 35) became much greater after the mid 1980s due to the large increase in the number of Japanese companies. Like Japanese FDI, non-Japanese FDI was concentrated in the sectors mentioned above. It may be possible that locational-specific factors of Thailand played important roles in determining the pattern of Japanese and non-Japanese FDI. Looking further within the ISIC 38 sector, it was observed that FDI was not evenly distributed across sub-sectors. The majority of FDI was concentrated in the sub-sectors of industrial machinery (ISIC 382), electrical machinery (ISIC 383), and transport equipment (ISIC 384). At industry-level (4-digit), the largest stocks of Japanese FDI were undertaken in the TV, radio, and communication equipment (ISIC 3832) and motor vehicle industry (ISIC 3843), and to a lesser extent the special industrial machinery industry (ISIC 3824). However, some industries like rail equipment (ISIC 3842) and aircraft industry (ISIC 3845) did not receive (or host) any FDI during the specified period.

Empirically, the main research questions to be addressed are "Why was Japanese FDI undertaken in some but not other manufacturing industries?", and "Why did some Thai industries receive greater amounts of investment undertaken than others?". To discuss further about the determinants of such FDI distribution, the following chapter begins by reviewing and evaluating various theoretical explanations of FDI determinants.

Appendix 2-1

The UNIDO International Standard Industry Classification (2 to 4-digit Codes)

Two-digit code

ISIC	Description
ISIC 31	Food, beverages, tobacco
ISIC 32	Textiles, wearing apparel, leather, and footwear
ISIC 33	Wood products and furniture
ISIC 34	Paper, printing, and publishing
ISIC 35	Chemicals, petroleum, rubber, and plastics
ISIC 36	Non-metallic mineral products
ISIC 37	Basic metal products
ISIC 38	Fabricated metal, machinery and equipment
ISIC 39	Other manufacturing products

Three-digit code

ISIC	Description
ISIC 311	Food products
ISIC 312	Other food products and animal feeds
ISIC 313	Beverages
ISIC 314	Tobacco
ISIC 321	Textiles
ISIC 322	Wearing apparel, except footwear
ISIC 323	Leather product
ISIC 324	Footwear, except rubber or plastic
ISIC 331	Wood products, except furniture
ISIC 332	Furniture, except metal
ISIC 341	Paper and products
ISIC 342	Printing and publishing
ISIC 351	Industrial chemicals
ISIC 352	Other chemicals
ISIC 353	Petroleum refineries
ISIC 354	Misc. petroleum and coal products
ISIC 355	Rubber products
ISIC 356	Plastic products
ISIC 361	Pottery, china, earthenware
ISIC 362	Glass and products
ISIC 369	Other non-metallic mineral products
ISIC 371	Iron and steel
ISIC 372	Non-ferrous metals
ISIC 381	Fabricated metal products
ISIC 382	Machinery, except electrical
ISIC 383	Machinery electronic
ISIC 384	Transport equipment
ISIC 385	Professional & scientific equipment
ISIC 390	Other manufactured products

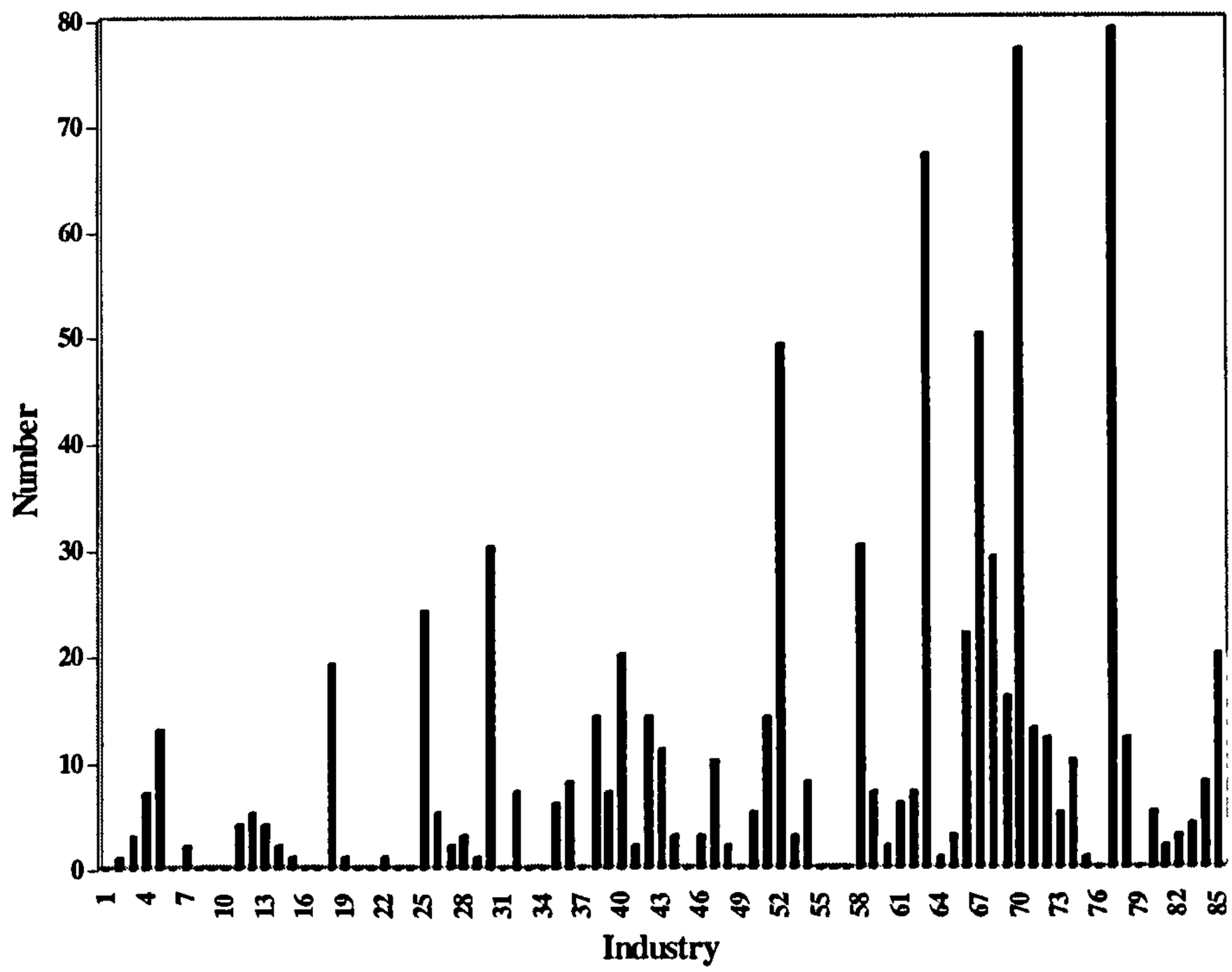
Four-digit code: (Thai I-O Classification reclassified according ISIC)

ISIC	Description
3111	Slaughtering, preparing, and preserving meat
3111(a)	Slaughtering
3111(b)	Preparing and preserving meat products
3112	Manufacture of dairy products
3113	Canning and preserving of fruits and vegetables
3114	Canning, preserving and processing of fish and similar foods
3115	Manufacture of vegetable and animal oils and fats
3115(a)	Coconut and palm oil
3115(b)	Animal and other vegetable oils
3116	Grain mill products
3116(a)	Rice milling and rice husk
3116(b)	Grinding corn
3116(c)	Tapioca products
3116(d)	Other flour and by products
3117	Manufacture of bakery products
3117(a)	Bakery products
3117(b)	Noodles and similar products
3118	Sugar factories and refineries
3119	Manufacture of cocoa, chocolate, and sugar confectionery
3121	Manufacture of food products not elsewhere classified
3121(a)	Ice manufacturing
3121(b)	Coffee and tea processing
3121 (c)	Mono Sodium Glutamate and other food products
3122	Manufacture of prepared animal feeds
3131 and 3132	Distilling, rectifying, blending spirits, and wine industries
3133	Malt liquors and malt
3134	Soft drinks and carbonated waters industries
3140	Tobacco manufactures
3140(a)	Tobacco processing
3140(b)	Cigarettes
3211	Spinning, weaving, and finishing textiles
3212 and 3219	Manufacture of made-up textile goods except wearing apparel
3213	Knitting mills
3214	Manufacture of carpets and rugs
3215	Cordage, rope, and twine industries
3220	Manufacture of wearing apparel, except footwear
3231	Tanneries and leather finishing
3233	Manufacture of products of leather and leather substitutes
3240	Manufacture of footwear except rubber or plastic footwear
3311	Sawmills, planing, and other wood mills
3312 and 3319	Manufacture of wood, cork products, and wooden containers
3320	Manufacture of furniture and fixtures, except primarily of metal
3411	Manufacture of pulp, paper, and paperboard
3412 and 3419	Manufacture of containers and boxes of paper, and other pulp, paper, and paper board not elsewhere classified
3420	Printing, publishing, and allied industries
3511	Manufacture of basic industrial chemicals except fertilizers
3512	Manufacture of fertilizers and pesticides
3513	Manufacture of synthetic resins, plastic materials and man made fibers
3521	Manufacture of paint, vanishes, and lacquers
3522	Manufacture of drugs and medicines

3523 3523(a) 3523(b)	Manufacture of soap and cleaning preparations, perfumes, cosmetics, and other toilet preparations Soap and cleaning preparations Perfumes and cosmetics
3529	Manufacture of chemical products not elsewhere classified
3530	Petroleum refineries
3540	Manufacture of miscellaneous products of petroleum and coal
3551	Tire and tube industries
3559	Manufacture of rubber product not elsewhere classified
3560	Manufacture of plastic products not elsewhere classified
3610	Manufacture of pottery, china, and earthenware
3620	Manufacture of glass and glass products
3691	Manufacture of structural clay products
3692	Manufacture of cement, lime, and plaster
3699	Manufacture of non-metallic mineral products not elsewhere classified
3710	Iron and steel basic industries
3720	Non-ferrous metal basic industries
3811	Manufacture of cutlery, hand tools, and general hardware
3812	Manufacture of furniture and fixture primary of metal
3813	Manufacture of structural metal products
3819	Manufacture of fabricated metal products
3821	Manufacture of engine and turbines
3822	Manufacture of agricultural machinery and equipment
3823	Manufacture of metal and wood working machinery
3824 and 3829	Manufacture of special industrial machinery and other machinery not elsewhere classified
3825 and 3829	Manufacture of office and household equipment
3831	Manufacture of electrical industrial machinery and apparatus
3832	Manufacture of radio, television, and communication equipment and apparatus
3833	Manufacture of household electrical appliances
3839 3839(a) 3839(b) 3839(c)	Manufacture of electrical apparatus and supplies not elsewhere classified Insulated wire and cable Accumulators and batteries Other electrical appliances and supplies
3841	Ship building and repairing
3842	Manufacture of railroad equipment
3843	Manufacture of motor vehicles
3844	Manufacture of motorcycles, bicycles, and other transport equipment
3845	Manufacture of aircraft
3851	Manufacture of professional and scientific, and measuring and controlling equipment
3852	Manufacture of photographic and optical goods
3853	Manufacture of watches and clocks
3901	Manufacture of jewelry and related articles
3902 and 3903	Manufacture of musical instruments, sporting, and athletic goods
3909	Manufacturing industries not elsewhere classified

Appendix 2-2

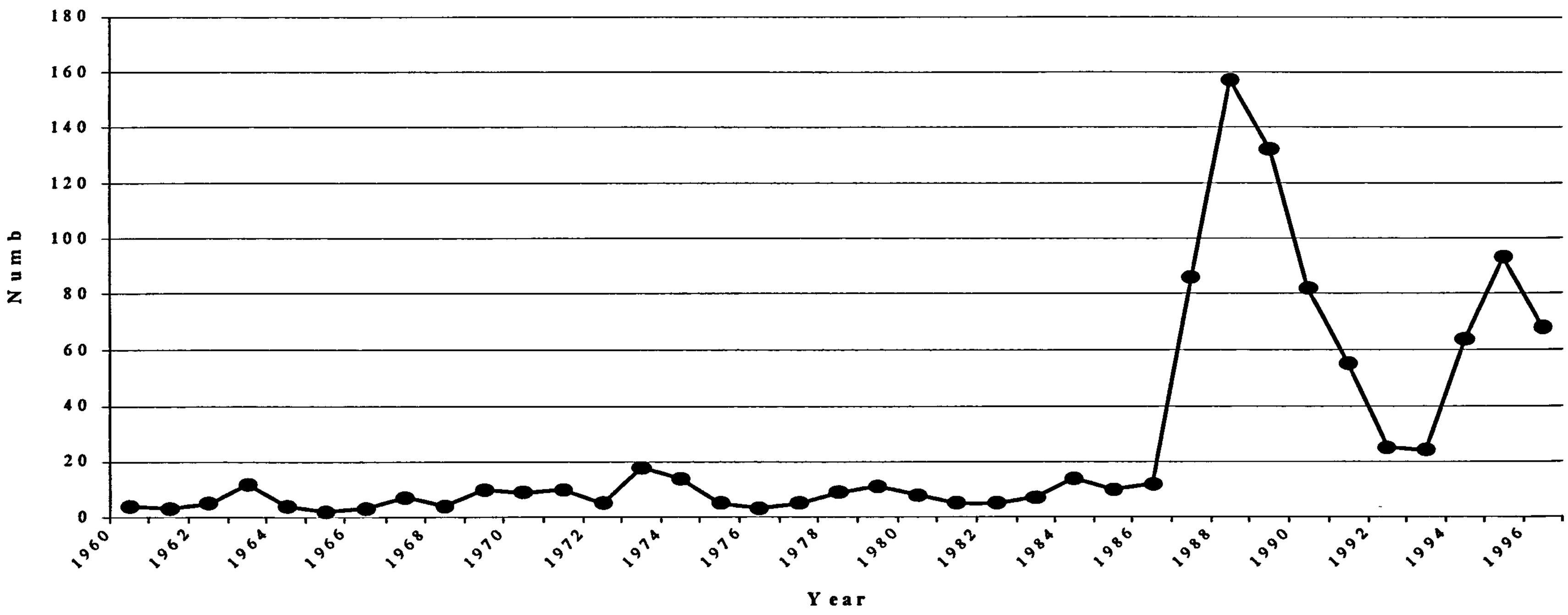
The Distribution of the Number of Japanese Companies across 85 Thai Manufacturing Industries (1954-1995) (4-digit ISIC Level)



Appendix 2-3-1

Annual Flows of Japanese FDI to Thailand (1960-1996)

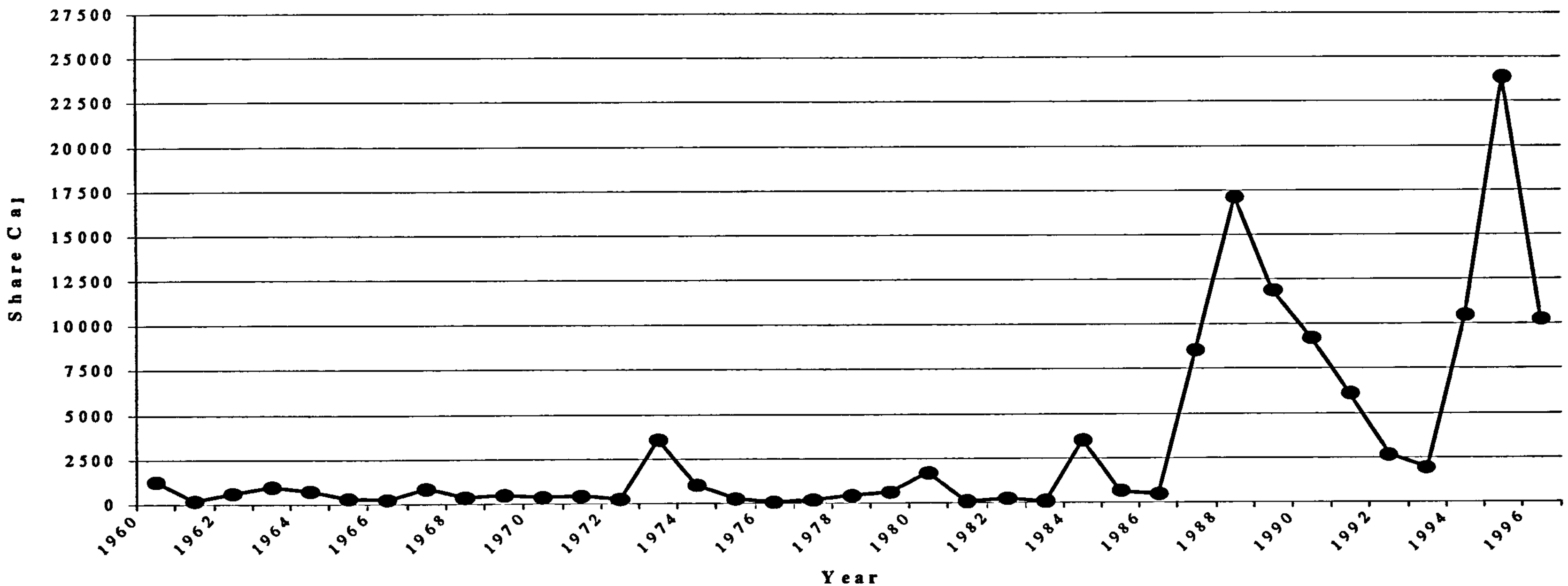
(Number of Japanese Companies)



Appendix 2-3-2

Annual Flows of Japanese FDI to Thailand (1960-1996)

(Share Capital - Million Thai Baht)



Chapter III

Theoretical Explanations of FDI Determinants

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3.1 Introduction

The theoretical literature on the determinants of FDI is fragmented. Different theories emphasise different factors that influence a firm's decision to engage in cross-border investment activities. Some theories focus on macro-economic factors such as interest rate differentials and exchange rate fluctuation. On the other hand, others concentrate on micro-economic factors such as transaction costs arising from the imperfection of markets for intangible assets. Broadly, theories may be grouped according to the approaches used, namely the capital-market, the firm / industry-organisation, and the locational approaches.

Theories using the capital-market approach emphasise differences in the prices of capital assets and the rates of returns on capital investment. On the other hand, those using the firm / industry-organisation approach concentrate on the transaction costs incurred from a transfer of intermediate inputs between two independent firms. Lastly, theories using the locational approach explain the variation in inward FDI in terms of differences in the factor endowments, market size, and non-economic factors (e.g. political stability).

The aim of this chapter is to review and evaluate different theoretical approaches to FDI determinations, as well as to identify an appropriate

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The aim of this chapter is to review and evaluate different theoretical approaches to FDI determinations, as well as to identify an appropriate

theoretical basis for the present study of Japanese FDI in Thailand. The review tends to be selective in the sense that it does not cover all existing theoretical explanations but focuses on some core ones[1]. Also, it concentrates on theories that seek to explain foreign value added activities (or manufacturing production activities) rather than service activities. Furthermore, it does not describe each theory in detail but compares and contrasts the key features.

To understand clearly 'what cause FDI', one should know first 'what FDI is'. The following discussions covers three broad aspects of FDI determination, namely FDI characteristics (*What is FDI?*), FDI motivation (*Why is there FDI?*), and geographical distribution or direction of FDI (*Where is there FDI?*). Critically, different theories will be evaluated in the light of their explanatory powers on each of these aspects. Firstly, the characteristics of FDI can be discussed in terms of the distinction between a firm that undertakes investment overseas (a multinational firm) and a firm that does not (a domestic firm) (see figure 3-1). Also, they can be discussed in terms of the characteristics of long-term direct investment (undertaken by a multinational firm) and short-term portfolio investment. Secondly, with respect to FDI motivation, it can be discussed in terms of different choices available for a firm in entering a foreign market. Since a firm from country A can serve a market of country B (or C) via exporting, licensing, or FDI activities, the main question to be addressed is why it chooses FDI (see figure 3-1).

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[1] For an extensive review of the genealogy of scholarly thought on FDI determinations, see Dunning (1993) or Dunning (2000).

Figure 3-1: Three Aspects of Foreign Direct Investment (Characteristics, Motivation, and Direction)

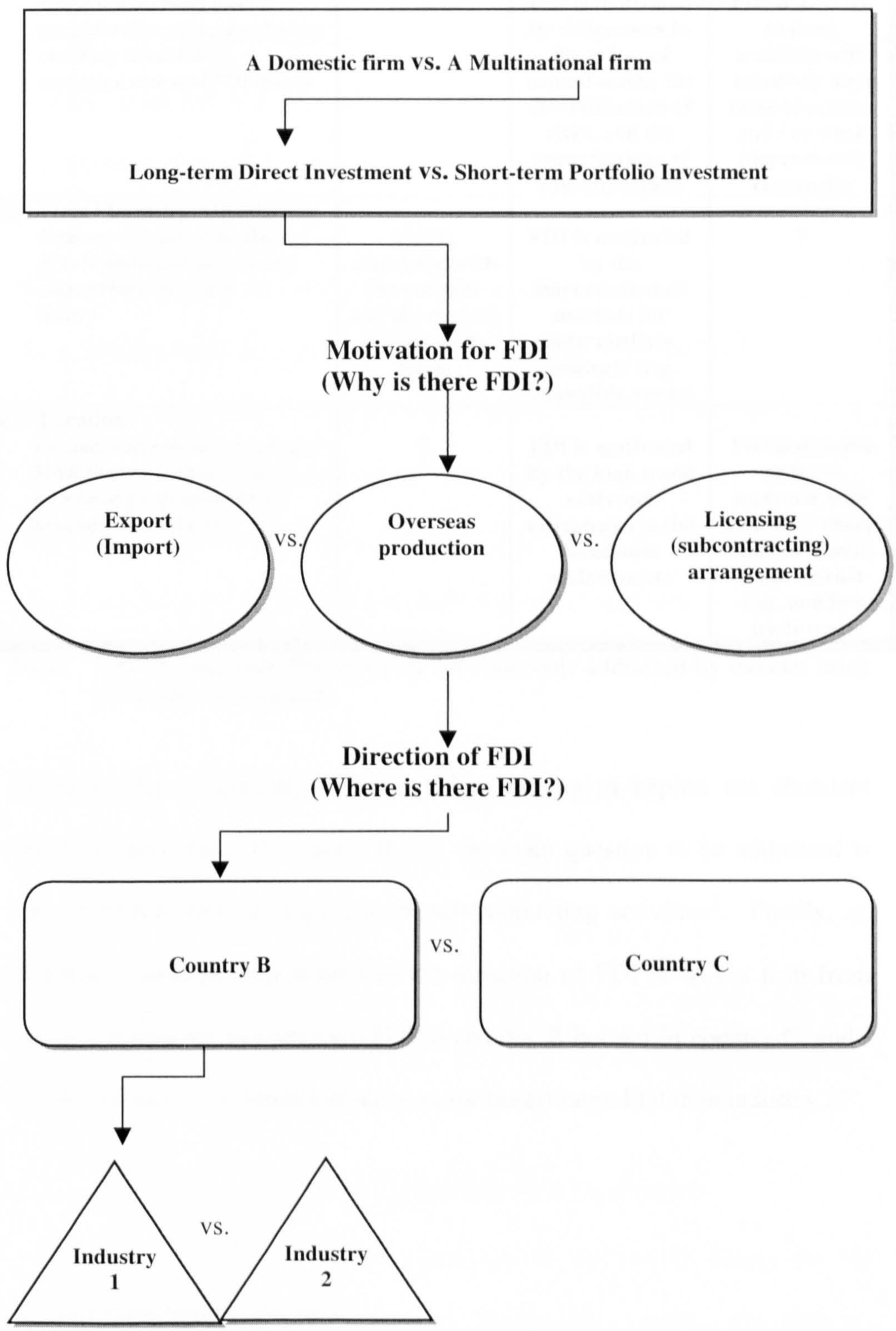


Table 3-1: Three Aspects of Foreign Direct Investment Addressed by Theories Using the Capital-market, the Firm / Industry-organisation, and the Locational Approaches

Theoretical approach	Characteristic	Motivation	Direction
A. Capital-market *Capital movement theory, portfolio diversification theory, currency area theory, exchange rate and FDI theory*	?	**FDI is motivated by differences in the prices of capital assets, the diversification of risks, and the imperfections of capital market**	**FDI is directed to those locations with relatively high rates of returns and / or weak (depreciated) currencies**
B. Firm / Industry-organisation *Industry-organisation theory, firm (internalisation) theory, oligopolistic reaction theory*	**FDI is associated with the transfer and the control of non-equity assets**	**FDI is motivated by the imperfection of markets for intermediate products (e.g. intangible assets)**	?
C. Location *Product cycle theory, trade and MNE theory, location / new economic geography theory, developmental theory*	?	**FDI is motivated by the high trade costs and differences in the locational endowments**	**FDI is directed to those locations with relatively cheap costs of labour, large market size, and low trade costs**

Note: **?** means that such FDI aspect is not commonly addressed by theories using that particular approach.

Similarly, for a vertically integrated firm aiming to exploit the abundant resource endowment of country B (C), the main question to be addressed is why it prefers FDI to importing or sub-contracting activities[2]. Finally, an important question with respect to the direction of FDI is why a firm from country A chooses to undertake FDI in country B but not in country C, and / or why industry 1 in country B receives (or hosts) more FDI than industry 2?".

[2] Foreign firms could subcontract local firms to produce intermediate inputs for them.

As can be seen from table 3.1, theories using different approaches address only particular aspects of FDI determination. For instance, theories using the locational approach tend to address the question "*Where is there FDI?*", but not the question "*What is FDI?*". In contrast, theories using the firm / industry-organisation approach concentrate on the first rather the third aspect of FDI. Alternatively, theories using the capital market approach focus more on the macro (financial) aspect of FDI determinants.

The remainder of this chapter is organised as follows. Section 3.2 assesses how different theories explain the characteristics of FDI, section 3.3 evaluates them with respect to FDI motivation, section 3.4 compares and contrasts different theoretical predictions on FDI direction, and section 3.5 briefly discusses the Dunning's eclectic paradigm. Finally section 3.6 draws conclusions and identifies an appropriate theoretical approach.

3.2. FDI Characteristics (*What is FDI?*)

This section briefly discusses different theoretical explanations regarding the characteristics of foreign direct investment. The aim is to evaluate how different theories distinguish between long-term direct investment and short-term portfolio investment or between a domestic firm and a multinational firm.

3.2.1 Theories Using the Capital-market Approach

Theories using the capital-market approach do not clearly distinguish FDI from other forms of capital investment. Traditionally, neo-classical trade and

capital movements theory (e.g. Ohlin, 1933) view both direct and portfolio investment as a movement of capital across national borders. No specific assumption is made with respect to the distinctive characteristics of long-term direct investment (e.g. an establishment of production plants) on the one hand, and short-term portfolio investment (e.g. a purchase of treasury bonds and securities) on the other hand.

Likewise, portfolio diversification theory (Rugman, 1977; Miller and Pras, 1980) views both direct and portfolio investment as a means used by a firm / investor to minimise investment risks. It is argued that the returns on investment are volatile to economic influences such as currency fluctuations, as well as non-economic influences such as political instability. These influences could affect the prosperity and success of investment projects. It is too risky for a firm / investor to invest all his / her capital assets in one location. Since the rates of returns across countries do not perfectly move together in unison, diversification of capital via both direct and portfolio investment is argued to minimise those investment risks (Markowitz, 1959).

One weakness of portfolio diversification theory is that it does not clearly explain why a multinational firm tends to be engaged in long-term rather than short-term investment. If an aim of that firm is only to diversify investment risks, there are other channels of organised security markets (e.g. stock market). These channels allow a multinational firm to easily move its capital from one place to another without being committed to long-term production activities.

Another theory using the capital-market approach is theory of currency area (Aliber, 1970 and 1971). It describes FDI as a movement of capital across different currency zones. Yet, it does not clearly distinguish the characteristics of direct and portfolio investment, since the latter also move across countries with different currency units.

3.2.2 Theories Using the Firm/Industry-organisation Approach

Dissatisfied with the above theories, industry organisation theory (Hymer, 1960; Kindleberger, 1969; and Caves, 1971) argues that direct investment differs from other kinds of international investment, in that the former is accompanied by the transfer (as well as the control) of non-equity resources. These resources are such as technologies, managerial skills, and trademarks, and they are not accessible to every firm[3]. A small domestic firm operating in a local market may not have them since these assets are costly to create due to large sunk costs and time efforts. For example, the creation of new technology is costly due to expensive R&D and lengthy period of innovation. However, once the successions takes place, a firm can use such technology as a core advantage to differentiate products, improve productivity, and / or

[3] Kindleberger (1969, p.14) also lists other kind of monopolistic advantages apart from those mentioned above such as plant scale economies and corporate size. Dunning (1988) formally categorises them into three groups. The first group comprises of barriers to entry such as scale economies, corporate sizes, special access to markets or raw materials, and exclusive possession of intangible assets (e.g. patents and trademarks). The second group consists of abilities of a firm to manage and co-ordinate activities across locations such as economies of multi-plant operations (Cave, 1996) and / or economies of vertical integration (Davies, 1987). The third group is the advantage gained by a firm from being multinational itself. Since different subsidiaries of a MNE may trap into specific knowledge available locally, an exchange of knowledge among subsidiaries could thus enhance the competitiveness of that MNE as a whole (Cantwell and Sanna-Randaccio, 1993).

reduce production costs. Similarly, the creation of a product's brand name is costly due to large marketing costs and time effort, but once reputation is established, a firm may be able to sell large numbers of goods world-wide. Therefore, the possession of these monopolistic advantages distinguishes a large multinational firm (with an extensive global network) from a domestic firm that operates inside a national border. Also, it distinguishes industry-organisation theory from neo-classical factor endowment theory (e.g. Ohlin, 1933); the former is based on an assumption of market imperfections while the latter is based on an assumption of perfectly competitive markets.

Hymer (1960) asserts that a multinational firm operating beyond a national boundary must possess these (superior) monopolistic advantages. This is because such advantages compensate for the disadvantages faced by multinational firms that operate in a foreign environment. Without them, a multinational firm would not be able to compete successfully with a local firm in a host country since the latter is more familiar with local customers, business practices, government, and institutional frameworks.

Despite having attracted much attention of economists since the late 60s, Industry organisation theory is, however, subject to criticisms. Buckley and Casson (1976) criticise such theory as being implicit about the costs and the benefits of exploiting monopolistic advantages overseas. If the costs of operating overseas are large relatively to the profits gained from using them, a firm may choose other modes of exploiting its advantages. For example, it may instead license a technology to local firms in a host country or serve a

host market via exports. These monopolistic advantages are thus viewed as a necessary but not sufficient condition for FDI (see discussions in McManus, 1972; Buckley and Casson, 1976; Magee, 1977; and Rugman, 1986). Potentially, there are several reasons why a multinational firm tends to be engaged in FDI rather than licensing or exporting activities, and these will be discussed in section 3.3.

3.2.3 Theories Using the Locational Approach

Most theories using the locational approach are not explicit about distinguishing the characteristics of a multinational firm from a domestic firm. They concentrate on the direction rather than the characteristics of FDI. Nonetheless, the recent trade and MNE theory (e.g. Markusen, 1984; Helpman, 1984; Markusen, Venables, Konan, and Zhang, 1996) takes into account the distinctive characteristics of foreign direct investment. According to theoretical models of trade and MNEs, a multinational firm is distinguished from a national firm in a sense that the former possesses the monopolistic advantages that can be used as joint-inputs for overseas subsidiaries. These specific advantages are costly to produce, but once they are, they can be supplied at relatively low (or zero) marginal costs to different overseas production plants. Importantly, this aspect of firm-specific assets is argued to provide a multinational firm with the advantages of being a multi-plant firms. It is an assumption of multi-plant operation that distinguishes the characteristics of a multinational firm from a local firm with a single plant operation [see the original version of Markusen (1984) or appendix 3].

For other theories, no specific assumption / distinction is made with regard to a manufacturing investment undertaken by a foreign firm and a domestic firm. For instance, according to recent theoretical models of economic geography or "new location theory" (Krugman, 1991; Krugman and Venebles, 1995; Puga and Venebles, 1996), there is no specific assumption made with respect to an investment undertaken by the former and the latter. All firms are assumed to have a single plant operation. Arguably, this assumption is inconsistent with the concept of foreign direct investment since a multinational firm engaged in overseas production tend to have more than one manufacturing plant across borders[4].

To summarise, theories using the firm / industry-organisation approach are more explicit about explaining the characteristics of foreign direct investment than are those using the capital-market or locational approaches. Despite being subject to criticisms, the concept of intangible assets initiated by Hymer (1960) has been widely used by several theoretical studies including the recent theoretical models of trade and MNEs.

Table 3-2: FDI Characteristics (Summary of Theoretical Explanations)

Theoretical approach	Characteristic
Capital-market	• No distinction made between long-term direct investment and short-term portfolio investment. Both are viewed as a movement of capital across national borders / currency areas.
Firm/I-O	• Long-term direct investment is different from short-term portfolio investment because the former is associated with the transfer / the control of non-equity resources.
Location	• No distinction made regarding investment undertaken by a multinational firm and that undertaken by a domestic firm.

[4] The key features of these theories are discussed in section 3.4.

3.3 FDI Motivation (*Why is there FDI?*)

The section evaluates how FDI theories using different approaches address two commonly raised questions: 'what motivates a multinational firm to undertake investment overseas?', and 'why does it prefers FDI to other modes of entering (exploiting) a host market (factor endowments)?'.

3.3.1 Theories Using the Capital-market Approach

Theories using the capital-market approach provide explanations on the first but not the second questions. Primarily, the traditional theory of trade and capital movement (e.g. Ohlin, 1933; Mundell, 1957) explains an outward flow of capital from a home to a host country in terms of a difference in the prices of capital assets between the two countries. Capital would flow out from a country with the relatively low rate of returns on capital investment to another country with the relatively high rate of returns.

One major weakness of this theory is that it cannot explain a reverse flow of FDI (i.e. a bilateral flow of FDI between the US and the EU). Also, it does not explicitly explain why a firm prefers to be engaged in long-term direct investment rather than short-term portfolio activity. In fact, it would be easier for a firm to shift its capital from one country to another if it were engaged in the latter rather than the former. Moreover, FDI is not only involved in the transfer of financial resources but also non-financial resources such as technology and managerial skills. Instead of taking the advantages of the differential rates of returns, a multinational firm may aim to reap the abnormal profits gained from exploiting its monopolistic advantages overseas.

Like capital movement theory, portfolio diversification theory does not take into account of the non-financial aspects of FDI (Rugman, 1977; and Miller and Pras, 1980). It explains the causes of FDI in terms of an individual's / a firm's motivation to minimise investment risks through the international diversification of capital assets. It is argued that the return on capital investment exhibits varying degrees of stability over time, depending on the political climate, business cycle, and / or restrictions imposed by local governments (Markowitz, 1959). At the corporate level, a manager recognises these instabilities and thus seeks to diversify corporate investment so that a company can acquire an overall high and stable rate of return. Potentially, the diversification of investment across countries is one strategy adopted by a corporate manager to reduce a company's investment risks. At an individual level, an investor can also purchase a share (s) of a multinational firm in order to achieve indirectly for oneself the benefit of international diversification. Yet, when purchasing a share (s) of that firm, one in turn contributes to the international diversification of direct investment. This is because he / she provides funds to finance an expansion and diversification of global investment activities of that multinational firm (Rugman, 1977).

As mentioned earlier, portfolio diversification theory does not clearly explain why a firm prefers direct investment to portfolio investment, neither does it explain why an individual investor prefers to diversify his / her investment via a multinational firm. This type of firm tend be committed to a long-term production activity. Although risk diversification may be one of many

possible explanations for geographical diversification of MNE's activities (Cave, 1996), it does not clearly explain why only some but not other firms become multinational.

According to currency area theory, the imperfection of currency markets is argued to be the main cause of FDI. Aliber (1970 and 1971) argue that the returns on capital assets (classified under the same risk class but denominated in different currencies) tend to be dissimilar due to the exchange risks and uncertainties associated with those currencies. In general, the rate of returns on capital assets denominated in a weak currency tends to be higher than that denominated in a stronger one. This is because the former reflects the expected rate of a currency's depreciation as well as the uncertainties (risks) involved with such currency's depreciation. The higher the perceived risks and uncertainties, the greater the excess of the interest rate on loans and deposits denominated in the weak currency over that denominated in the strong one. Therefore, a firm in a country with the relatively strong currency would find it profitable to borrow funds from its home country (at a cheaper rate) and lend them to firms in another country with the higher rate of return[5]. For instance, an interest rate on loans denominated in the Thai Baht will be greater than that borrowed in the Japanese Yen, if a depreciation of the Thai Baht is expected or there are risks and uncertainties following the earlier

[5] Although there are also risks associated with an investment undertaken by a multinational firm in the host country with a depreciating currency, a lender in the home country still charge a multinational firm at a relatively low interest rate. This is because a lender may believe that a MNE is efficient in hedging against exchange risks. Also, a MNE may provide him / her with a diversified portfolio at a lower cost than he / she can acquire on his / her own. Finally, he / she may not be aware of a type of activity MNE is engaging (see Aliber, 1971, p. 53).

depreciation (e.g. after 1997). Thus, with the imperfection of currency markets, a firm from Japan would find it profitable to acquire a relatively cheap source of funding from Japan to finance any form of investment expenditures in Thailand (e.g. buying securities, lending money, and acquiring existing businesses).

One weakness of this theory is that FDI is not only a means used for financing foreign capital expenditure but also a channel by which an enterprise transfers and controls non-financial resources (Buckley and Casson, 1976; Dunning, 1988). Moreover, despite having equal access to cheap sources of funding, theory does not clearly explain why only some but not all firms engage in FDI activities.

Related to above theory, exchange rate and FDI theory focuses on the financial advantages of a firm from a home country in purchasing capital assets in a host country (Froot and Stein, 1991; Klein and Rosengren, 1994; Blonigien, 1997). According to this theory, a depreciation of a host country's currency in relation to that of a home country decreases the prices of capital assets of the former (or increase the relative wealth of firms in the latter). This thus motivates firms in the latter to expand their purchases of those capital assets overseas. Critically, this theory can only explain an increase in FDI from one year to another (short-run flows of FDI), but not a variation in long-run stocks of FDI. Also, this theory may be specific to time period and certain types of FDI like merger and acquisition.

3.3.2 Theories Using the Firm/Industry-organisation Approach

Unlike theories using the capital-market approach, those using the firm / industry-organisation approach focus on the costs and benefits of transferring non-financial assets overseas. According to industry organisation theory, FDI is used as a strategic means by a multinational firm to retain its exclusive rights to exploit its intangible assets aboard (Hymer, 1960). Also, FDI is used as a means to extract a maximum economic rent gained from using such intangible assets. However, one criticism of this theory is that it does not explicitly explain why a multinational firm prefers direct investment despite there being other ways of exploiting its intangible assets overseas. For instance, a firm can instead license its intangible assets (e.g. technology) to local firms in a host country to produce for them[6] (see criticisms in Dunning and Rugman, 1985).

In contrast to industry-organisation theory, internalisation theory provides clear explanations about this aspect of FDI motivations (McManus, 1972; Buckley and Casson, 1976; Teece, 1985; Hennart, 1982; Rugman, 1986). It is argued that there are large transaction costs involved in the transfer of intangible assets between two independent firms (across the national boundary), due to the imperfection of markets for such assets. To clarify, a firm from country A may be interested in servicing a host market of country B and it could do so either by licensing its technology to a local independent firm in country B or establishing its own production plant there. If a firm

[6] Hymer (1976), however, takes this issue into account.

chooses the first mode, it is likely to incur large time and operational costs in searching for a potential licensee and in negotiating for licensing contracts.

Firstly, because technology is a proprietary asset, a firm from country A (a seller) would not disclose its secrecy about such technology to every local firm in country B. Rather, it would search for the potential buyer - a local firm who is really interested in buying that technology. Yet, the searching process may be prolonged involving time and operational costs. Secondly, despite having found one, there are also time and operational costs incurred from the prolonged negotiation process for licensing contracts. This is because the buyer (the local firm) and the seller (the foreign firm) do not have a perfect knowledge (information) regarding the consequences of the transaction that they are undertaking. On the one hand, the buyer may be uncertain about the usage and the application of such technology, i.e. whether that technology can be efficiently applied to a new environment with different types of skilled personnel and organisational structure[7]. Since it is difficult, if not impossible, for the buyer to experiment with that technology before actually purchasing it, he / she tends to negotiate for a lower price. On the other hand, by licensing the technology to the buyer, the seller is also uncertain about his / her long-term technological competitiveness. It is possible that the buyer could use such licensed technology as a basis for further improvements, and thus weakening the monopolistic position of the seller in the long run. Therefore, while the buyer negotiates for the lower price of such technology, the seller

[7] Certain kinds of knowledge may be embodied in the skills of personnel or may have a high tacit component. Thus, the transfer of technology may not be complete without the physical transfer of personnel.

tends to push the price up to compensate for the future loss of his / her technological competitiveness. With all time and operational costs involved, it is argued that a firm from country A is likely to set up its own production plants in country B rather than to license its technology to a local firm in that country. In other words, that firm prefers to internalise the cross-border transactions under its hierarchical control.

In some cases, a firm from country A may be also interested in exploiting resource / factor endowments of country C. Similar to the case discussed above, there would be time and operational costs involved if such firm choose to exploit the abundant resources of country C via sub-contracting rather than overseas production activities. For instance, that firm may be interested in taking advantage of cheap unskilled labour in country C. It could do so either by licensing the technology to a local firm (to produce labour-intensive parts and components) or by establishing its own production plants there. Considering the first choice, the former may be uncertain about the latter's ability to utilise its technology in an efficient way due to differences in the environment, the organisational structure, and the managerial practice of the latter. Moreover, the former may be uncertain about the qualities and time deliveries of those intermediates since it does not control any operational management or decision making of the latter. When the costs of inputs (used for producing intermediate components) increase, the latter (a local firm in country C) could also behave opportunistically by passing on its rising marginal costs to the former (a firm from country A). Although the former is able to switch to another local supplier in country C in a long run, it is difficult

to do so in a short run due to high switching costs, time costs, and administrative costs (i.e. searching for a new sub-contractor). Alternatively, a firm from country A may attempt to limit such opportunistic behaviour by re-arranging the sub-contracting agreements or taking legal actions against a local supplier. Yet, these actions are costly, involving prolonged and expensive legal procedures. Therefore, with all potential transaction costs involved, it is likely that a firm from country A chooses to set up it own production plant in country C (an internal transfer of technology between a parent and its affiliate).

Apart from the reasons given above, there are also other motives for a firm to internalise its production activities such as to engage in transfer pricing, to safeguard supplies of essential inputs, and / or to ensure quality control of end products (see Casson, 1979; Teece, 1985; Hennart, 1986; Dunning, 1993). Buckley and Casson (1976) argue that there are also costs that offset the potential gain from undertaking FDI. For example, there are costs of communicating and transporting intermediate products between parent and subsidiary firms. The optimal action of a foreign firm to internalise its monopolistic advantages should be set at the margin where the costs and the benefits of internalisation are equalised. The greater the transaction costs perceived by a foreign firm, the more likely it is that a firm would exploit its intangible assets via FDI. By contrast, the higher the overseas administrative costs, the less likely it is that FDI will be undertaken.

Apart from internalisation theory, another theory using the firm approach is oligopolistic reaction theory. This theory explains the motivation for FDI in term of strategic reaction (rivalry) among home country firms operating in the tight oligopolistic environment (Knickerbocker, 1973; Flowers, 1976). To clarify, in the oligopolistic / concentrated industry, there are a few producers and products that are closely substitute to one another. If firm 1 and 2 from country A export similar types of products to a host country B, any strategic action taken by firm 1 (2) would be perceived as threats to future competitiveness of firm 2 (1), and thus triggering a response of the latter. Suppose that firm 1 decides to serve a host market of country B via FDI. Then, firm 2 would be uncertain about the forms of threats it would encounter, if not following the action undertaken by firm 1. Potentially, firm 1 may gain several advantages over firm 2, such as gaining access to local distribution channels, having close interactions with local customers, and establishing good relationships with host governments and local suppliers. However, so long as firm 2 does not follow the action taken by firm 1, it would never be certain about the forms of threats it is encountering. Hence, the only way that firm 2 could counter any potential advantages gained by firm 1 and secure its market share overseas is to follow the action undertaken by firm 1 (i.e. establishing its own manufacturing subsidiary in a host country B).

One weakness of oligopolistic theory is that it does not clearly explain why firm 1 is engaged in FDI in the first place; it only predicts the reaction of firm 2 when firm 1 undertakes investment overseas. Also, it does not specify clearly the main objectives of firm 2, whether they are profit-maximisation,

managerial risk-aversion, growth-maximisation, or maintenance of market share (Buckley and Casson, 1976). Lastly, it cannot explain the movement of FDI undertaken in the loose oligopolistic environment.

3.3.3 Theories Using the Locational Approach

In contrast to theories using the firm / industry-organisation approach, most theories using the locational approach do not provide any clear explanation for FDI motivation. As earlier mentioned, they focus on the factors that influence the geographical distribution or direction of FDI. However, one exception is trade and MNE theory. This theory explains why a firm from country A prefers FDI to exporting (importing) activities as an alternative mode of servicing (exploiting) a host market of country B (factor endowments of country C).

Dated back to the original version of product cycle theory (Vernon, 1966), it is argued that a firm from an industrialised country A is motivated to undertake FDI in another industrialised country B or developing country C due to three main reasons. First is to serve the large and the expanding industrialised market of country B, second is to avoid the high trade costs incurred from exporting its products to that country, and third is to take advantages of cheap (unskilled) labour in a developing country C. However, the extent to which each factor influences the firm's investment decision varies across different stages of the product's life cycle. This is because each stage requires different key inputs used. Primarily, the first stage is the innovative stage. The product's innovation is likely to take place in a country with the sophisticated

technology and highly skilled-labour. i.e. it takes place in an industrialised country A. Furthermore, it is likely to take place in a country with the large population of high-income consumers. This is because parts of innovative sunk costs can be shared by those wealthy consumers. Since the new technology has not been standardised at this stage, a firm in country A requires tight communications among different production units, close interactions with customers, and flexibility in using and changing production inputs. At this stage, it has no incentive to establish production plants overseas.

In the second stage, however, when certain degrees of technological elements become standardised, that firm may begin to be committed to large-scale production, serving both the domestic and overseas markets (the market with similar levels of income). At this stage, the expansion of the industrialised market of country B, together with the rising costs of export to that country, play important roles in determining the investment decision of a firm in country A. Vernon (1966) argues that if the sum of marginal costs of home production, together with overseas transportation, is greater than the average cost of overseas production, then a firm from country A would serve the market of country B via direct investment.

In the last stage, the technology becomes fully standardised and other firms in country A (and also country B) are able to produce the same product. The market for such product is no longer monopolistic but highly competitive. The firm's competitiveness no longer depends on the sophisticated (differentiated) characteristics of such product, but the price. Due to the fact

that the standardised technology can be now transferred across countries, a firm from country A would seek to locate its labour-intensive activities in locations with the relatively low costs of labour (to minimise production costs). At this stage, FDI tend to be undertaken in developing countries with the relatively abundance of cheap (unskilled) labour (e.g. a developing country C).

Mainly, one weakness of the original product cycle theory (Vernon, 1966) is that it only explains one way flow of FDI from the most highly innovated country (e.g. the US in the post-war) to other industrialised countries (e.g. the EU) and subsequently to developing countries. However, the reverse flow of FDI (e.g. FDI from the EU or the NICs to the USA) is not clearly addressed[8].

Similar to the above explanation, the recent trade and MNE theory explain the motivation for FDI in terms of the large market size, the high trade costs, and the differences in the factor endowments (Markusen, 1984; Helpman, 1984; Markusen, Venables, Konan, and Zhang, 1996; Zhang and Markusen, 1999). Yet, these theoretical models are more formally constructed under the general equilibrium framework. Furthermore, they distinguish different types of multinational firms: horizontally integrated and vertically integrated MNEs.

The model of horizontally integrated MNEs focuses on a multinational firm that produces the same goods and services across different geographical

[8] However, this issue is addressed by the second version of product cycle model Vernon (1979).

locations (e.g. Markusen, 1984; Markusen and Venables, 1998). For example, Markusen and Venables (1998) present a two-country analytical model in which each country (namely A and B) has one national firm and one multinational firm. A national firm is distinguished from a multinational firm in that the former produces all output in the base country, facing only one set of fixed plant costs and one set of fixed firm costs (i.e. headquarters). On the other hand, a multinational firm face one set of fixed firm costs at home but fixed plant costs at home and abroad (the latter represent FDI). The foreign plant produces solely for the local market. In equilibrium, Markusen and Venables show that, multinational firms (from country A and B) are more likely to exist when incomes (both countries) are high (high purchasing power), firm-level scale economies are high relative to plant-level scale economies, and trade costs (transportation costs and tariff) are high[9].

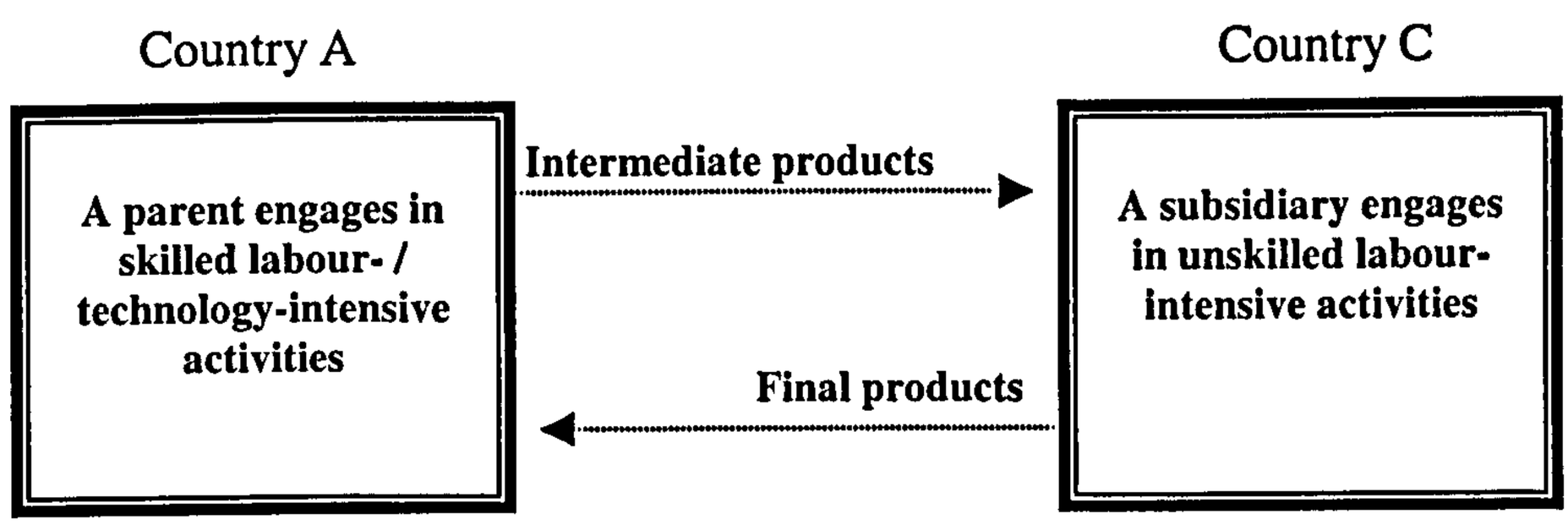
Figure 3-2: Activities of Horizontally integrated MNEs in Country A and B (A Case of High Trade Costs)

On the other hand, the model of vertically integrated MNEs focuses on a multinational firm that separates its production activities into different stages, and locate them at different locations according to local factor endowments

[9] When the trade costs are high, the gains from exporting (by taking advantage of plant economies of scale) are eroded relative to producing and selling locally.

(see the recently developed model by Zhang and Markusen, 1999). Under the main assumption of differences in the factor endowments between countries A and C (skilled vs. unskilled labour), it is shown that a multinational firm from a skilled labour-abundant country (country A) would locate its skilled labour-intensive activities at home, and move its unskilled labour-intensive activities to country C. Different stages of production are located in different countries, and thus a parent firm in a home country A and its subsidiary firms in a host country C engage in the intra-firm trading activities (i.e. exporting and importing of intermediate and final products).

Figure 3-3: Activities of Vertically integrated MNEs in Country A and C (A Case of Low Trade Costs)



Primarily, capital-intensive or technology-intensive products are produced at home. Then, they are exported to a host country for labour-intensive activities. Finally, processed products are re-exported back to a home country for further processing or serving the final demands (see figure 3-3). According to this model, it is suggested that the low rather than the high costs of transportation (and trade barriers) facilitate the activities of those vertically integrated firms. Zhang and Markusen (1999) further suggests that the host

market of country C is also important since smaller parts of products would be shipped back to a home country, thus reducing costs of transportation.

In summary, theories using the capital-market, the firm / industry-organisation, and the locational approaches focus on different factors that motivate a firm's decision to undertake investment overseas. Those using the capital-market approach emphasise differences in the rates of returns on capital investment, the international risk diversification, and the imperfection of capital / currency markets. However, they do not clearly explain why FDI is preferred to other modes such as exporting or licensing activities. In contrast, internalisation theory explains this in terms of large transaction costs incurred from the transfers of intermediate products between two independent firms. Apart from the recent trade and MNE theory, other theories using the locational approach do not provide any clear explanation regarding this aspect of FDI motivation.

Table 3-3: FDI Motivation (Summary of Theoretical Explanations)

Theoretical approach	Motivation
Capital-market	• A firms is motivated to undertake FDI overseas because of the high rates of return on capital investment, the risk diversification, and other financial advantages gained from the imperfection of the capital / currency markets.
Firm/I-O	• A firm is motivated to undertake FDI overseas because of the large transaction costs arising from the imperfection of markets for intangible assets.
Location	• A firm is motivated to undertake FDI overseas because of the high / low trade costs, the large market size, and / or the relatively cheap costs of labour.

3.4 FDI Direction (*Where is there FDI?*)

This section evaluates different theories in the light of their explanations (predictions) regarding the home and the host country for FDI (i.e. a place where FDI is originated and / or a place where it is directed). Noticeably, theories using the firm / industry-organisation approach only predict the home rather than the host countries for FDI. On the other hand, theories using the locational approach predict the latter rather than the former.

3.4.1 Theories Using the Capital-market Approach

Neo-classical trade and capital movement theory (e.g. Ohlin, 1933) predicts that FDI will flow from a home country with the relatively low rate of return on capital investment to a host country with the relatively high rate of return. Yet, theory does not explain why cross-investment does take place between these two countries (e.g. a bilateral flow of FDI between the USA and European countries). Furthermore, it does not explain why some industries are more internationally oriented than others. Lastly, by focusing on the movements of capital across countries, it fails to predict the direction of direct investment undertaken by MNEs. This is because MNEs is able to shift their capital from one country to another and / or reinvest its profits earned from one country in another regardless of differences in the returns on capital investment. For example, a multinational firm from country A may finance its investment project in country C via reinvesting its profits gained locally. Hence, a movement of capital is not observed between countries A to C, despite the expansion of direct investment in the latter.

Unlike capital movement theory, theory of portfolio diversification does not provide any clear prediction regarding a home / host country for FDI (Rugman, 1977; and Miller and Pras, 1980). It only suggests that a multinational firm tends to diversify its investment in several countries where the rates of returns on capital investment are not highly correlated. Implicitly, this theory implies that any country can be both a home and a host country for FDI.

According to currency area theory (Aliber, 1970 and 1971), FDI will flow from a country with the relatively strong currency to another with the relatively weak currency due to the financial advantages gained by a firm in the former – gaining access to the relatively cheap source of funding. However, like capital movement theory, theory does not adequately explain why there is the cross-investment between these countries; i.e. US firms invest in Europe at the same time as European firms invest in the USA (see criticisms in Dunning, 1971).

Related to above theory, theory of exchange rate and FDI suggests that the over-valuation of exchange rate associate with an outflow of FDI while the under-valuation exchange rate associate with an inflow of FDI (Froot and Stein, 1991; Klein and Rosengren, 1994; Blonigien, 1997). In other words, a country with the over-valuation of exchange rate will be a home country while that with the under-valuation of exchange rate will be a host country. Theory also predicts that FDI tends to be greater in the relatively capital- / technology-intensive industries rather than labour-intensive industries. This is because the

depreciation of a host currency increase the relative wealth of home country firms, thus providing them with financial advantages to take over relatively large capital-intensive projects. These firms (from a host country) may also aim to take over technology-intensive firms in a host country in order to enhance their (existing) technological competitiveness (Kogut and Chang, 1991; Blonigen, 1997).

Critically, one weakness of exchange rate theory is that it concentrates on the merger and acquisition type of investment that tends to be the common form of FDI in industrialised countries, not FDI in non-industrialised countries. Generally, FDI in the latter tends to be in the form of new plant establishments rather than merger and acquisition types, and more likely to be undertaken in the labour-intensive rather than technology-intensive activities.

3.4.2 Theories Using the Firm/Industry-organisation Approach

Theories using the firm / industry-organisation do not provide any clear prediction regarding the geographical distribution of FDI. However, industry-organisation theory (Hymer, 1960; Kindleberger, 1969) does explain the inter-firm / industry variation in FDI in terms of superior monopolistic advantages possessed by a multinational firm. To clarify, due to the fact that FDI is associated with the transfer of intangible assets (e.g. technologies, managerial skills, and marketing abilities), theory predicts that a firm with these attributes is more likely to undertake direct investment overseas. Also, it predicts that FDI tends to be concentrated in those monopolistic / oligopolistic industries, which are characterised by the relatively high intensity of those superior

advantages mentioned above. In other words, the outward FDI tends to be greater in those industries with the relatively high intensity of technological, marketing, and / or managerial abilities.

One weakness of this argument is that a multinational firm may have different motivations when undertaking FDI across countries. FDI in DMEs may be aimed at serving the large market of those countries while that in DCs may be aimed at exploiting the abundance of factor endowments. Since a multinational firm undertaking investment in the former needs some forms of intangible assets in order to successfully compete against local firms, its investment activities tend to be associated with such monopolistic advantages. However, multinational activities in DCs tend to be vertically integrated in nature. The aim is to exploit the factor endowments in those countries, and thus FDI activities are expected to be relatively labour- / resources-intensive.

According to theory of oligopolistic reaction, the action-reaction taken by oligopolistic firms from a home country may result in a bunching of FDI in the highly concentrated industries in a host country. Yet, theory does not clearly explain why firms choose to undertake FDI in that country in the first place.

Theory of internalisation argues that FDI is likely to be undertaken between countries with similar environments and developmental stages. This is because the costs of transferring intangible assets tend to be relatively small between two countries with similar labour conditions, institutions, organisation, and cultures (Buckley and Casson, 1976). However, theory still

does not explain much about the variation in FDI among DMEs or among DCs.

3.4.3 Theories Using the Locational Approach

Unlike above theories, theories using the locational approach argue that there are other factors besides the intangible assets which influence the inter-country / industry variation in 'inward' FDI. Crucially, these factors tend to be location-specific rather than firm-specific.

Primarily, the traditional location theory (e.g. Weber, 1929) explain a spatial distribution of investment (both domestic and foreign investment) in terms of differences in the factor endowments. Accordingly, a firm being subject to scale economies tends to incur large fixed costs in setting up production plants, and thus prefers to serve a market from a single location. By doing so, the fixed costs can be spread over large production runs, thus lowering average cost per unit of output. In order for a firm to minimise the marginal costs of production, it has a tendency to establish a manufacturing plant in a location with the relatively cheap costs of labour. Also, to reduce costs of transportation, it tends to select the location with the relatively large market. This is because the large volume of manufacturing outputs can be sufficiently absorbed, and thus smaller parts of them are transported to serve other markets. According to this theory, both domestic and foreign investment tends to be undertaken in locations with lower costs of labour, lower costs of transportation (costs of importing and exporting the output), and larger size of local market. Nonetheless, one weakness of this theory is that it fails to

distinguish different types of foreign direct investment. Arguably, the extent to which different locational factors affect FDI depend on the types of investment, whether it is horizontally integrated (market seeking) or vertically integrated (resource seeking).

Similar to traditional locational theory, trade and MNE theory explain the inter-locational / industry variation in 'inward' FDI in terms of the differences in the factor endowments, the size of host market, and the trade costs (Markusen, 1984; Helpman, 1984; Markusen, Venables, Konan, and Zhang, 1996). However, it takes into account the characteristics of horizontally and vertically integrated FDI. As argued by Markusen, Venables, Konan, and Zhang (1996), when the trade costs are extremely high, horizontally integrated MNEs will undertake FDI in DMEs to serve the large market of those countries. It is unlikely that this type of firms will operate in DCs because the markets of those countries are too small. Furthermore, vertically integrated firms are unlikely to operate in DCs because the trade costs are too high. It is too expensive for parent and subsidiary firms to engage in the intra-firm trading activities[10]. However, when the trade costs are moderate to low, horizontally integrated MNEs are more profitable to serve industrialised markets via exports. This is because the marginal costs of home production and transportation are lower than the average costs of overseas production (e.g. fixed costs of setting production plants and variable costs of local operations). By contrast, the low trade costs facilitate importing and exporting

[10] Unless the advantages gained from exploiting the local endowments compensate for the high trade costs.

activities of vertically integrated MNEs, thus encouraging the expansion of this type of investment in developing countries (see more details in appendix 3).

Recently, there has been a development of the formal theoretical models of economic geography (e.g. Krugman, 1991; Krugman and Venables, 1995). These models focus on pecuniary benefits arising from the manufacturing concentration of firms (foreign and / or domestic firms) across geographical locations. Arguably, a location where several (foreign and domestic) firms are agglomerated tends to attract more investment (both domestic and foreign investment) due to three incentives: the available supply of labour with different specialised skills, the large demand for and / or the supply of intermediate products, and the technology spill-over.

Firstly, the concentration of manufacturing firms in one location tends to bid up wage rates, and thus causing the migration of labour from other locations. Over times, a pooled market for labour with different specialised skills will be formed, and thus acting as an incentive for subsequent firms to establish production activities there. The subsequent firms will gain advantages in terms of large available supply of labour with different specialised skills, as well as flexibility of the labour market. To clarify, firms that experience 'a good time' in their business performances could employ a surplus of workers released from those experiencing 'a bad time' (Krugman, 1991). Workers also gain securities in their employment since the prospect of being unemployed is

low. In other words, they are able to switch from one job to another without changing locations.

The second agglomeration benefit is the large market demand for and / or the available supply of intermediate products. Arguably, with the concentration of manufacturing firms in the same location, those firms subject to scale economies can be specialised in particular product ranges (or particular processes of production), and depend on the purchases of intermediate inputs from other specialised manufacturers (Krugman and Venables, 1995; and Puga and Venables, 1996). The pecuniary benefits gained from being concentrated in one location are the cost (or forward) and the demand (or backward) linkages. On the one hand, by being close to a number of intermediate suppliers, producers using such intermediates would benefit from available intermediate inputs and perhaps a reduction in input costs. This is because the greater the number of suppliers the lower the price of the products (the forward linkage). On the other hand, by being close to a number of producers using intermediate inputs, suppliers of such intermediates would benefit from an increase in sales due to large demand for the products (the backward linkage). Hence, with an increase in the number of manufacturing firms, the demand for and / or the supply of intermediate product also increase, so do the benefits gained from the backward and forward linkages. In other words, an entry of new firms will lead to a greater manufacturing concentration, thus providing more benefits of the input-output linkages.

The third agglomeration benefit is the technology-spill over. With the large concentration of firms operating in one location, firms with related activities can learn from and / or interact to one another. This results in the technology or knowledge spill-over among firms. Especially, this aspect of agglomeration economies is important for those firms operating in the technology- or information-intensive activities.

With regard to other FDI related documents, non-economic factors such as political stability, cultural similarity, and social attitude are argued to be no less important than other economic factors, which influence FDI in developing countries (e.g. Green, 1972; Root and Ahmed, 1979; Schneider and Frey, 1985). This is because the local environment in developing countries may not be so hospitable to foreign investors. Schneider and Frey (1985) argue that the political and economic instability in host developing countries discourage inward flows of FDI. This is because there are risks and uncertainties involved in investment projects, such as political risks of appropriation and / or economic risks of exchange rate fluctuations, as well as rising rates of inflation. Furthermore, Loree and Guisinger (1995) argues that the dissimilarity in cultures and institutional practices between a host and a home country tend to slow down the inward FDI flows. This is due to the large adjustment costs incurred by foreign firms that operate in a new (alienated) environment. Lall (1980) indicates that incentives and assistance provided by host governments tend to encourage foreign investment, since the incentives in terms of corporate tax and tariff concession reduce production and operation costs of foreign firms.

However, it should be noted that these factors tend to influence the inward flows of FDI in conjunction with other locational factors, such as trade costs and market size. Moreover, they may affect only a certain type of FDI. For instance, the cultural difference may influence, to a larger extent, horizontally integrated FDI than vertically integrated FDI; the latter is aimed at exploiting the factor endowments across countries.

Before concluding this section, some mention of Kojima's theory of trade and FDI (Kojima, 1978) is necessary. Kojima's theory is an extension of the neo-classical theory of factor endowments. It is argued that FDI is used as a means to exploit differences in the factor endowments across countries. In Kojima's view, different stages of production should be carried out according to local endowments. For instance, capital- / technology-intensive activities should be carried out in countries where capital and skilled labours are abundant. On the other hand, labour-intensive activities should be carried out in those countries with the abundance of corresponding factor inputs used (e.g. unskilled labour). According to Kojima, Japanese FDI conforms to his view. It is trade-oriented, being responsive to differences in the local factor endowments. This kind of FDI leads to greater trade and greater world-wide efficiency. In contrast, US FDI is an anti-trade oriented one. It is mostly undertaken in industries in which a host country has a comparative disadvantage. However, FDI occurs because of protection or oligopolistic competition. It is criticised by Kojima that this kind of FDI leads to diminished trade, market segmentation, and

possibly reduced global welfare (see criticisms of Kojima's theory in Mason, 1980).

In summary, table 3-4 below shows the different theoretical predictions regarding the direction of FDI. Theories using the capital approach suggest that FDI would flow out from countries with the relatively high rates of returns on capital investment (or with the depreciation of currencies). On the other hand, theories using the locational approach predicts that an 'inward' FDI tends to be undertaken in locations with the relatively large market size, cheap costs of labour, low / high trade costs, stable political and economic environments, and agglomeration benefits. Theories using the firm / industry-organisation approach, on the other hand, do not provide any clear prediction regarding the inter-country variation in 'inward' FDI. Implicitly, they suggest that FDI tends to be associated with the monopolistic characteristics of manufacturing industries in which multinational firms operate.

Table 3-4: FDI direction (Summary of Theoretical Explanations)

Theoretical approach	Direction
Capital-market	• FDI tend to be directed to countries with the relatively high rates of return on capital investment. • FDI tend to be originated from countries with the appreciation of currencies and / or directed to countries with the depreciation of currencies.
Firm/industry-organisation	• FDI tends to be undertaken in manufacturing activities with the relatively high intensity of technology, as well as other monopolistic advantages possessed by foreign firm undertaking such FDI.
Location	• FDI tends to be undertaken in host locations with the relatively large market size, cheap costs of labours, low / high trade costs, etc.

3.5 Dunning's Eclectic Paradigm

The theoretical approaches to FDI determinations discussed above tend to focus on some aspects of FDI. There is no single theory that is able to provide full explanations of all FDI aspects. As criticised by Dunning (1973, 1981, and 1988), FDI does not evolve independently and the explanations for foreign direct investment should be multi-dimensional, combing the conceptual elements of the different theoretical approaches. According to eclectic paradigm proposed by Dunning, a multinational firm from a home country will undertake overseas direct investment if and when three conditions are satisfied.

Firstly, a firm must possess the superior advantages to successfully compete with local firms in a host country. These advantages are the intangible assets such as technological and managerial capabilities that are exclusive or specific to a firm possessing them (at least for a certain time period). Formally, the advantages are termed by Dunning as 'ownership advantages'.

Secondly, assuming that the first condition is satisfied, it must be advantageous for a multinational firm to exploit these advantages overseas by itself rather than to sell them or lease them to other local firms. Since these advantages are explained by theory of internalisation, they are termed as 'internalisation advantages'.

Lastly, assuming that the first and second conditions are satisfied, it must be in a global interest of that firm to utilise these advantages in conjunction with

other factor inputs or services outside its home country. For example, a firm may be interested in exploiting its ownership and internalisation advantage in conjunction with the abundance of cheap labours in developing countries or specific facilities available in industrialised countries. Otherwise, it would not undertake FDI but entirely serve all overseas markets by exports. Dunning terms these last advantages as 'locational advantages' (for details, see Dunning, 1993, p. 81-83).

3.6 Conclusions

This chapter reviewed and evaluated different theoretical approaches to the determinants of foreign direct investment. It was shown that different theories using the three broad approaches tend to focus on particular aspects of FDI. While theories using the firm / industry-organisation approach concentrate on the characteristics and the motivation of FDI, theories using the locational approach tend to focus on the directional aspect of FDI. Alternatively, theories using the capital-market approach emphasise the macro-economic or the financial aspect of FDI determinants.

With dissimilarities among different theoretical approaches, it may be argued that a suitable theoretical basis for the present analysis of Japanese FDI in Thailand depends on the aspect of FDI being examined. In other words, it depends on the type of research question being asked, whether it is '*What is FDI?*', '*Why is there FDI?*' or '*Where is there FDI?*'. As noted by Dunning (1988, p. 5), "the question raised will, to a large extent, determine the strand of

theoretical frameworks appropriate for its answer". According the present analysis, the research's aim is to examine the inter-industry variation in Japanese FDI in Thailand, and thus the directional aspect of FDI is the main focus of this analysis.

Referring back to the discussion on FDI direction (section 2.4), theories using the capital-market approach are not appropriate for the present analysis. This is because they concentrate on macro determinants (e.g. exchange rate and prices of capital assets) which tend to influence short-run flows rather than long-run cumulative stocks of FDI. In other words, these theories are able to explain FDI flows from one period to the next, but not a systematic variation in cumulative stocks of FDI across host manufacturing industries over a given period.

Theories using the firm / industry-organisation approach neglect the different objectives of a multinational firm when undertaking FDI in different countries. As discussed earlier, the motivation for a firm to undertake FDI in DMEs tends to be different from that in DCs. It is likely that manufacturing activities carried out by foreign firms in two different countries (DMEs vs. DCs) also tend to be dissimilar. In general, a multinational firm operating in DMEs tends to be horizontally integrated, with an aim of serving the large markets of those countries. Because such firm needs monopolistic advantages to compete successfully against local firms, FDI in DMEs tends to be strongly associated with these monopolistic characteristics.

On the other hand, multinational activities in developing countries tend to be vertically integrated in nature, aiming to exploit local factor endowments and / or natural resources. Referring back to the previous chapter (the descriptive analysis), the average share capital and employment of Japanese companies in Thailand are quite small, implying that many small and medium investment projects has been undertaken. In addition, the manufacturing pattern of Japanese and non-Japanese FDI in Thailand tended to be similar, with foreign direct investment being mainly concentrated in the fabricated metal, industrial machinery, and electrical equipment sector (the ISIC 38). Therefore, it is likely that locational-specific characteristics of Thailand such as endowment and policy factors played important roles in influencing the pattern of Japanese and non-Japanese FDI.

From above arguments, it is thus appropriate to use the locational approach to model the determinants of FDI in this context. In line with the eclectic paradigm, the internalisation and ownership advantages of Japanese firms will be taken as given (see dunning, 1993, p. 83, for lists of these advantages). The determinants of Japanese FDI distribution across Thai manufacturing industries will be thus identified and investigated in terms of the locational determinants.

Appendix 3

Theoretical model of Trade and MNEs

From the original works by Markusen (1984) and Helpman (1984), there have been several improvements on the theoretical works of trade and foreign direct investment. Some works concentrate on horizontally integrated MNEs (e.g. Markusen and Venables, 1998) while other focus on vertically integrated MNEs (e.g. Zhang and Markusen, 1999). This appendix summarises the theoretical work that takes into account of both types of MNEs (Markusen, Venables, Konan, and Zhang, 1996). A structure of this model is as follows.

Basic assumptions

- There are two countries (h and f), producing two homogenous goods (Y and X). There are two factors of production, L (unskilled labour) and S (skilled labour). L and S are mobile between industries but internationally immobile. Good Y is competitive, L intensive, and produced under constant returns to scale, while good X is imperfectly competitive, S intensive, and produced under increasing returns to scale. Y is used as numeraire through out the model.

Firm types and fixed costs

- Subscripts (n,v,m) represent national firms, vertical multinational firms, and horizontal multinational firms [m_i, v_i, and n_i indicate the number of active m, v, and n firms based in country i].

- Assuming that skilled labour (S) is used for the firm specific fixed costs of producing good X, while a combination of both skilled (S) and unskilled (L) labours are used for the plant specific fixed costs. The fixed costs in the X sector can be described as follows:

F_1^n	=	Skilled labour requirements of a type-n firm drawn from the headquarters' country
F_1^v	=	Skilled labour requirements of a type-v firm drawn from the headquarters' country
F_1^m	=	Skilled labour requirements of a type-m firm drawn from the headquarters' country
F_2^v	=	Skilled labour requirements of a type-v firm drawn from the non-headquarters' country
F_2^m	=	Skilled labour requirements of a type-m firm drawn from the non-headquarters' country
G^n	=	Unskilled labour requirements of a type-n firm drawn from the headquarters' country (where the plant is located)
G^v	=	Unskilled labour requirements of a type-v firm drawn from the non-headquarters' country (where the plant is located)
G^m	=	Unskilled labour requirements of a type-m firm which must be incurred in each country (one G^m for each plant)

- Skilled labour needed in the fixed costs for type-n and type-v single-plant firms are the same ($F_1^n = F_1^v + F_2^v$). Type-v firms need to draw some of

this skilled labour from the country in which the plant is located whereas type-n firms draw all skilled labour from the headquarters' country.

- Skilled labour needed in fixed costs for type-m firms are higher than the amount required for single-plant type-n and type-v firms, but much less than double the amount ($2F_1^n > F_1^m + F_2^m > F_1^n$). This assumption reflects the 'joint-input property' of knowledge-capital in terms of blueprints, manuals, formulae, procedures, etc. This can be supplied by headquarter to additional plants overseas with low costs. In other words, type-m firms require more skilled labour in the headquarters' country and much less skilled labour in the host country, since some of the goods and services produced by skilled labour in at home can be transferred to the host country with low or zero marginal costs.
- Unskilled labour requirements should be the same for all plants and should be drawn entirely from the country in which a plant is located ($G^m = G^n = G^v$).

Predictions

From the above assumptions, general predictions of the model can be discussed as followings. Firstly, type-n_h firms tend to be the dominant type in country h if h is both large and skilled-labour abundant. This is because the large size of country h favours production in that country while the relatively skilled-labour abundance of country h favours locating headquarters in that country. There is no incentive for type-v firms to separate production and headquarters in different countries. Further, if the market of country f is small, it is costly for type-m firms to set up another production activities there

(unless trade costs are high). Type-n_h firms also tends to be the dominant type if h and f are similar in the size and the relative endowments, and the costs of transporting manufacturing products between the two countries are low. With the similar factor endowments, there is no motive for type-v firms. Also, with the low trade costs, there is no motive for type-m firms since Type-n_h can serve the market of country f via exports.

Secondly, type-m_h firms tend to be the dominant type in country h if h and f are similar in the size and the relative endowments, but the transport costs are high. The intuition behind this is that if countries are dissimilar in either the size or the relative endowments, then one country will be favoured as a site of production (or headquarters). For instance, if the countries are similar in the relative endowments but dissimilar in the size, then type-n firms located in the large country will be favoured. They avoid large fixed costs in setting up production plants in a country with the relatively small market. Besides, if the trade costs are low, there is no motive to set up additional production plants in another country, and thus type-n firms will dominate. If the countries are very different in the relative endowments but of similar size, then there is a motive to concentrate headquarters in the skilled-labour-abundant country and production in the skilled-labour-scare country. Under this circumstance, headquarters of type-v firms are located in the skilled-labour-abundant countries.

Lastly, type-v_h firms should be the dominant types in country f if that country is large, skilled-labour-scare, and the transport costs are not too high. This is

explained by the fact that when countries are largely dissimilar in terms of the factor endowments, firms in the relatively skilled-labour abundant country tend to locate their skill-labour-intensive activities at home, and move their unskilled-labour-intensive activities overseas in order to exploit the abundance of unskilled labours there. The moderate (low) trade costs facilitate trading activities between headquarters and production plants located in different countries.

For more technical details and simulation results, see Markusen, Venables, Konan, and Zhang (1996).

Chapter IV

Survey of Empirical Studies on FDI Determinants

Chapter IV

Survey of Empirical Studies on FDI Determinants

4.1 Introduction

In relation to the previous chapter, this chapter reviews and evaluates different studies that have tested various hypotheses derived from theories using the capital-market, the firm / industry-organisation, and the locational approaches. The aim of this chapter is to compare and contrast differences in the hypotheses tested, the characteristics of sample data and the methodologies used, and the general findings obtained. Since there is a large volume of empirical studies that are similar to one another in terms of the hypotheses tested, the review tend to be confined to those studies published after 1980[1]. This review is also selective in a sense that it covers only studies using an econometric methodology as a quantitative tool for empirical analysis[2].

The remainder of this chapter is organised as follows. Section 4.2 discusses various hypotheses derived from theories using the three approaches discussed in chapter III, while section 4.3 reviews some of empirical studies that have tested the hypotheses. Section 4.4 discusses the measures and the techniques

[1] For studies prior to 1980s, see a survey by Agarwal (1980).
[2] Survey analyses were popular during 1960s-1970s. However, formal econometric studies have been mostly conducted in recent times. See Dunning (1993, p. 140) for a summary of previous survey studies.

used, as well as the empirical findings obtained by empirical studies, and finally section 4.5 draws conclusions and discusses the links between the previous and the present analyses of Japanese FDI.

4.2 Testable Hypotheses

Table 4-1 shows the commonly tested hypotheses derived from theories using the capital-market, the firm / industry-organisation, and the locational approaches.

Table 4-1: Summary of Testable Hypotheses

Capital-Market Approach	
1. Rate of return	• FDI is positively related to a differential rate of return on capital investment.
2. Exchange rate	• FDI is positively related to a depreciation of a host country's currency (or an appreciation of a home country's currency).
Firm / Industry-organisation Approach	
3. Technological ability	• Firms with superior technological abilities are more likely to undertake FDI.
4. Marketing ability / product differentiation	• Firms with superior marketing abilities and higher degrees of product differentiation are more likely to undertake FDI.
5. Managerial ability	• Firms with superior managerial abilities are more likely to undertake FDI.
6. Firm's Size	• Firms with larger corporate size are more likely to undertake FDI.
7. Scale economies	• Firms operating in industries characterised by larger (firm-level) scale-economies are more likely to undertake FDI.
8. Capital intensity	• Firms with higher levels of capital intensity are more likely to undertake FDI.
9. Internal cash flows	• Firms with larger internal cash flows are more likely to undertake FDI.
10. Industry concentration	• Firms operating in more highly concentrated industries are more likely to undertake FDI.

Table 4-1 (Cont'd)

11. Multi-plant operations	• Firms with higher degrees of multi-plant operation are more likely to undertake FDI.
Locational Approach	
12. Market size	• FDI tends to be greater in countries / industries with larger market sizes.
13. Labour cost, labour endowment	• FDI tends to be greater in countries / industries with lower costs of labour and / or greater abundance of skilled (or unskilled) labour.
14. Infrastructure	• FDI tends to be greater in countries with better-developed infrastructures.
15. Export intensity	• FDI tends to be greater in countries / industries with higher intensities of export between a home and a host country.
16. Political and economic stability	• FDI tends to be greater in countries with stable political and economic environments.
17. Distance	• FDI tends to be greater in host countries that are (geographically) closer to a home country. • FDI tends to be greater in host countries with more similar cultural and social attitudes to that of a home country.
18. Agglomeration economies	• FDI tends to be greater in countries / industries with larger concentrations of manufacturing firms.
19. Trade costs	• FDI tends to be greater in countries / industries with higher trade costs (horizontally integrated FDI). • FDI tends to be greater in countries / industries with lower trade costs (vertically integrated FDI).
20. Incentives / assistance	• FDI tends to be greater in countries /industries with more financial incentives and assistance being given.

It is noticed that empirical studies falling under the capital-market and the locational approaches tend to be the 'country-level' hypotheses while those falling under the firm / industry-organisation approach tend to be the 'industry- / firm-level' hypotheses. Hypotheses derived from currency area and portfolio

diversification theories are not included in this review because both focus on the motivation rather than the direction of FDI. Besides, both have rarely been subject to empirical testing[3].

From table 4-1, the rate of return hypothesis (1) may be subject to empirical limitations. This is because an objective of a firm in investing overseas may go beyond the motive for acquiring the immediate returns on capital investment. Especially, a large multinational firm that has production activities world-wide may be aimed at maximising its long-run global competitiveness and / or profits rather than the immediate returns. Similarly, the exchange rate hypothesis (2) may be only applicable to FDI in a host country and / or a home country with a flexible exchange rate regime or with an experience of exchange rate devaluation. Besides, exchange rate movements may influence only particular forms of FDI such as merger and acquisition, which tend to be undertaken in certain industries and countries. Therefore, it may be rational (for statistical reasons) to distinguish different forms of FDI when testing this hypothesis.

Referring back to theories using the firm / industry-organisation approach, a multinational firm tends to operate in a monopolistic environment [e.g. in a highly concentrated market (hypothesis 10)]. It is also likely to operate in an industry with relatively large barriers to entry [e.g. firm-level scale economies (hypothesis 7)]. More importantly, the monopolistic advantages such as

[3] For example of empirical studies testing theory of portfolio diversification, see Prachowny (1972).

technological and marketing abilities (hypotheses 3 and 4) are argued to be the specific intangible assets possessed by a multinational firm. Due to the fact that an objective of that firm is to use such advantages to compete against local firms for domestic market share, it may be appropriate to test the hypotheses 3 to 11 in the context of horizontally integrated FDI. Furthermore, it may be appropriate to test these hypotheses with respect to FDI in developed market economies (DMEs) rather than that in developing countries (DCs). This is because local firms in DMEs are well developed with these attributes. Any foreign firm wishing to enter the market of DMEs must possess such specific advantages over those possessed by local firms. On the other hand, in a case of FDI in DCs, these advantages may not be the main conditions for foreign firms since local firms in general tend to lack of marketing, management, and technological knowledge to compete with foreign firms in the first place. Besides, the main objective of firm undertaking FDI in many DCs is to exploit local endowments (e.g. natural resources or unskilled labour), and thus the intangible assets such as technological or managerial advantages may not systematically influence the inter-industrial distribution of FDI in those countries.

The hypotheses under the locational approach (hypotheses 12-20) tend to be specific to particular types of foreign firm that operate in particular host countries at particular time periods. For example, the market size hypothesis (12) is more appropriate in the context of horizontally integrated FDI than vertically integrated FDI. The labour cost hypothesis (13), on the other hand, is appropriate in the context of labour-intensive rather than technology

intensive FDI. Besides, cheap costs of labour may be an important determinant of inward FDI in a developing country at a particular point in time, but subsequently become irrelevant as a country progress in terms of her economic development, due to a new source of locational advantages being created. With respect to the infrastructure hypothesis (14), FDI tend be influenced to different degrees by a host infrastructure depending on a relative importance of that infrastructure. Particularly, FDI aimed at exporting processed / final products back to a home country and / or to a third country is less concerned with the quality of domestic infrastructure than is FDI aimed at servicing a host domestic market (i.e. the latter prefers a well-developed transport network and distribution channel). Regarding the trade intensity hypothesis (15), a positive relationship between FDI and an intensity of home manufacturing exports is explained by various reasons depending on the types of foreign direct investment being examined. Firstly, an expansion of a host market (or a rise in trade costs) induces a firm from a home country to switch from exporting to FDI activities. A positive relationship between previous (home) exports and present FDI undertaken in a host country is expected under this circumstance. Secondly, low transportation costs, as well as tariff and non-tariff barriers, encourage parent firms in a home country and their (vertically integrated) subsidiaries in a host developing country to engage in the intra-firm trading activities. In this regard, a positive relationship between FDI and export intensity is anticipated. Lastly, competitive advantages of foreign firms from a home country required to compete successfully against local firms from a host country may be partially revealed through export performances. Therefore, the outward FDI (undertaken by those firms) is

expected to correspond positively with the intensity of home exports. With different explanations for the positive relationship between FDI and export intensity, it may be thus desirable that the form / type of FDI examined is clearly indicated.

The stability and distance hypotheses (16 and 17) are more relevant for FDI in DCs since the political, economic, social, and cultural environments of these countries tend to be different from the Western ones. Nonetheless, factors such as cultural and geographical distances tend to diminish over time due to the increasing trend of globalisation, which enhance both global communication and business practices. Quantitatively, it is difficult to measure political stability and cultural similarity because these factors are qualitative in nature. With regard to the trade cost hypothesis (19), it is viewed to be controversial. Large trade costs may encourage horizontally integrated FDI but discourage vertically integrated FDI. Similar to the export intensity hypothesis, a type of FDI should be clearly indicated when testing this hypothesis. Lastly, the incentive hypothesis (20) tends be specific to investment policies set by different host governments. Potentially, multi-country studies testing such hypothesis may encounter proxying problems.

4.3 Characteristics of Data Used by Empirical Studies

With the various hypotheses discussed above, this section looks at the sample data used by some of empirical studies that have tested such hypotheses.

Table 4-2: Summary of Empirical Studies

Study	Approaches		
	Capital	Firm	Location
1. Dunning (1980) **(DUN)**		✔	✔
2. Kravis and Lipsey (1982) **(K&L)**			✔
3. Lall and Mohammad (1983) **(L&M)**		✔	
4. Cushman (1985) **(CUS)**	✔		
5. Grubaugh (1987) **(GRU)**		✔	
6. Ray (1989) **(RAY)**	✔	✔	✔
7. Yu (1990) **(YU)**		✔	
8. Coughlin, Terza, Arromdee (1991) **(CT&A)**			✔
9. Froot and Stein (1991) **(F&S)**	✔		
10. Kogut and Chang (1991) **(K&C)**		✔	
11. Belderbos (1992) **(BEL)**	✔		
12. Friedman, Gerlowski, and Silberman (1992) **(FG&S)**			✔
13. Hill and Munday (1992) **(H&M)**			✔
14. Jeon (1992) **(JEO)**		✔	
15. Wheeler and Mody (1992) **(W&M)**			✔
16. Lucas (1993) **(LUS)**			✔
17. Moore (1993) **(MOO)**			✔
18. Ratnayake (1993) **(RAT)**	✔	✔	✔
19. Taylor (1993) **(TAY)**			✔
20. Woodward and Rolfe (1993) **(W&R)**			✔
21. Bajo-Rubio and Sosvilla-Rivero (1994) **(B&S)**	✔		✔
22. Hennart and Park (1994) **(H&P)**		✔	
23. Klein and Rosengren (1994) **(K&R)**	✔		
24. Kumar (1994) **(KUM*)**			✔
25. Swenson (1994) **(SWE)**	✔		
26. Trevino and Daniels (1994) **(T&D)**	✔	✔	
27. Aswicahyono and Hill (1995) **(A&H)**		✔	
28. Denekamp (1995) **(DEN)**		✔	
29. Grosse and Trevino (1995) **(G&T)**	✔		✔
30. Head, Ries, and Swenson (1995) **(HR&S*)**			✔
31. Loree and Guisinger (1995) **(L&G)**			✔
32. Aristotelous and Fountas (1996) **(A&F)**	✔		✔
33. Banerji and Sambharya (1996) **(B&S*)**	✔	✔	
34. Barrell and Pain (1996) **(B&P*)**	✔		✔
35. Belderbos and Sleuwaegen (1996) **(B&S**)**	✔	✔	
36. Braunerhjelm and Svensson (1996) **(B&S***)**			✔
37. Hines (1996) **(HIN)**			✔
38. Kogut and Chang (1996) **(K&C*)**	✔		
39. Milner and Pentecost (1996) **(M&P)**			✔
40. Pugel, Kragas, and Kimura (1996) **(PK&K)**		✔	
41. Belderbos (1997) **(BEL*)**			✔
42. Blonigen (1997) **(BLO)**	✔		
43. Cassou (1997) **(CAS)**	✔		
44. Liu, Song, Wei, and Romilly (1997) **(LSW&R)**	✔		✔
45. Mody and Srinivasan (1998) **(M&S)**			✔
46. Kumar (1998) **(KUM**)**			✔
47. Barrell and Pain (1999a) **(B&P**)**			✔
48. Barrell and Pain (1999b) **(B&P***)**		✔	✔
49. Girma, Greenaway, and Wakelin (1999) **(GG&W)**		✔	✔
50. Head, Ries, and Swenson (1999) **(HR&S**)**			✔

✔ means a hypothesis (es) under that particular approach has been tested

Table 4-2 gives an overview of empirical studies testing different hypotheses falling under the capital-market, the firm / industry-organisation, and the locational approaches, while tables 4-3 to 4-5 show detailed summaries. According to the Dunning's eclectic paradigm (1980 and 1988), a firm's decision to undertake FDI is simultaneously determined by both the ownership advantages and the locational advantages. However, it may be difficult to jointly test the hypotheses under the firm / industry-organisation and locational approaches, since the hypotheses are somehow specific to the types of investment, industries, time periods, countries, and objectives of analyses, i.e. some studies examine an outward FDI while others investigate an inward FDI. Also, the constraints on available data pose a major problem to analyses.

From table 4-2, it is observed that, except for the studies by Ray (1989), Ratnayake (1993), Barrell and Pain (1999a), Girma, Greenaway, and Wakelin (1999) (studies 6, 18, 48, and 49), the hypotheses under the firm / industry-organisation approach were not tested jointly with those under the locational approach. However, the hypotheses under the capital approach were often tested in conjunction with the hypotheses falling under the firm or the locational approaches. The data inconsistency may be the main problem encountered by studies wishing to test the hypotheses under the firm / industry-organisation and locational approaches. On the one hand, studies under the firm / industry-organisation approach generally focus on an outward FDI and often employ the disaggregated data at the firm- / industry-level. On the other hand, studies under the locational approach concentrate on an inward FDI and often employ the aggregated data at the macro level. It is difficult to

obtain the data at the firm level for some locational variables such as labour costs or trade flows. Furthermore, it is almost impossible to test the stability or infrastructure hypotheses using the industry-level data since the data are not commonly measured.

4.3.1 Studies under the Capital-market Approach

Table 4-3 (a) shows a sub-group of empirical studies testing the hypotheses under the capital-market approach. In more details, table 4-3 (b) shows the characteristics of sample data used by 'country-level' studies while table 4-3 (c) shows those used by 'industry- / firm-level' studies.

Table 4-3 (a): Summary of Empirical Studies Testing the Hypotheses under the Capital-market Approach

Study	Hypothesis	
	1	2
(4) CUS	✔	
(6) RAY	✔	
(9) F&S	✔	
(11) BEL	✔	✔
(18) RAT		✔
(21) B&S	✔	
(23) K&R	✔	
(25) SWE	✔	
(29) G&T	✔	✔
(32) A&F	✔	
(34) B&P*	✔	
(38) K&C*	✔	
(42) BLO	✔	
(43) CAS	✔	✔
(44) LSW&R	✔	
Number of studies	14	4

From table 4-3 (a), it is apparent that the majority of empirical studies tested the exchange rate hypothesis (2). However, as observed from table 4-3 (b and c), the exchange rate hypothesis was mostly tested in the context of FDI in

DMEs. Also, the majority of empirical studies focused on the relationship between exchange rate movements and inward flows of FDI to the USA (studies 6, 9, 23, 25, 29, 38, 42, and 43). Some studies (6, 9, 23, 25, and 38) also employed the disaggregated data; nonetheless, these data are from the same source - the US Department of Commerce.

Table 4-3 (b): Summary of 'Country-level' Data Used by Studies under the Capital-market Approach

Study	Sample Data			
	Year	Type	Host country	Home country
(4) CUS	1963-78	P	5 DMEs[1]	USA
(21) B&S	1964-88	T	Spain	All, USA, EC
(23) K&R	1979-91	P	USA	7 DMEs[2]
(29) G&T	1980-91	P	USA	All
(32) A&F	1983-92	P	EU[3]	USA, Japan
(34) B&P*	1971-88	T	7 DMEs[4]	USA
(43) CAS	1970-89	P	USA	6 DMEs[5]
(44) LSW&R	1983-94	P	China	All

Note: **P** denotes panel data, **T** denotes time-series data, and **C** denotes cross-sectional data
[1] UK, France, Germany, Canada, and Japan
[2] Canada, Germany, France, Japan, the Netherlands, Switzerland, and UK
[3] Belgium, Denmark, France, Germany, Ireland, Italy, Netherlands, Spain, UK
[4] Canada, Germany, France, Japan, the Netherlands, Switzerland, and UK
[5] France, Germany, Italy, Japan, Sweden, and UK

From table 4-3 (a, b, and c), a reason why the exchange rate hypothesis was often tested may be explained by an over-representation of empirical studies analysing the specific circumstances of exchange rate and FDI movements. Particularly, many studies examined the effect of the depreciation of the US Dollar against the Japanese Yen during the 1980s. Since the effects of exchange rate movements could be specific to certain types of FDI, studies by Froot and Stein (1991), Klein and Rosengren (1994), and Blonigen, 1997 (studies 9, 23, and 42) also separated different types of direct investment (e.g. merger and acquisition (M&A) vs. new plant establishment).

Table 4-3 (c): Summary of 'Firm- / Industry-level' Data used by Studies under the Capital-Market Approach

Study	Sample Data			
	Year	Type	Host country	Home country
(6) RAY	1979-85	P	USA	All, EC, Japan, Canada
(9) F&S	1973-88	T	USA	All
(11) BEL	1978-84	P	All	The Netherlands
(18) RAT	1985	C	Australia	All
(25) SWE	1979-91	P	USA	5 DMEs[1]
(26) T&D	1984-88	C	USA	Japan
(33) B&S*	1980-86 (A)	C	USA	Japan
(35) B&S**	1986-88 (A)	C	Asia, Europe, North America[2]	Japan
(38) K&C*	1976-89 (A)	C	USA	Japan
(42) BLO	1975-92	P	USA	Japan

Note: A means an average value of dependent and / or independent variable is used for the specified period.
[1] Japan, UK, Canada, France, and Netherlands
[2] North America includes USA and Canada; Europe includes EFTA, EC, and Eastern European countries; Asia includes South Korea, Taiwan, Hong Kong, China, and ASEAN
Other are details as in table 4-3 (b).

It may be inferred from table 4-3 (b, and c) that studies testing the rate of return hypothesis (1) have different objectives. One the one hand, Belderbos (1992) and Ratnayake (1993) (studies 10 and 18) aimed to test the effect of the rate of returns on FDI distribution across manufacturing industries in DMEs. The returns on investment, in this regard, were not the prices of capital assets but the profits / revenues gained from conducting business activities overseas. On the other hand, Grosse and Trevino (1994) and Cassou (1997) (studies 29 and 43) tested the traditional hypothesis of a differential rate of return. According to these studies, inward flows of FDI to the USA were argued to be determined by the differences in the prices of capital assets between the USA and the home countries (see theoretical discussions in chapter III). From table 4-3 (b and c), it is observed that none of empirical studies tested the rate of

return hypothesis in the context of FDI flows to developing countries. The reason may be that FDI data in DCs are insufficient and / or other factors play more important roles in determining FDI in those countries.

4.3.2 Studies under the Firm/Industry-Organisation Approach

With regard to the hypotheses under the firm / industry-organisation approach, table 4-4 (a) shows that the majority of studies tested the technological capability, marketing ability, and firm's size hypotheses (3, 4, and 6). Arguably, these factors may be perceived as the pre-conditions for a firm to undertake investment overseas, and also data used for measuring this variable may be widely accessible. On the other hand, the scale economies, cash flow, and multi-plant operation hypotheses (7, 9, and 11) were not often tested [table 4-4 (a)], possibly due to difficulties in finding an available information as well as suitable measures used for the variables. It is observed that Lall and Mohammad (1983) and Aswicahyoho and Hill (1995) (studies 3 and 27) expected a positive relationship between FDI and (firm-level) scale economies (across manufacturing industries) while Girma, Greenaway, and Wakelin (1999) (studies 49) expected a negative relationship between FDI and (plant-level) scale economies. The former argued that foreign firms tended to operate in monopolistic industries being characterised by large barriers to entry – large (firm-level) scale-economies. On the other hand, the latter anticipated that firms in industries characterised by large minimum efficient plant size tend to concentrate their production activities at home in order to exploit (plant-level)

scale economies, rather than disperse manufacturing activities across geographical locations[4].

Table 4-4 (a): Summary of Empirical Studies Testing the Hypotheses under the Firm / Industry-organisation Approach

Study	Hypothesis								
	3	4	5	6	7	8	9	10	11
(1) DUN			✔						
(3) L&M	✔	✔	✔		✔	✔			
(4) CUS							✔		
(5) GRU	✔	✔		✔					
(6) RAY	✔	✔				✔		✔	
(7) YU	✔	✔		✔					
(10) K&C	✔	✔						✔	
(14) JEO		✔		✔				✔	
(18) RAT	✔	✔	✔	✔				✔	✔
(22) H&P	✔	✔						✔	
(26) T&D	✔			✔			✔	✔	
(27) A&H	✔	✔	✔		✔	✔			
(28) DEN	✔	✔				✔		✔	
(33) B&S*				✔			✔		
(34) B&P*							✔		
(35) B&S**	✔	✔	✔	✔		✔	✔		
(40) PK&K	✔	✔						✔	
(48) B&P***	✔								
(49) GG&W					✔				
No. studies	13	12	5	7	3	5	5	8	1

Apart from the technology, marketing, and firm's size hypotheses, the industry concentration hypothesis (10) was often tested in comparison to other hypotheses falling under the firm / industry-organisation approach. Possibly, the reason why this hypothesis was always tested jointly with the technology and marketing hypotheses may be that a firm with strong technological and marketing abilities tends to operate in a monopolistic / oligopolistic environment. Hence, the industry concentration variable was included as a

[4] However, when the trade costs are high, the gains from exporting (by taking advantage of plant economies of scale) are eroded relative to producing and / or selling in host countries.

control variable in the empirical models. Some studies like Hennart and Park (1994) also used this variable to indirectly test for oligopolistic reaction theory (see chapter III for discussions).

Table 4-4 (b): Summary of 'Country-level' Data used by Studies under the Firm- / Industry-organisation Approach

Study	Sample Data			
	Year	Type	Host country	Home country
(4) CUS	1963-78	P	5 DMEs	USA
(34) B&P*	1971-88	T	7 DMEs	USA

Note: Other details are as in table 4-3 (b).

Table 4-4 (c): Summary of 'Firm- / Industry-level' Data used by Studies under the Firm / Industry-organisation Approach

Study	Sample Data			
	Year	Type	Host country	Home country
(1) DUN	1970	C	7 DMEs[1]	USA
(3) L&M	1976-78 (A)	C	India	All
(5) GRU	1982	C	All	USA
(6) RAY	1979-85 (A)	P	USA	All, EC, Japan, Canada
(7) YU	1982-84 (A)	C	17 DMEs	USA
(10) K&C	1976-87 (A)	C	USA	Japan
(14) JEO	1989	C	DMEs[2]	Korea
(18) RAT	1985	C	Australia	All
(22) H&P	1986	C	USA	Japan
(26) T&D	1984-88	C	USA	Japan
(27) A&H	1985	C	Indonesia	All
(28) DEN	1982-89	C	All	USA
(33) B&S*	1980-86 (A)	C	USA	Japan
(35) B&S**	1986-88 (A)	C	Asia ,Europe, North America	Japan
(40) PK&K	1987	C	USA	Japan
(48) B&P***	1978-94	P	6 EU[3]	USA
(49) GG&W	1988-1996	P	UK	Japan

Note: [1] Canada, UK, France, Germany, Belgium, Mexico, and Brazil
[2] Australia, Canada, Japan, USA, Western Europe, plus Hong Kong and Singapore
[3] UK, Germany, France, Italy, Netherlands, Belgium, Ireland, and Spain
Other details are as in table 4-3 (b).

From table 4-4 (b and c), it is apparent that, apart from Cushman (1985) and Barrell and Pain (1996) (study 4 and 34), all empirical studies were cross-sectional, employing the disaggregated data at the firm- or industry-level. As

noted earlier, theories under the firm / industry-organisation approach tend to address the directional aspect of FDI determinants in term of the inter-firm or the inter-industry variation rather than the inter-country variation of FDI. Noticeably, most of empirical studies testing the hypotheses under the firm / industry-organisation focused on FDI in DMEs; only Lall and Mohammad (1983) and Aswicahyoho and Hill (1995) (3 and 27) tested the hypotheses with respect to FDI undertaken in DCs. As earlier argued, the monopolistic advantages may not be the main condition for a foreign firm to invest in developing countries; other factors discussed below may be more important.

4.3.3 Studies under the Locational Approach

It is apparent from table 4-5 (a) that the hypotheses under the locational approach were more often tested than those under the two approaches discussed above. Possibly, this is due to the widely accessible data on locational variables measured at the macro / country level. Table 4-5 (a) indicates that the market size and labour cost hypotheses (12 and 13) were often tested, possibly due to the data availability and the perceived relative importance of such hypothetical influences. As earlier argued, the main objective of a firm to separate production activities overseas is either to serve the large market or to take advantage of factor endowments in terms of skilled (or unskilled) labour. In contrast to the hypotheses 12 and 13, the infrastructure and distance hypotheses (14 and 17) were not often tested. This is possibly due to measurement and data problems encountered by those studies for developing countries.

Table 4-5 (a): Summary of Empirical Studies Testing the Hypotheses under the Locational Approach

Study	Hypothesis								
	12	13	14	15	16	17	18	19	20
(1) DUN	✔	✔		✔				✔	
(2) K&L	✔	✔							
(6) RAY								✔	
(8) CT&A	✔	✔	✔				✔		✔
(12) FG&S	✔	✔					✔		✔
(13) H&M		✔							✔
(15) W&M	✔	✔			✔		✔		
(16) LUS	✔	✔			✔				
(17) MOO	✔	✔			✔			✔	
(18) RAT				✔				✔	
(19) TAY		✔	✔				✔		✔
(20) W&R		✔	✔		✔		✔	✔	✔
(21) B&S	✔	✔			✔			✔	
(24) KUM*		✔		✔			✔		✔
(29) G&T				✔	✔	✔			
(30) HR&S*							✔		
(31) L&G		✔	✔		✔	✔			✔
(32) A&F	✔							✔	
(34) B&P	✔	✔		✔					
(36) B&S***	✔	✔		✔		✔	✔		
(39) M&P	✔	✔		✔				✔	
(41) BEL*								✔	
(44) LSW&R	✔	✔		✔	✔	✔			
(45) M&S	✔	✔	✔	✔	✔		✔		
(46) KUM**	✔	✔	✔			✔			✔
(47) B&P**		✔		✔				✔	
(48) B&P***	✔	✔							
(49) GG&W	✔	✔		✔				✔	
(50) HR&S**	✔	✔					✔		✔
No. studies	18	23	6	11	9	5	10	10	9

As can be seen from tables 4-5 (a and b), the stability, distance, and government incentive hypotheses (16, 17, and 20) were mostly tested in the context of FDI across developing countries. It may be inferred that the instability arising from political conflicts and economic mis-management, together with different organisational and social practices in DCs are viewed to adversely affect investment climates in those countries.

Table 4-5 (b): Summary of 'Country-level' Data used by Studies under the Locational Approach

Study	Sample Data			
	Year	Type	Host country	Home country
(8) CT&A	1981-83 (A)	C	50 US States	All
(12) FG&S	1977-88 (A)	C	48 US States [1]	All, Japan, EU
(13) H&M	1980-89 (A)	C	11 UK regions[2]	Japan
(15) W&M	1982-88	P	DMEs+DCs (42)	USA
(16) LUC	1961-87	T/P	7 Asian[3]	All
(19) TAY	1984-91 (A)	C	11 UK regions	Japan
(20) W&R	1984-87 (A)	C	Caribbean	All
(21) B&S	1964-88	T	Spain	All, USA, EC
(24) KUM*	1982	C	DMEs+DCs (40)	USA
(29) G&T	1980-91	P	USA	All
(31) L&G	1977,1982	C	DMEs+DCs (48)	USA
(32) A&F	1983-92	P	EU	USA, Japan
(34) B&P*	1971-88	T	7 DMEs	USA
(37) HIN	1987	C	50 states in USA	8 DMEs
(43) CAS	1970-89	P	USA	6 DMEs
(44) LSW&R	1983-94	P	China	All
(45) M&S	1977-92	P	DMEs+DCs (35)	USA
	1981-88	P	DMEs+DCs (28)	Japan
(46) KUM**	1982-94	P	DMEs+DCs (74)	USA, Japan
(47) B&P**	1980-91	P	10 EU, USA[4]	Japan
(48) B&P***	1978-94	P	6 EU	USA

Note: [1] Except Hawaii and Alaska
[2] South East, East Anglia, South West, East Midlands, West Midlands, Yorkshire/Humberside, North West, North, Wales, Scotland, and Northern Ireland
[3] Indonesia, Malaysia, Singapore, Thailand, South Korea, Philippines, and Taiwan
[4] UK, Ireland, Spain, Greece, Portugal, France, Germany, Denmark, Italy, Benelux
Other details are as in table 4-3 (b).

One important point to be noted from tables 4-5 (b and C) is that a single case study carried out with respect to inward FDI in DCs is relatively rare. Only Liu, Song, Wei, and Romilly (1997) tested the determinants of inward FDI to China. Furthermore, a detailed case-study on the locational determinants of FDI distribution across manufacturing activities in a developing country is not found. Potentially, this may be due to the limited data availability for both dependent and independent variables.

Table 4-5 (c): Summary of 'Firm- / Industry-level' Data used by Studies under the Locational Approach

Study	Sample Data			
	Year	Type	Host country	Home country
(1) DUN	1970	C	7 DMEs	USA
(2) K&L	1966	C	43 DMEs +DCs	USA
(6) RAY	1979-85	P	USA	All, EC, Japan, Canada
(17) MOO	1980-88	P	17 DMEs	Germany
(18) RAT	1985	C	Australia	All
(30) HR&S*	1980-84 (A)	C	USA	Japan
(36) B&S***	1975-90	P	EC,EFTA,NFTA	Sweden
(39) M&P	1989-90	C	UK	USA
(41) BEL*	1989-95	C	EU and USA	Japan
(49) GG&W	1988-1996	P	UK	Japan
(50) HR&S	1980-92	C	USA	Japan

Note: Details as in table 4-3 (b)

The second important point to be made is that there seems to be a trade off between employing disaggregated and aggregated data. In general, studies using the industry-level data are able to capture the effect of inter-industry variation in FDI but encounter with data limitations on the explanatory variables (e.g. Ratnayake, 1993; Milner and Pentecost, 1996). On the other hand, those studies using the aggregated data are able to add more explanatory variables into the estimated model but neglect the heterogeneity across different industries as well as different types of FDI across countries. From table 4-5 (b and c), it is observed that time series data were not commonly used. This may be that most studies aimed to examine the effects of locational factors on FDI variation across countries / industries rather than over times. Unlike pure time-series data, panel data was often used since it allowed the studies to analyse the variation in FDI both across countries / industries and over time.

4.4 Estimation Procedures, Measures, and Results

This section discusses estimation procedures, measures used for dependent and independent variables, and empirical findings.

4.4.1 Estimation Procedures

Table 4-6 shows that there are various estimation procedures used by empirical studies. Possibly, the variation depends on the characteristics of sample data employed, the hypothetical relationships investigated, and the research aim set by each empirical study. First of all, the aim may be set so as to examine a particular stage of a firm's decision making for FDI. To clarify, a firm's decision on FDI can be broadly separated into three different stages. In the first stage, a firm decides whether or not to establish a production facility overseas. Then, it selects a location for FDI. Finally, it decides how large is the investment to be undertaken (Taylor, 1993).

Studies by Grubaugh (1987), Yu (1990), Hennart and Park (1994), Banerji and Sambharya (1996), and Belderbos (1997) (studies 5, 7, 22, 33, and 41) examined the determinants of a firm's decision on FDI (the 1st stage). A type of measure used for dependent variable (FDI) is a dichotomous variable, being assigned a value of 1 if a firm decides to undertake direct investment overseas and 0 otherwise (see table 4-7 for measures used).

Table 4-6: Summary of Estimation Procedures

Study	Estimation technique	
	OLS	Other
1 DUN	✔	
2 K&L	✔	
3 L&M	✔	
4 CUS		Maximum Likelihood (ML)
5 GRU		Logit
6 RAY		Probit, Tobit
7 YU		Logit
8 CT&A		Conditional Logit (CL)
9 F&S	✔	
10 K&C		Poisson
11 BEL	✔	
12 FG&S		Conditional Logit (CL)
13 H&M	✔	
14 JEO		Tobit
15 W&M	✔	
16 LUS	✔	
17 MOO)	✔	
18 RAT	✔	Two Stage Least Square (2SLS)
19 TAY		Poisson
20 W&R		Conditional Logit (CL)
21 B&S	✔	
22 H&P		Logit
23 K&R	✔	
24 KUM*	✔	
25 SWE	✔	Generalised Least Square (GLS)
26 T&D	✔	
27 A&H	✔	
28 DEN	✔	
29 G&T	✔	
30 HR&S*		Conditional Logit (CL)
31 L&G	✔	
32 A&F	✔	
33 B&S*		Logit
34 B&P*	✔	
35 B&S**		Maximum Likelihood (ML)
36 B&S***	✔	Tobit, Probit
37 HIN		Tobit
38 K&C*		Hazard
39 M&P	✔	
40 PK&K		Tobit
41 BEL*		Logit
42 BLO		Maximum Likelihood (ML)
43 CAS	✔	
44 LSW&R		Generalised Least Square (GLS)
45 M&S	✔	
46 KUM**	✔	
47 B&P**	✔	
48 B&P***	✔	
49 GG&W	✔	Tobit, Probit
50 HR&S**		Conditional Logit (CL)

Due to the fact that the dependent variable is bound between 0 and 1, an ordinary least square (OLS) procedure is inappropriate; the relationship between the dependent and the independent variables is not linear (see Maddala, 1983). Instead, a Logit (Probit) procedure is employed for this type of analysis.

Studies examining the determinants of a firm's locational decision on FDI (the 2nd stage) viewed a Conditional Logit procedure as an appropriate site selection procedure (Coughlin, et al, 1991; Friedman, et al, 1992; Woodward and Rolfe, 1993; and Head, et al, 1995 and 1999). Similar to the Logit procedure, the dependent variable is the dichotomous variable, assigned the value of 1 if a particular location is selected and 0 otherwise. A firm's locational decision (for FDI) is set to be determined by the characteristics of each location such as available skilled / unskilled labour, market size, and fiscal incentives (see more details of the Conditional Logit model in Maddala, 1983). Since the dependent variable is also bound between 0 and 1, the OLS procedure is neither appropriate for this type of analysis.

Finally, the last group of empirical studies investigated the determinants of the size (or the extent) of FDI. An ordinary least square (OLS) procedure was widely used by these studies due to its simplicity and practicability. Nonetheless, when the characteristics of sample data do not conform to the OLS assumptions, alternative estimation procedures are also considered. For example, Ratnayake (1993) (study 18) used the 2 stage least square procedure (2SLS) as opposed to the OLS procedure since FDI (a dependent variable) and

profitability (an independent variable) were argued to be simultaneously determined [see table 4-4 (a) for the hypotheses tested]. In other words, FDI tends to be undertaken in those host industries with the relatively high profitability, but the abnormal returns on investment also tend to be generated by those large multinational firms that undertake such FDI. According to the OLS assumptions, all independent variables must be exogenously determined, i.e. they must be determined by factors not included in the estimated model. Therefore, the simultaneous relationship between FDI and profitability may result in bias and inconsistent estimates (see Greene, 1993, pp. 578-612, for details).

When a sample data on dependent variable contain both zero and non-zero values (censured data), the OLS procedure also lead to bias and inconsistent estimates (see Maddala, 1983; Greene, 1993). The studies by Ray (1989), Jeon (1992), Braunerhjehm and Svensson (1996), Pugel, Kragas, and Kimura, (1996), and Girma, Greenaway, and Wakelin (1999) (studies 6, 14, 36, and 49) employed a Tobit procedure to take into account of this characteristic of FDI data. Braunerhjehm and Svensson (1996), and Girma, Greenaway, and Wakelin (1999) (studies 36 and 49) also used the two-stage estimation procedure as an alternative procedure for the Tobit procedure. According to the two-stage procedure, the Probit technique is firstly used to estimate the probability of FDI being undertaken. The dependent variable is assigned a value of 1 if FDI is undertaken in industry j and 0 otherwise. In the second stage, by using only the sub-industries that receive such FDI, the OLS

technique is employed to examine the determinants of the extents of FDI (see Heckman, 1976).

The choices for estimation procedures may also be driven by the limited available data on FDI. Likely, FDI data tend to be unreliable and inconsistent across countries due to different definitions used for FDI as well as industrial classifications used for collecting data on FDI (see discussions in the following section). To avoid such problems, FDI is measured as a dichotomous variable (0,1) and alternative estimation techniques to the OLS procedure such as the Logit or the Probit procedure is used instead. However, one disadvantage of adopting this practice is that the research question is narrowed to "Where is there FDI?"; a question like "How large is FDI?" is not addressed.

4.4.2 Measures for Dependent Variable

Table 4-7 shows how FDI was measured by different studies. Mainly, two types of FDI information (data) were used: short-run flows and long-run cumulative stocks of FDI. It may be argued that whether the information on stocks or flows of FDI is used depends on the types of hypotheses tested and the research aims set by different empirical studies.

According to table 4-7 (a), it is noticed that the majority of studies testing the hypotheses under the capital market approach used the information on new flows rather than exiting accumulated stocks of FDI. This may be because new flows of foreign capital are expected to correspond positively to the (less

systematic) rises and falls of exchange rates and rates of return on investment, not stocks of FDI.

Table 4-7 (a): Summary of Measures Used for FDI (Studies under the Capital-Market Approach)

Study	Measure
(4) CUS	First difference of nominal stocks of outward FDI at a constant price
(6) RAY	Level of nominal flows of outward FDI, a dummy variable assigned a value of 1 if the FDI is undertaken and zero otherwise
(9) F&S	Level of nominal flows of inward FDI at a constant price
(11) BEL	Share of nominal stocks of outward FDI
(18) RAT	Share of annual sales foreign affiliates
(21) B&S	First difference of nominal stocks of inward FDI at a constant price
(23) K&R	Level of nominal flows of inward FDI at a constant price, share of nominal flows of outward FDI
(25) SWE	Level of nominal flows of outward FDI
(29) G&T	Level of nominal flows of inward FDI, level of annual sale of foreign affiliates
(32) A&F	Level of nominal flows of outward FDI at a constant price
(34) B&P*	First difference of nominal stocks of outward FDI at a constant price (quarterly)
(38) K&C*	Number of new entries of foreign firms
(42) BLO	Number of new foreign acquisitions
(43) CAS	Level of net flow of FDI (inward minus outward)
(44) LSW&R	Level of nominal inward flows of FDI at a constant price

In contrast, many studies testing the hypotheses under the firm / industry-organisation approach used an information on cumulative stocks rather than new flows of FDI [table 4-7 (b)]. This may be because the main objective of those studies was to examine the influences of firm- / industry-specific characteristics on the inter-industry variation in FDI, and thus long-run stocks rather than short-run flows of FDI were expected to vary systematically with these attributes.

For studies under the locational approach, most of them used an information on new FDI flows [table 4-7 (c)]. This may be due to the research aim of each

study and the data availability. Firstly, if an empirical study aims to examine the effects of locational factors on the long-run pattern of FDI distribution across countries / industries, cumulative stocks of FDI may be appropriate.

Table 4-7 (b): Summary of Measures Used for FDI (Studies under the Firm / Industry-organisation Approach)

Study	Measure
(1) DUN	Share of local sale and/or export of foreign affiliates
(3) L&M	Share of foreign equity (dividends paid abroad)
(4) CUS	First difference of nominal stocks of outward FDI at a constant price
(5) GRU	A dummy variable assigned a value of 1 if a firm invests abroad and 0 otherwise
(6) RAY	Level of nominal flows of outward FDI, a dummy variable assigned a value of 1 if the FDI is undertaken and zero otherwise
(7) YU	A dummy variable assigned a value of 1 if a firm invest abroad and 0 otherwise
(10) K&C	Number of new entries of foreign firms
(14) JEO	Level of foreign equity
(18) RAT	Share of annual sales foreign affiliates
(22) H&P	A dummy variable assigned a value of 1 if a foreign firm manufactures product j in the host country and 0 otherwise
(26) T&D	Level of nominal stocks of inward FDI, number of foreign firms
(27) A&H	Level of foreign equity
(28) DEN	Level of nominal stocks of outward FDI
(33) B&S*	A dummy variable assigned a value of 1 if FDI is undertaken and 0 otherwise
(34) B&P*	First difference of nominal stocks of outward FDI at a constant price (quarterly)
(35) B&S**	A dummy variable assigned a value of 1 if FDI is undertaken and 0 otherwise
(40) PK&K	Share of employment of foreign firms
(48) B&P***	Level of nominal outward stocks of FDI
(49) GG&W	Level of annual employment or fixed assets of foreign affiliates

On the other hand, if the research objective is to examine the locational effects on the variation in new FDI, then new flows rather than existing accumulated stocks of FDI is more appropriate. Secondly, although a study aims to analyse the long-run pattern of FDI variation across countries, it may be encountered with limited available data on FDI stocks (e.g. Barrell and Pain, 1999a).

Table 4-7 (c): Summary of Measures Used for FDI (Studies under the Locational Approach)

Study	Measure
(1) DUN	Share of annual sale and / or export of foreign affiliates
(2) K&L	Share of annual export of foreign affiliates
(6) RAY	Level of nominal flows of outward FDI, a dummy variable assigned a value of 1 if the FDI is undertaken and zero otherwise
(8) CT&A	A dummy variable assigned a value of 1 if a firm invest in a particular states and 0 otherwise
(12) FG&S	A dummy variable assigned a value of 1 if foreign firm establishes a new plant in host country and 0 otherwise
(13) H&M	Share of new employment of foreign affiliate
(15) W&M	Level of new capital expenditure of foreign affiliates
(16) LUC	Share of nominal outward flows of FDI
(17) MOO	First difference of nominal FDI stocks at a constant price
(18) RAT	Share of annual sales foreign affiliates
(19) TAY	Number of new entries of foreign firms
(20) W&R	A dummy variable assigned a value of 1 if foreign firm entries host country in form of export-oriented FDI and 0 otherwise
(21) B&S	First difference of normal stocks of inward FDI at a constant price
(24) KUM*	Share of annual exports of foreign affiliates
(29) G&T	Level of nominal flows of inward FDI, level of annual sales of foreign affiliates
(30) HR&S*	A dummy variable assigned a value of 1 if foreign firm establishes a new plant in host country and 0 otherwise
(31) L&G	Level of nominal outward Flows of FDI
(32) A&F	Level of nominal flows of outward FDI at a constant price
(34) B&P*	First difference of nominal FDI stocks at a constant price
(36) B&S***	Share of annual net sale of foreign affiliates, a dummy variable assigned a value of 1 if there is a value of sale of foreign affiliates and 0 otherwise
(37) HIN	Number of new entries of foreign affiliates as a percentage of total firms
(39) M&P	Level of nominal stocks of FDI, First difference of nominal stocks of FDI adjusted for revaluation effects
(41) BEL*	A dummy variable assigned a value of 1 if foreign firm establishes a new plant in host country and 0 otherwise
(43) CAS	Level of net flow of FDI (inward minus outward)
(44) LSW&R	Level of nominal inward flows of FDI at a constant price
(45) M&S	Level of new capital expenditure of foreign affiliates
(46) KUM**	Share of annual export of foreign affiliates
(47) B&P**	Level of nominal outward flows of FDI
(48) B&P***	Level of nominal outward stocks of FDI
(49) GG&W	Level of annual employment or fixed assets of foreign affiliates
(50) HR&S**	A dummy variable assigned a value of 1 if foreign firm establishes a new plant in host country and 0 otherwise

Apart from different types of information used for measuring FDI (stocks vs. flows), different types of measures were also employed. A dependent variable (FDI) was measured either as a dichotomous variable or a continuous variable. As discussed in section 4.4.1, the reasons for using the dichotomous variable

(0,1) was either due to the objective of empirical studies or the inconsistency of continuous data on FDI. The continuous variable was mostly used to reflect the size / the amount of FDI while the dichotomous variable is used to represent the incidence of FDI. From table 4-7, the most common measure used for the continuous variable was the nominal capital invested by foreign firms. One drawback to using such variable, especially for multi-country analyses, is that FDI definition varies from one country to another. For instance, the US Department of Commerce defines a foreign investment as a direct when a single investor has acquired a stake of 10 percent or more in a local firm. However, other countries use different figures. Another drawback is that a foreign investor may own more than 10% of share capital of a local firm but his / her aim is not to control decision marking of that firm. Instead, the main aim is to acquire intermediate returns on investment. The main problem encountered by empirical studies is that it is difficult to define which foreign capital is meant for direct investment and which is not.

Some studies (e.g. Loree and Guisinger, 1995) argued that the equity investment was preferred to the aggregated nominal stocks of foreign capital since the latter included re-invested earning and inter-company debt components, which carried the elements of sunk-cost. These elements were unlikely to respond systematically with the locational characteristics of a host country.

For other measures such as sales, employment, or exports of foreign affiliates, the choices for these measures depend largely on the availability of data and

the objectives of the studies. For example, some studies aimed to analyse the determinants of export-oriented FDI (vertically integrated FDI) and thus used the share of affiliates' exports as a measure for FDI (Kravis and Lipsey, 1982; Kumar, 1994; Kumar, 1998) (studies 2, 24, and 46). However, it should be noted that this information tends to be available for US overseas affiliates (US Department of Commerce) and Swedish affiliates.

4.4.3 Measures for Independent Variables and Results

Tables 4-8 to 4-25 summarise different measures used for independent variables and general findings. It is apparent that measures used for each independent variable varied considerably from one study to another. The variation in measures used tends to be subject to the data availability and suitability. It is also observed that estimated results were sensitive to different measures, sample data, and estimation techniques used by different studies.

Table 4-8: Differential Rate of Return Hypothesis (Hypothesis 1): Measures and Results

Study	Technique	Expected sign (+) / Measure / Result			
		ROR1	ROR2	ROR3	ROR4
(11) BEL	OLS	✓**			
(18) RAT	OLS/2SLS				✓I**
(29) G&T	OLS		✓A		
(43) CAS	OLS			✓**	

Note: 1) (✓) means an estimated sign is consistent with an expected sign, (+) means that an estimated sign is positive, (-) means that an estimated sign is negative, (+/-) means that an estimated signs are mixed. * means that a result is significant at least the 10% level, ** means that a result is significant at least the 5% level, *** means that a result is significant at the 1% level. A means that a result is ambiguous (some are significant while others are not). I means that a result is insignificant.

2) **ROR1** = Average rate of return on FDI stock divided by domestic rate return on equity
ROR2 = Average share of stock price index
ROR3 = Real interest rate (long term nominal interest rate – consumer price index)
ROR4 = Gross profit divided by the total sale

Table 4-8 shows that there was consistent evidence supporting the rate of return hypothesis by Belderbos (1992), Ratnayake (1993), and Cassou (1997) (studies 11, 18, and 43). However, measures used varied from one study to another. Also, results obtained by Ratnayake (1993) (19) were sensitive to estimation techniques used. The coefficient for ROR2 was statistically significant when estimated using the 2SLS procedure, but not when estimated using the OLS procedure. The significant coefficient thus supports the view that there is the simultaneous effect between FDI and profitability. In other words, FDI tends to be undertaken in those industries with the high profitability, but the large abnormal returns on investment also tend to be generated by large multinational firms undertaking such FDI. Overall, the results obtained by Belderbos (1992), Ratnayake (1993), Grosse and Trevino (1995), and Cassou (1997) lent support to the rate of return hypothesis.

As shown in table 4-9, regardless of differences in the measures used for the exchange rate variable, there was strong and consistent support for the exchange rate hypothesis. Insignificant results obtained by Belderbos (1992) (11) imply that the exchange rate hypothesis is specific to FDI undertaken in particular countries and industries. Specifically, the outward flows of Dutch FDI to food, metal, and electronic industries across different host countries were found to be weakly influenced by the exchange rate movements (see table 4-3 for details of sample data used). However, as evidenced by studies 4, 23, 25, 34, and 43, FDI from (and to) the USA was responsive to the movements of bilateral exchange rates (e.g. the US dollar vs. the Japanese Yen).

Table 4-9: Exchange Rate Hypothesis (Hypothesis 2): Measures and Results

Study	Technique	Expected sign (+) / Measure / Result				
		EXC1	EXC2	EXC3	EXC4	EXC5
(4) CUS	ML	✔***				
(6) RAY	Probit/Tobit		+/- **/I			
(9) F&S	OLS			✔**		
(11) BEL	OLS		✔I			
(21) B&S	OLS				✔**	
(23) K&R	OLS	✔A				
(25) SWE	OLS/GLS		✔**/**			
(29) G&T	OLS		✔***			
(32) A&F	OLS		✔***			
(34) B&P*	OLS				+/-**	
(38) K&C*	Hazard		✔***			
(42) BLO	ML		✔A			
(43) CAS	OLS					✔**
(44) LSW&P	GLS		✔***			

Note: 1) **EXC1** = Wholesale price index or consumer price index
EXC2 = Nominal exchange rate deflated by GDP deflator and / or by productivity
EXC3 = IMF's merm rate
EXC4 = Index of real effective exchange rate
EXC5 = Base year exchange rate time (home GDP deflator divided by host GDP deflator)
2) Other details are as in table 4-8.

From table 4-10, even though TEC1 was commonly used as a measure for technological ability, the estimated results obtained (from using TEC1) varied from one study to another. While Grubaugh (1987), Ratnayake (1993), and Hennart and Park (1994) (studies 5, 18, and 22) obtained the positive and significant coefficient for TEC1, Lall and Mohammad (1983), Kogut and Chang (1991), Belderbos and Sleuwaegen (1996), and Pugel, Kragas, and Kimura (1996) (3, 10, 35, and 40) obtained ambiguous results. Noticeably, empirical findings tended to be sensitive to sample data of home and host countries, as well as types of FDI and industries, being investigated.

Especially, with regard to FDI in developing countries, Lall and Mohammad (1983) and Aswicahyono and Hill (1995) (studies 3 and 27) did not find any systematic influence of technological intensity on the inter-industry variation in FDI. These empirical findings lend support to the argument made earlier that the firm's monopolistic advantages are not the key factors influencing FDI in DCs. The superior technological ability may be associated with a few large multinational firms operating in developing countries but the systematic relationship between the home technological intensity and the inter-industrial distribution of FDI in a host developing country may be rather weak. Apart from this reason, the insignificant findings may be due to others such as insufficient data used.

Table 4-10: Technological Ability Hypothesis (Hypothesis 3): Measures and Results

Study	Technique	Expected sign (+) / Measure / Result		
		TEC1	TEC2	TEC3
(3) L&M	OLS	+/-[I]	✔***	
(5) GRU	Logit	✔***		
(6) RAY	Tobit/Probit	+/-[A/A]		
(7) YU	Logit	✔**		
(10) K&C	Poisson	✔[A]		
(18) RAT	OLS/2SLS	✔***/***		
(22) H&P	Logit	✔***		
(26) T&D	OLS	+/-[I]		
(27) A&H	OLS	✔[I]		
(28) DEN	OLS			✔***
(35) B&S**	ML	✔[A]		
(40) PK&K	Tobit	✔[A]		
(48) B&P***	OLS	✔***		

Note: 1) **TEC1** = Firm or industry research and development expenditure divided by the total sales or total cost or value added

TEC2 = Payment of foreign royalties, total royalties, or technical fees divided by the total sales

TEC3 = Number of scientists and engineers divided by the total industry employment

2) Other details are as in table 4-8.

Table 4-11: Marketing Ability Hypothesis (Hypothesis 4): Measures and Results

Study	Technique	Expected sign (+) / Measure / Result		
		MAK1	MAK2	MAK3
(3) L&M	OLS	+/-[I]		
(5) GRU	Logit		✔[I]	
(7) YU	Logit	+/-[A]		
(10) K&C	Poisson	✔[I]		
(14) JEO	Tobit	✔[I]		
(18) RAT	OLS/2SLS	✔**/**		
(22) H&P	Logit	-[I]		
(27) A&H	OLS	+/-[I]		
(28) DEN	OLS			+/-[I]
(35) B&S**	ML		✔[A]	
(40) PK&K	Tobit	✔***		

Note: 1) **MAK1** = Advertising expenditure divided by the total sales or total output
MAK2 = Sales and administrative expenses divided by the total sales
MAK3 = Number of marketing and advertising personnel divided by the total employment
2) Other details are as in table 4-8.

Although MAK1 was commonly used, the estimated results (obtained from using MAK1) were not consistent across studies testing the marketing ability hypothesis (table 4-11). Potentially, the inconsistent findings may be explained by similar reasons discussed above – the findings were sensitive to sample data, as well as types of FDI. Like a case of technological ability, it is apparent that Lall and Mohammad (1983) and Aswicahyono and Hill (1995) (studies 3 and 27) did not find any systematic influence of the marketing intensity on FDI distribution across Indian and Indonesian manufacturing industries. Regarding empirical findings obtained by Grubaugh (1987), Denekamp (1995), and Belderbos and Sleuwaegen (1996) (studies 5, 28, and 35), insignificant results may be due to indirect measure used. Particularly, MAK3 may not adequately represent a firm's marketing ability. It is the efficiency rather than the number of the personnel that enhances a firm's marketing advantage.

Table 4-12: Managerial Ability Hypothesis (Hypothesis 5): Measures and Results

Study	Technique	Expected sign (+) / Measure / Result			
		MAN1	MAN2	MAN3	MAN4
(1) DUN	OLS	✔***	-[1]		
(3) L&M	OLS		+/-[A]	✔**	
(18) RAT	OLS/2SLS		✔***/ ✔***		
(27) A&H	OLS		✔**		
(35) B&S**	ML				✔[A]

Note: 1) **MAN1** = Skilled workers divided by the total employees
MAN2 = Wage per production worker or per employee, share of wage and salaries of highly paid employees, sales per worker
MAN3 = Profits before tax on net worth as a measure of management efficiency
MAN4 = Labour cost of non-factory employees divided by the total labour cost
2) Other details are as in table 4-8.

Table 4-12 shows different measures used and empirical results obtained by empirical studies testing the managerial ability hypothesis. Although MAN2 was commonly used as a measure for managerial ability, it may not be the direct measure. This is because an information on skilled and unskilled labour is not separated. Although Lall and Mohammad (1983) (study 3) used the wages of highly paid workers to capture the effect of managerial skills, the estimated results obtained were still ambiguous. Lall and Mohammad also used MAN3 (profits before tax) as an alternative measure for management efficiency and obtained the positive and significant coefficient. However, this measure is quite broad and may capture other effects of a firm's ownership advantages (e.g. marketing and technological abilities), which also tend to influence a firm's profitability.

It is apparent from table 4-13 that there was strong and consistent evidence supporting the firm's size hypothesis, especially the results obtained by studies

using SIZ3 and SIZ3. In contrast, there was inconsistent evidence supporting the economies of scale hypothesis (table 4-14).

Table 4-13: Firm's Size Hypothesis (Hypothesis 6): Measures and Results

Study	Technique	Expected sign (+) / Measure / Result			
		SIZ1	SIZ2	SIZ3	SIZ4
(5) GRU	Logit	✔***			
(7) YU	Logit	✔**			
(14) JEO	Tobit	✔***			
(18) RAT	OLS/2SLS		✔***/ ***		
(26) T&D	OLS			+/-^A	
(33) B&S*	Logit				-**
(35) B&S**	ML		✔**		

Note: 1) **SIZ1** = Firm's total assets
SIZ2 = Firm's employment
SIZ3 = Firm's net sales
SIZ4 = Firm's paid up capital
2) Other details are as in table 4-8.

Table 4-14: Scale Economies Hypothesis (Hypothesis 7): Measures and Results

Study	Technique	Expected sign (+) / Measure / Result		
		SCA1	SCA2	SCA3
(3) L&M	OLS	✔*		
(27) A&H	OLS		✔[1]	-[1]
(49) GG&W	Tobit, OLS/Probit	-[1]/**		

Note: 1) **SCA1** = Firm's fixed assets divided by value added, average employment
SCA2 = Average sale of large plants (top 50% industry sales) divided by average sale of all plants
SCA3 = Value added per employee of the large plants in relation to that of remaining plants
2) Other details are as in table 4-8.

This may be due to proxying problems since it is difficult to precisely measure scale economies. Expecting a negative relationship between (plant-level) scale economies and FDI (see the discussion in section 3.4), Girma, Greenaway, and Wakelin (1999) (study 49) obtained the negative and statistically significant estimates from the OLS and the Probit models (table 4-14) but not from the

Tobit model. It is noticed that the measure of SCA1 used by this study is similar to that used for firm's size (SIZ2) and thus the significant findings may be partly due to an indirect size effect.

Table 4-15: Capital Intensity Hypothesis (Hypothesis 8): Measures and Results

Study	Technique	Expected sign(+) / Measure / Result				
		CAP1	CAP2	CAP3	CAP4	CAP5
(3) L&M	OLS	-***	-**			
(6) RAY	Tobit/Probit			+/-A/A		
(27) A&H	OLS		✔**			
(28) DEN	OLS					✔A
(35) B&S**	ML				✔A	

Note: 1) **CAP1** = Plant and machinery per highly paid employee
CAP2 = Non-wage value added per head in the host country
CAP3 = Gross book value divided by the total labour employment
CAP4 = Value of fixed depreciable capital divided by the total labour cost
CAP5 = Net value added in production relative to wages
2) Other details are as in table 4-8.

From table 4-15, there was ambiguous support for the capital intensity hypothesis. Besides, Lall and Mohammad (1983) (study 3) obtained the wrong estimated signs. As earlier argued, the monopolistic advantages may not be the main condition for foreign firms to undertake FDI in developing countries. Instead, the strong negative relationship between the capital intensity and FDI may suggest that FDI in these countries tend to be concentrated in labour-intensive rather than capital-intensive industries. Other reasons such as data deficiencies / peculiarities of data used could also be accountable for this negative relationship. Belderbos and Sleuwaegen (1996) (study 35) found strong support for the capital intensity hypothesis when testing the hypotheses in the context of FDI in North America and Europe, but not in Asia. Possibly, the insignificant results (for Asia) may be explained by

the fact that this hypothesis is specific to FDI undertaken in capital-intensive industries. The sample of Asian countries may be, however, dominated by labour-intensive export-oriented FDI (see table 4-4 for details of sample data used).

Table 4-16: Cash flow Hypothesis (Hypothesis 9): Measures and Results

Study	Technique	Expected sign (+) / Measure / Result		
		CF1	CF2	CF3
(4) CUS	ML	✔***		
(26) T&D	OLS	✔[A]	✔[I]	
(34) B&P*	OLS	✔**		
(34) B&S*	Logit			✔[I]
(36) B&S**	ML		✔[A]	

Note: 1) **CF1** = Real corporate profits [pre-tax corporate profits – (corporate taxes + dividends)] divided by GDP deflator
CF2 = Pre-tax corporate profit divided by domestic fixed capital outlay
CF3 = Returns on sales
2) Other details as are in table 4-8.

It is apparent from table 4-16 that only studies using CF1 obtained significant findings. Apparently, CF2 (corporate profits before tax) may not reflect the real cash flows since a firm is likely to consider its profit after tax rather than that before tax as an available fund for future investment. Empirical results obtained by Cushman (1985) and Barrell and Pain (1996) (4 and 34) suggest a strong statistical relationship between the monopolistic advantages of US firms in terms of large available cash flows and FDI undertaken in industrialised countries. In contrast, results obtained by Belderbos and Sleuwaegen (1996) (36) imply that such monopolistic advantage (available cash flows) is not the main important determinant of Japanese FDI in Asian developing countries (see table 4-4). Possibly, the size of investment

undertaken in Asia is relatively small, as compared to that in the USA and the EU, and thus the smaller amounts of capital are needed for investment.

Table 4-17: Industry Concentration and Multi-Plant Operation Hypotheses (Hypotheses 10 and 11): Measures and Results

Study	Technique	Expected sign (+) / Measure / Result	
		CON	MPO
(6) RAY	Tobit/Probit	✔A/A	
(10) K&C	Poisson	✔***	
(14) JEO	Tobit	-I	
(18) RAT	OLS/2SLS	✔***/ ***	✔I/*
(22) H&P	Logit	✔*	
(26) T&D	OLS	+/-A	
(28) DEN	OLS	✔***	
(40) PK&K	Tobit	✔I	

Note: 1) **CON** = Industry concentration ratio (percentage of sales accounted for by three /four / eight largest firms in an industry in the host country)
MPO = Number of plants under each industry
2) Other details are as in table 4-8.

Table 4-17 shows strong but inconsistent evidence supporting the industry concentration hypothesis. By contrast, the multi-plant operation hypothesis was weakly supported. Empirical results obtained by Ratnayake (1993) (18) were also sensitive to the estimation techniques used. The significant result obtained using the 2SLS procedure (but not the OLS procedure) implies the simultaneous relationship between the multi-plant operations and FDI. A firm with several production activities is likely to undertake investment overseas, but this also leads to more activities (multi-plant operations) being carried out.

With regard to the hypotheses under the locational approach, table 4-18 shows different measures used and estimated results obtained by empirical studies testing the market size hypothesis. It is apparent that most of empirical results

were statistically significant; the exception being the results obtained by Lucas (1993) (study 16). Although there were several measures used for market size, MAR1 (the growth or level of GDP) was the most common measure. Nonetheless, it should be noted that all empirical studies using this measure were country-level studies. Those industry-level analyses like Milner and Pentecost (1996) and Girma, Greenaway, and Wakelin (1999) (studies 39 and 49) measured the market size variable by industrial sales or industrial production (MAR4).

Table 4-18: Market Size Hypothesis (Hypothesis 12): Measures and Results

Study	Technique	Expected sign (+) / Measure / Result			
		MAR1	MAR2	MAR3	MAR4
(1) DUN	OLS				✔***
(2) K&L	OLS	✔**			
(8) CT&A	CL		✔***		
(12) FG&S	CL		✔***		
(15) W&M	OLS	✔***			
(16) LUC	OLS			✔[I]	
(17) MOO	OLS	✔[A]			
(21) B&S	OLS	✔***			
(32) A&F	OLS	✔***			
(34) B&P*	OLS	✔***			
(36) B&S***	Tobit/Probit, OLS	✔**/***			
(39) M&P	OLS				✔**
(44) LSW&R	GLS	✔[A]			
(45) M&S	OLS,GLS	✔[A]			
(46) KUM**	OLS	✔***			
(48) B&P***	OLS				✔***
(49) GG&K	Tobit, OLS/Probit				✔***/[A]
(50) HR&S	CL		✔***		

Note: 1) MAR1 = Growth or level of nominal or real GDP
MAR2 = State or county per capita income, sum of personnel income divided by the square of the road-mile distance between the principle cities of one state and another
MAR3 = Private + government consumption spending divided by the consumer price index
MAR4 = Value of sale (total sale - export + import) or value of production
2) Other details are as in table 4-8.

From table 4-19, there was strong evidence supporting the labour cost hypothesis, especially the results obtained by studies 8, 20, 21, 24, 34, and 44. These studies used either LAB2 or LAB3 as measures for the variable. On the other hand, studies using LAB1 tended to obtain insignificant or ambiguous results [Kravis and Lipsey, 1982; Hill and Munday, 1992; and Taylor, 1993 (studies 2, 13, and 19). This may be due to measurement problems since the average earning (LAB1) is unlikely to capture the real costs of labour (i.e. the longer the working hours the larger the earning).

Table 4-19: Labour Cost Hypothesis (Hypothesis 13): Measures and Results

Study	Technique	Expected sign (-) / Measure / Result			
		LAB1	LAB2	LAB3	LAB4
(1) DUN	OLS				✔[M]
(2) K&L	OLS	+/-[I]			
(8) CT&A	CL		✔***		
(12) FG&S	CL		✔[A]		
(13) H&M	OLS	✔[I]			
(15) W&M	OLS		✔[A]		
(16) LUC	OLS	✔[A]			
(17) MOO	OLS		✔[I]		
(19) TAY	Poisson	✔[I]			
(20) W&R	CL		✔***		
(21) B&S	OLS			✔***	
(24) KUM*	OLS		✔***		
(31) L&G	OLS				✔[I]
(34) B&P*	OLS			✔***	
(44) LSW&R	GLS		✔***		
(45) M&S	OLS, GLS	✔[A]			
(46) KUM**	OLS				✔[A]
(47) B&P**	OLS			✔***	
(48) B&P***	OLS			✔***	
(49) GG&W	Tobit, Probit/OLS			✔[I,A]	
(50) HR&S**	CL	✔[A]			

Note: 1) LAB1 = Average total or average gross (weekly or monthly) earning divided by real GDP or gross earning or product price

LAB2 = Nominal or average hourly wage rate (adjusted for other fringe benefit) divided by wholesale price indexes or productivity (and / or multiplied by productivity index

LAB3 = Unit labour cost or Index of real unit labour costs

LAB4 = Average compensation per worker, a residual of a regression on nominal wage as a function of secondary / territory school enrolments

2) Other details are as in table 4-8.

Similar to LAB1, studies using LAB4 obtained either insignificant or ambiguous results. This may be because the compensation per worker tends to reflect the non-wage earnings rather than the real-wages. It may be a case that the former is not the main incentive for FDI.

Table 4-20: Infrastructure Hypothesis (Hypothesis 14): Measures and Results

Study	Technique	Expected sign(+) / Measure / Result			
		INF1	INF2	INF3	INF4
(8) CT&A	CL	✔***			
(19) TAY	Poisson		✔[I]		
(20) W&R	CL			✔***	
(31) L&G	OLS				✔***
(45) M&S	OLS, GLS			✔***	
(46) KUM**	OLS				+/-[A]

Note: 1) INF1 = Highway mile or rail road mile per square mile of land, number of public airport facilities per square mile of land
INF2 = Population density (Population per square kilometre) as a measure for highly populated area which are linked by transportation network
INF3 = GDP per capita, output of electricity per gross domestic products
INF4 = Infrastructure indices measuring both transportation and communication Infrastructure, composite indices consisting of telephone per capita, road length, newspaper, etc.
2) Other details are as in table 4-8.

Although the infrastructure hypothesis was strongly supported by the majority of empirical studies (table 4-20), the measures used varied from one study to another. This is mainly explained by the limited available data. The measures of population density (INF2) used by Taylor (1993) (19) and the GDP per capita (INF3) used by Woodward and Rolfe (1993) (20) were rather indirect and may capture the effects of other influences. Also, the measure of output electricity (INF3) used by Mody and Srinivasan (1998) (study 45) reflect only one aspect of host infrastructure. Furthermore, the demands for electricity

(INF3) are subject to requirements as well as types of FDI activities. Infrastructure indices (INF4) might have been calculated from selective sources of surveyed data.

Table 4-21: Export Intensity Hypothesis (Hypothesis 15): Measures and Results

Study	Technique	Expected sign (+) / Measure / Result		
		EXP1	EXP2	EXP3
(1) DUN	OLS		✔[A]	
(18) RAT	OLS/2SLS		✔***	
(24) KUM*	OLS		✔***	
(29) G&T	OLS		✔[A]	
(34) B&P*	OLS	+/-***		
(36) B&S***	Tobit,Probit/ OLS		✔***/ ✔**	
(39) M&P	OLS		✔***	-[I]
(44) LSW&R	GLS		✔***	
(45) M&S	OLS, GLS		+/-[A]	
(47) B&P**	OLS		✔***	
(49) GG&W	Tobit/ Probit, OLS		✔***/ ✔***	

Note: 1) EXP1 = Lag of export divided by the total output
EXP2 = Volume of (intra-firm) export (and / or import) divided by the total sale or output
EXP3 = Revealed of comparative advantage (net export divided by the total trade)
2) Other details are as in table 4-8.

Although table 4-21 shows strong support for the export intensity hypothesis, different inferences could be drawn from estimated results. Firstly, the results obtained by Barrel and Pain (1996) (34) suggest that there was a positive relationship between the previous exports (4 period lag) and FDI over times. As earlier noted, due to the expansion of the host market and / or the rise in transportation costs (and other trade barriers), a manufacturing firm from a home country may switch from exporting to FDI activities. In contrast to Barrel and Pain (1996), Kumar (1994) (study 24) found a significant positive relationship between the intra-firm exports / imports and FDI. These results suggest that vertically integrated FDI was the main dominant type of

investment undertaken in those host countries being investigated. Finally, the results obtained by Milner and Pentecost (1996) and Girma, Greenaway, and Wakelin (studies 40 and 49) indicate a strong and positive relationship between a competitive advantage of a home (or host) country and FDI undertaken.

Table 4-22: Stability Hypothesis (Hypothesis 16): Measure and Results

Study	Technique	Expected sign (+) / Measure / Result					
		Political stability		Economic stability			Both
		POL1	POL2	EC1	EC2	EC3	P&E
(15) W&M	OLS	✔[I]					
(16) LUC	OLS			✔[I]			
(20) W&R	CL		✔*		✔***		
(21) B&S	OLS					✔**	
(29) G&T	OLS	✔[A]					
(31) L&G	OLS						✔[A]
(44) LSW&R	GLS	✔[I]					
(45) M&S	OLS/GLS						✔***

Note: 1) POL1 = Political risk rating score or risk indices (high score means low risk)
POL2 = Dummy variable assigned a value of 1 for political stability and 0 otherwise
EC1 = Foreign exchange reserve covering monthly import
EC2 = Average annual inflation rate
EC3 = Rate of change on GDP deflator at market price (measure for inflation rate)
P&E = Composite risk score measuring political, economic, and financial risk (high score means high stability)
2) Other details are as in table 4-8.

From table 4-22, there was ambiguous support for the political stability hypothesis. This may be due to the measurement problem. It is difficult to measure this variable quantitatively. Also, political and economic risk scores (POL1 and P&E) may be subject to biases due to selective sources of (surveyed) data used for computing such scores. Unlike political stability hypothesis, the economic stability hypothesis was supported by results of Woodward and Rolfe (1993) and Bajo-Rubio and Sosvilla-Rivero (1994) (21

and 22). The results of the former imply a strong effect of inflation rate on FDI flows into Caribbean countries.

Table 4-23: Distance Hypothesis (Hypothesis 17): Measures and Results

Study	Technique	Expected sign (-) / Measure / Result		
		Culture	Geography	Both
		CUL	GEO	C&G
(29) G&T	OLS	✔[A]	✔[A]	
(31) L&G	OLS	+/-[A]		
(36) B&S***	Tobit, Probit / OLS			✔***/**
(44) LSW&R	GLS	✔[A]	+/-[I]	
(46) KUM**	OLS		✔***	

Note: 1) CUL = Indices of cultural difference measuring four dimension of cultural difference related to management including power distance, uncertainty avoidance, individuality, and masculinity / femininity
GEO = Number of miles between capital cities of home and host countries
C&G = Indices of geographical, cultural, and linguistic distance
2) Other details are as in table 4-8.

Similar to the stability hypothesis, the distance hypothesis was ambiguously supported due to the problem of measurement (table 4-23). In general, it is difficult to measure the cultural variable in quantitative terms. Also, a single measure may be only appropriate for a particular country. Like infrastructure and political risk indices, the indices of cultural and geographical distances may be bias since surveyed data used (for constructing such indices) may be selective (subjective).

It is apparent from table 4-24 that there was strong and consistent support for the agglomeration hypothesis. The most common measures used for the agglomeration variable were AGO1 and AGO5. However, both measures are broad and could indirectly reflect other influences of locational variables. For example, a share of manufacturing employment (AGO1) may reflect an

availability of labour and / or an intensity of labour in a particular host industry / location. Also, an existing number / capital of foreign firms in the host countries (AGO2) may reflect other economic and non-economic conditions of a host country (e.g. stability, openness, and well-developed infrastructure) rather than real benefits of agglomeration economies (e.g. pooled market for skilled labour).

Table 4-24: Agglomeration Economies Hypothesis (Hypothesis 18): Measures and Results

Study	Technique	Expected sign (+) / Measure / Result				
		AGO1	AGO2	AGO3	AGO4	AGO5
(8) CT&A	CL	✔***				
(12) FG&S	CL		✔***			
(15) W&M	OLS			✔**	✔**	✔***
(19) TAY	Poisson	✔**				
(20) W&R	CL	✔***				
(24) KUM*	OLS					✔[I]
(30) HR&S*	CL					✔***
(36) B&S***	Tobit, Probit / OLS	✔**/ ✔[A]				
(45) M&S	OLS, GLS					✔***
(50) HR&S**	CL					✔***

Note: 1) AGO1 = Number / percentage of manufacturing employment or share of FDI employment
AGO2 = Sum of personnel income divided by the square of the road-mile distance between the principle cities of one state and another state
AGO3 = Infrastructure indices based on quality of transport, communications, Energy
AGO4 = Degree of industrialisation indices based on manufacturing (mining) divided by GDP
AGO5 = Existing number of foreign firms or capital stocks invested by foreign firms
2) Other details are as in table 4-8.

Similarly, the sum of personal income divided by the square of road mile (AGO2) was also used as a measure for market size (MAR3) (see table 4-18), and thus indirectly reflecting the size of the host market. Lastly, infrastructure indices (AGO3) could instead capture an effect of host infrastructure rather than the real effect of agglomeration economies.

Table 4-25: Trade Costs Hypothesis (Hypothesis 19): Measures and Results

Study	Technique	Expected sign (+) / Measure / Result					
		TAF1	TAF2	TAF3	NTA	TRN1	TRN2
(1) DUN	OLS	✔**					
(6) RAY	Probit/Tobit	-[A]		+/-[A]	+/-[A]		
(17) MOO	OLS	+/-[I]					
(18) RAT	OLS/2SLS	✔***					-[M]
(20) W&R	CL					-***	
(21) B&S	OLS	✔**					
(32) A&F	OLS		✔[A]				
(39) M&P	OLS			✔[I]	-[I]		
(41) BEL*	Logit	✔**			✔**		
(47) B&P**	OLS				✔**		
(49) GG&W	Tobit, Probit/OLS			+/-[I]	✔[A] ✔***		

Note: 1) TAF1 = Nominal tariff rate or average tariff rate (plus other taxes)
TAF2 = Receipts from all international trade taxes divided by the total import value
TAF3 = Effective rate of tariff protection
NTAF = Dummy variable assigned a value of 1 if there is an incidence of non-tariff barriers, frequency of anti-dumping measure undertaken
TRN1 = Ratio of the total transport and insurance costs to the value of free-along-ship of exports to a host country
TRN2 = Nominal transport costs estimated by using costs of distance between a home and host countries.
2) Other details are as in table 4-8.

As discussed earlier, the trade costs hypothesis is controversial depending on the types of FDI examined and the sample data used. Expecting a negative relationship between transportation costs and vertically integrated FDI in developing countries, Woodward and Rolfe (1993) (study 20) found a strong support for such hypothesis (table 4-25). For other studies, a positive relationship between the trade costs (tariff, non-tariff, and transportation costs) and horizontally integrated FDI was expected, but results obtained were quite ambiguous. While Dunning (1980), Bajo-Rubio and Sosvilla-Rivero (1994), Belderbos (1997), and Barrell and Pain (1999a) (1, 21, 41, and 47) found strong support for the hypothesis, Ray (1989), Moore (1993), Aristotelous and Fountas (1996), and Milner and Pentecost (1996) (6, 17, 32, and 39) obtained

either insignificant or ambiguous support. Also, estimated signs obtained by some studies like Ray (1989) (6) were inconsistent with expected signs. Potentially, one reason for the insignificant findings obtained by these studies is that the effects of tariff and non-tariff barriers tend to operate at a highly disaggregated product-level, rather than a broadly defined industry-level. Therefore, by using the broad industry-level data (e.g. Milner and Pentecost, 1996), the effect of trade cost variable on FDI was not found.

Table 4-26: Government Incentives Hypothesis (Hypothesis 20): Measures and Results

Study	Technique	Expected sign (+) / Measure / Result			
		INC1	INC2	INC3	INC4
(8) CT&A	CL	✔***			
(12) FG&S	CL	✔***			
(13) H&M	OLS	✔**			
(19) TAY	Poisson		✔**		
(20) W&R	CL		✔***		✔***
(24) KUM*	OLS			+/-[1]	✔**
(31) L&G	OLS			+/-[1]	
(46) KUM**	OLS				✔[A]
(50) HR&S**	CL	✔[A]	✔***		

Note: 1) INC1 = Government expenditure on financial assistance and promotional activities
INC2 = Dummy variable assigned a value of 1 if a location being subject to government financial assistance or promotion
INC3 = Percentage of affiliates being provided tax and tariff concessions, subsidies, and other incentives
INC4 = Total acres of free trade zone or employment in free trade zone
2) Other details as in table 4-8

The incentive hypothesis was strongly supported by results obtained from the majority of empirical studies. These results imply that the host government incentives have positive and significant influences on FDI variation across countries / locations. Nonetheless, there were insignificant results obtained by Kumar (1994) and Loree and Guisinger (1995) (study 24 and 31). Potentially, these results may be subject to the bias of measure used, since both studies

used exactly the same measure and data source; all come from the US Department of Commerce. It is observed that INC1 (export processing zone) was mostly used by empirical studies aiming to examine the determinants of vertically integrated FDI across developing countries [Woodward and Rolfe, 1993; and Kumar, 1994 (studies 20 and 24)]. Horizontally integrated FDI may not be influenced by this factor since it is mainly aimed at serving the domestic market of host industrialised countries.

4.5 Conclusions

This chapter reviewed and evaluated different empirical studies that have tested the hypotheses derived from theories using the capital-market, the firm / industry-organisation, and the locational approaches. The discussions can be summarised into two parts. The first part discussed the hypotheses tested while the second discussed the empirical findings obtained.

Firstly, it was recognised that some hypotheses were repeatedly tested while others were rarely tested (see table 4-3 to table 4-5). The variation in numbers of studies depends on the perceived relative importance of the various hypotheses, as well as the availability of data. Also, some hypotheses are specific to certain industries and countries. It was argued that the choices of estimation procedures used tended to depend on the research objectives, as well as the characteristics and the availability of FDI data (see table 4-6 and 4-7). The differences in the measures used for the independent variables also

depend on the appropriateness and the availability of statistical data. For example, there were common measures used for exchange rate, technology, marketing, industrial concentration, market size, labour costs, and export intensity, probably due to the suitability and availability of secondary data. However, measures used for other variables such as scale economies, capital intensity, infrastructure, and political stability varied from one study to another. This may be because the suitable data are not available and / or there is no common view of how these variables should be measured.

With regard to the estimated results obtained from empirical studies, they were quite sensitive to differences in the measures used, the types of sample, and the estimation techniques. There were strong and consistent supports for some hypothetical influences, namely the exchange rate, corporate size, market size, export intensity, agglomeration economies, and government incentives. Nonetheless, empirical studies testing these hypotheses were different in terms of their aims and characteristics of sample data used (country-level vs. firm- / - industry level). Some hypotheses were tested using the country-level data while others were tested using the firm- / industry-level data. These variations make it difficult to identify a set of commonly supported or refuted hypotheses.

From the review of the empirical studies, there are two important points to be noted. Firstly, the majority of the empirical studies focused on the determinants of FDI in DMEs. Only a few studies examined the determinants of FDI in the context of DCs (Lall and Mohammed, 1983; Lucas, 1993;

Woodward and Rolfe, 1993; Aswicahyono and Hill, 1995; and Liu, Song, Wei, and Romilly, 1997). As noted in the previous chapters, the determinants of FDI in DMEs and DCs tend to be different. However, there could be two reasons why most research attention has been directed at FDI undertaken in DMEs. One is that, in the post-war period, most FDI has been undertaken between DMEs. Under this circumstance, many studies have sought to explain why cross-investment activities have been concentrated among countries with similar incomes and market size. Another is that data on both inward and outward FDI are much more systematically recorded in DMEs at both the aggregate and disaggregate levels than in DCs.

Secondly, among a very few empirical studies for developing countries, FDI analysis at the industry level has been rarely carried out. Only a small number of studies have focused on the factors that influence the industrial distribution or composition of FDI (Lall and Mohammad, 1983; Aswicahyono and Hill, 1995). Furthermore, these studies have concentrated on the firm specific determinants such as superior technological, marketing, and managerial abilities. There is still little knowledge about the effects of locational factors on the incidence and the extent of FDI distribution across manufacturing industries in these countries. To date, there has been almost no detailed case study on the locational determinants of FDI in developing and industrialising countries, and thus there is still scope for further work on this line of research. Therefore, the present analysis on Japanese FDI in Thailand would shed more light on the role of locational factors, in determining the manufacturing distribution of FDI in the context of non-industrialised countries.

Chapter V

The Locational Determinants of Japanese FDI in Thailand

Chapter V

The Locational-specific Determinants of Japanese FDI in Thailand

5.1 Introduction

As observed from the previous chapter, the empirical literature on the determinants of foreign direct investment is quite substantial with different studies focusing on different sets of determinants, types of FDI, groups of industries, and choices of home and host countries. Despite there being some FDI studies conducted in the context of developing and industrialising countries, only a small number have focused on the factors which influence the inter-industry distribution of FDI (Lall and Mohammad, 1983; Aswicahyono and Hill, 1995). There is still little knowledge about the industry-level determinants of FDI undertaken outside industrialised countries.

The aim of this chapter is to identify and investigate the locational-specific determinants of the manufacturing distribution of Japanese FDI in Thailand, by employing the information on FDI stocks recorded at 1985, 1990, and 1995. Using the locational approach to the determinants of FDI discussed in chapter III, five alternative hypotheses are reviewed and an industry-level model is subsequently set up for empirical estimation.

For the remainders of this chapter, they are organised as follows. Section 5.2 formulates the locational hypotheses about the determinants of Japanese FDI, section 5.3 describes the empirical model, data definitions, and sources, section 5.4 proceeds to quantitative analysis, and finally section 5.5 summarises.

5.2 Hypothesis Formation

The theoretical literature discussed in chapter III indicates a wide range of hypotheses about the locational determinants of FDI. However, some factors tend to be specific to certain types of FDI in different host countries. As mentioned earlier, FDI in developed or industrialised countries tends to be in the form of horizontally integrated FDI, aimed at servicing the 'large' market of those countries. It is mainly motivated by the size of host industrialised markets, as well as the height (and certain types) of the trade barriers, imposed by host governments (Markusen, 1995). On the other hand, FDI in most developing and industrialising countries (especially after the 70s) is likely to be vertically integrated in nature, aimed at taking advantages of the factor endowment differences across countries (e.g. Helpman, 1984; Zhang and Markusen, 1999)[1]. In this chapter, a set of locational hypotheses will be formulated in the context of FDI from DMEs to developing (or industrialising)

[1] It is recognised that the type of FDI in many developing countries prior to 1980 was different due to import-substitution strategies pursued by host governments, which encouraged foreign firms to produce for domestic market rather than for exports. Besides, at present time, market-seeking FDI type still dominates in some large developing and industrialising countries such as India, China, and Brazil.

countries, not between industrialised countries (e.g. between the US and the EU).

5.2.1 Labour-intensity of Production

A number of theories under the locational approach to FDI determinants emphasise differences in the factor endowments between a home and host countries as one of explanatory factors of FDI. According to the theoretical models of vertically integrated firms that separate different stages of production according to local endowments (e.g. Helpman, 1984; Zhang and Markusen, 1999) (see chapter III), inward FDI in developing countries is likely to be influenced by the relative abundance of cheap (unskilled) labour. In other words, foreign firms from developed market economies (DMEs) are likely to locate their capital- and technology- intensive activities in their home countries with relatively large supplies of capital and skilled labour. Unskilled labour-intensive activities are moved to host developing countries where this type of labour is abundant.

According to these models, it may be inferred that manufacturing firms operating in the relatively high labour-intensive industries in an industrialised country would tend to relocate their production activities to developing countries. The higher the intensity of labour in industry j in the former, the more likely it is that firms would relocate their production activities to the latter, and thus the greater the inward stocks of FDI would tend to be. As a consequence, much FDI would be undertaken / concentrated in industry j in developing countries. In the context of Japanese FDI in Thailand, it may be

thus hypothesised that Japanese FDI stocks in Thailand tend be greater in those manufacturing industries with the highest levels of Japanese labour-intensity, ceteris paribus[2].

5.2.2 Home Market Size

Several trade and MNE models suggest that different types of FDI tend to be influenced, to different degrees, by the host market size. Horizontally integrated MNEs are likely to be influenced by the relatively large size of the host market than vertically integrated MNEs. This is because the former is mainly aimed at servicing that host market (Markusen, Venables, Konan, and Zhang, 1996; Markusen and Venables, 1998). However, in many developing countries, vertically integrated FDI tend to be the dominant type of inward FDI there. The size of the local host market may not strongly influence the incidence and the extent of inward FDI undertaken in those countries[3].

As discussed earlier, the aim of vertically integrated MNEs (with production facilities in developing countries) is to exploit the abundance of cheap unskilled labour. Their unskilled labour-intensive (or assembling) activities are carried out in those countries, and most of finished and semi-finished products tend to be shipped back to serve the home market[4]. Under this circumstance, it may be expected that there is a positive relationship between

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[2] This hypothesis is consistent with Kojima's argument (1978) suggesting that Japanese firms investing overseas are usually from labour-intensive industries that has lost or are loosing comparative cost advantages at home (e.g. rising real wages).

[3] However, FDI in large developing countries such as China may be motivated by the large market size of those countries.

[4] They may be also exported to the regional or other industrialised markets. However, it is assumed for now that there is no third market.

vertically integrated FDI undertaken in a host developing country and the size of the home market. Given that there are differences in the size of markets across manufacturing industries in Japan, it may be thus anticipated that Japanese FDI stocks in Thailand tend to be greater in those manufacturing industries with the largest size of Japanese intermediate and final markets, ceteris paribus[5].

5.2.3 Transportation Costs

As with market size, transportation costs tend to have different effects on the incidence and the extent of inward FDI depending on the types of investment. On the one hand, horizontally integrated FDI is likely to be positively influenced by the costs of transportation, since the high transportation costs raise the marginal costs of exporting relative to direct investment (Brainard, 1993; Markusen and Venables, 1998). Ceteris paribus, the higher the costs of exporting manufacturing products to a large industrialised market, the more likely it is that multinational firms would choose to service that market through FDI rather than exports[6]. In this case, the relationship between FDI and trade is one of substitution. On the other hand, vertically integrated FDI tends to be influenced by the low costs of transportation, which facilitate the intra-firm trading activities between parent firms in home DMEs and their

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[5] One may argue that Japanese firms may also aim to use their presence in Thailand as a platform for access to a wider ASEAN market. However, it may be also counter-argued that the ASEAN economies are not as deeply integrated as European economies. Also, the ASEAN Free Trade Area (AFTA), the primary stage of economic integration, was formed in the early 90s, and thus has not been fully implemented.

[6] Of cause, internalisation advantages are also taken into consideration, whereby foreign firms evaluate the costs and the benefits of undertaking FDI in relation to other modes of serving a host market (e.g. licensing agreement).

subsidiary firms in host DCs (Markusen, Venables, Konan and Zhang, 1996). In this instance, trade and FDI are complementary rather than substituting.

With regard to FDI in host developing countries, it may be argued that whether or not FDI is trade substituting or trade creating depends on the market size of host countries, as well as the trade policies of host governments. In the relatively small industrialising country like Thailand, there are two reasons to support the argument that FDI is trade creating rather than trade substituting. Firstly, the size of the Thai market is relatively small as compared to that of other developing or industrialising countries (e.g. China and Brazil). Even in the presence of high transportation costs, it may not be economically profitable for large foreign firms to incur large fixed costs in setting up production facilities there (except for some manufacturing industries with the relatively large market size). Secondly, the trade regimes of the Thai government have been switched from the import substitution to export promotion strategies since the late 1970s. Due to various incentives provided to exporting firms and sharp reductions in tariffs, many foreign firms are encouraged to set up assembly plants in Thailand. Intermediate products are imported from the home countries for final / semi-final assembling activities in Thailand, and subsequently final products are shipped back to serve the home market. In general, this type of activity is considered to be that of vertically integrated, as discussed earlier.

Hence, with regard to Japanese inward FDI in Thailand, it may be expected that there is a negative relationship between the stocks of FDI and the costs of

transporting intermediate (final) products from (to) Japan. This is because the high transportation costs discourage the intra-firm trading activities between parent firms in Japan and their affiliates in Thailand. Assuming that Japanese affiliates in Thailand only import intermediate inputs from Japan and exports back the processed outputs, two types of transportation costs would be incurred. First are the costs of transporting the intermediate inputs to Thailand and second are the costs of transporting the processed products back to Japan. It is likely that Japanese affiliates would consider these combined costs of transportation (costs of importing intermediate inputs and exporting final / semi-final outputs) when undertaking FDI in Thailand.

Given that there are differences in the costs of transporting different manufacturing products[7], it is hypothesised that FDI stocks tend to be greater in those manufacturing industries with the lowest (combined) costs of transporting intermediate inputs from Japan to Thailand and final outputs from Thailand back to Japan, ceteris paribus[8].

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[7] These depend on different processes of handing, weights, and etc.

[8] One may argue that other types of trade barriers such as custom tariff rates should be considered in this analysis. However, trade barriers may not have significant influences on Japanese FDI due to following reasons. Firstly, the trade and industrial policies of the Thai government are set so as to promote export-oriented activities, and thus tariff rates imposed on intermediate imports to Thailand are generally low (except auto parts). Secondly, one-third of the sample of Japanese firms in Thailand is promoted by the BOI, whereby they are granted with tariff exemptions for importing machinery and raw materials to Thailand. Thirdly, Japanese affiliates in Thailand and parent firms in Japan can avoid trade taxes imposed on their imports by manipulating the prices of imports via intra-firm trade. For instance, imports to Thailand may be under-invoiced so that the values of custom duties and taxes charged are minimised [See Lall (1980), chapter 4-6, and Murray (1981) for more discussions on intra-firm trade and transfer pricing activities by multinational firms in developing countries]. Finally, Japanese tariff rates imposed on manufacturing (intermediate) imports are also low (GATT, 1990).

5.2.4 Government Incentives

A common practice among governments in developing countries is to provide a variety of incentives to attract inward FDI (Lall and Streenten, 1977; Lall, 1980; Cave, 1996). Investment incentives in terms of tax and tariff concessions, as well as subsidies, tend to reduce production costs for foreign firms. Among recent empirical studies, Woodward and Rolfe (1993), Kumar (1994), Loree and Guisinger (1995), and Head and Ries (1996) have proposed the government incentives as one of locational factors affecting a firm's decision on FDI. Nonetheless, the empirical evidence has been inconclusive. While Woodward and Rolfe (1993) and Head and Ries (1996) found positive significant effects of the government incentives on exported-oriented FDI in the Caribbean and in China, Kumar (1994) and Guisinger (1995) found no effect of the government incentives on US exported-oriented FDI. Possibly, this factor tends to influence inward FDI only in conjunction with other locational factors. Its effects on FDI alone would be minimal when other host locational factors are not favourable to foreign firms.

In the case of Thailand, the Thai government (the Board of Investment of Thailand) has provided fiscal incentives in terms of tax and tariff concessions to both domestic and foreign investors in selected industrial activities since the early 1970s. To some extent, the presence of these incentives may influence the industrial distribution of Japanese FDI activities in Thailand. It may be thus anticipated that Japanese FDI stocks in Thailand tend to be greater in those manufacturing industries where Japanese firms are eligible for receiving government incentives, ceteris paribus.

5.2.5 External Trade Preferences

Referring back to the earlier discussion, vertically integrated firms from DMEs tend to use host developing countries as assembling bases, whereby intermediate products are imported for labour-activities and final products are subsequently exported back to serve the home market demands. However, in many cases, FDI in developing countries is not only aimed at exploiting local endowments there but also at gaining access to large industrialised markets of the US / EU via trade preferences granted to exports from those developing countries[9]. Since the late 1970s, several manufacturing exports from developing countries have been eligible for benefits from the 'Generalised System of Preferences' (GSP) granted by the USA, the EU, and other industrialised countries (on a non-reciprocal and non-discriminatory basis). Under the GSP scheme, specific manufacturing products originated from developing countries (subject to certain conditions) are not charged (or less charged) with customs duties. It is thus possible that manufacturing firms from Japan may also aim to take advantage of these benefits by using FDI in Thailand as an export base to penetrate other large industrialised markets[10].

At a broadly defined industrial level, there are at least some manufacturing products listed under the US GSP schemes (USTR, 1999). However, a

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[9] There are extensive discussion on the effects of trade privileges in terms of North American Free Trade Agreement on inward flows of FDI to Mexico (see Markusen, Rutherford, and Hunter, 1995; Rugman, 1993; and Rugman, 1994). For a discussion concerning the external trade preferences and Japanese FDI in ASEAN, see Jomo *et al.*, 1997.

[10] Local firms in developing countries may not able to produce several GSP listed products because they lack technological capabilities and financial resources.

potential for producing and exporting those GSP listed products may vary across manufacturing activities. These depend on availability of local resources, supporting infrastructure, transportation costs[11], and size of industrialised market (for those GSP products). Hence, it may be expected that Japanese FDI stocks in Thailand tend to be greater in those manufacturing industries with the potential for producing and exporting GSP eligible products to large industrialised markets, ceteris paribus[12].

Table 5-1: Summary of Locational Hypotheses

1. Labour Intensity	➢ FDI tends to be greater in those Thai manufacturing industries with the highest intensity of Japanese labour.
2. Home Market Size	➢ FDI tends to be greater in those Thai manufacturing industries with the largest size of Japanese markets.
3. Transport Costs	➢ FDI tends to be greater in those Thai manufacturing industries with the lowest combined costs of transporting intermediate products from Japan to Thailand and final products backs to Japan.
4. Government Incentives	➢ FDI tends be greater in those Thai manufacturing industries where Japanese firms are eligible for receiving government incentives.
5. External Trade Preferences	➢ FDI tends to be greater in those Thai manufacturing industries with the potential for producing and exporting US / EU GSP listed products.

On the basis of the discussion above, the five testable hypotheses can be summarised in table 5-1. It should be noted that these hypotheses are based on

[11] Cost of importing inputs from elsewhere and exporting GSP listed products to the US / US.

[12] One may argue that Japanese FDI in Thailand is also aimed at penetrating the US / EU market in response to the anti-dumping and countervailing (AD / CV) measures exercised against their product, being exported to those markets. However, the AD / CV measures tend to be imposed on specific product items and thus may not have any significant influence on the broader industrial pattern of Japanese FDI in Thailand. Furthermore, some recent empirical studies indicate that Japanese FDI tends to be undertaken directly in the host country which have exercised the AD / CV measures against Japanese exports (Belderbos, 1997; Girma, Greenaway, and Wakelin, 1999).

the locational approach to the determinants of FDI in the context of developing countries; they are not exhaustive. There may be other factors that affect the inward investment decision of individual firms. However, as discussed in chapter III, the macro economic factors like Japanese Yen appreciation and interest rate differentials tend to influence short run flows rather than long-run stocks of FDI. Also, the intangible assets like technological and managerial capabilities may be specific to Japanese firms operating in particular manufacturing activities in Thailand, and thus they may not systematically influence the manufacturing distribution FDI as a whole. Since FDI in developing countries tend to be vertically integrated, not aimed at servicing the final market demands of those countries, factors like host market concentration and / or cultural similarity may not play important roles in determining the industrial composition of FDI.

5.3 Empirical Model and Data Descriptions

This section describes an empirical model, measures, and data sources used for quantitative analysis.

5.3.1 Empirical Model

Based on the previous theoretical discussion, the following cross-sectional relationships will be subjected to empirical testing:

$$FDI_j = f(\underset{+}{LAB_j}, \underset{+}{MARK_j}, \underset{-}{TRANS_j}, \underset{+}{GOV_j}, \underset{+}{GSP_j})$$

where the signs below each independent variable denote the posited direction of influence corresponding to the hypotheses shown in table 5-1, and where

FDI_j	=	Japanese inward FDI stocks in industry j
$JAPLAB_j$	=	Japanese labour intensity in industry j
$MARK_j$	=	Size of Japanese market in industry j
$TRANS_j$	=	Transportation costs of exporting products under industry j from Thailand back to Japan
GOV_j	=	Incidences of government incentives provided to foreign investors operating in industry j
GSP_j	=	Incidences of GSP listed products under industry j that have been exported from Thailand to the US

This model will be empirically tested using the information on Japanese FDI stocks recorded at 1985, 1990, and 1995 across 85 Thai manufacturing industries. The reason why FDI stocks are separated into different periods is that there has been a large expansion, as well as diversification, of Japanese investment activities after the Japanese Yen appreciation in 1985 (see chapter II). It is thus sensible to examine whether the locational factors discussed above are relevant in explaining both the manufacturing pattern of Japanese FDI before the Japanese Yen appreciation (1985) and after that event. Additionally, since the export promotion policies adopted by the Thai government actually came into effect around the mid 1980s (Anuroj, 1995), some investment activities carried out prior to that period might have been horizontally integrated, mainly aimed at servicing the Thai market.

5.3.2 Data, Definitions, and Sources

The choices of measures, data definitions, and sources for both dependent and independent variables are discussed as follows.

A. Foreign Direct Investment

The industry-level data on Japanese FDI stocks are aggregated from the company-level data, which are gathered from five different sources (see chapter II). As shown in chapter II, some Thai manufacturing industries did not receive any FDI during the specified period (1954-1995), and thus the corresponding values of FDI are recorded as zero. Given that FDI data used in this analysis consist of both zero and non-zero observations, three alternative measures for FDI are considered. First is the qualitative measure representing the incidence of Japanese FDI undertaken in industry j in Thailand:

FDIBIN = *Dichotomous variable assigned a value of 1 if there had been an incidence of Japanese FDI undertaken in industry j during the specified period and 0 otherwise.*

The second measure is the quantitative measure representing the extent of Japanese FDI undertaken in industry j in Thailand:

FDICAP = *Value of the total stocks of Japanese share capital in industry j (US dollar)*

The above measure reflects the size of Japanese investment undertaken across Thai manufacturing industries over period of 1985, 1990, and 1995. FDICAP variable can only be measured in absolute term, not relative term, because the

data on aggregated capital stocks in Thailand are not available. Lastly, the alternative measure to FDICAP is defined as:

FDINUM = *Cumulative number of new Japanese-owned companies operating in industry j*

This measure is used for two reasons. Firstly, as discussed in chapter II, there are some weaknesses associated with the measure of authorised share capital. Secondly, this measure reflects the frequency rather than the size of investment. It may be worth exploring whether the locational factors specified in the model have different effects on the size of investment on the one hand, and the frequency of investment on the other hand. As observed from the sample data, there was a large amount of investment undertaken by few Japanese companies in some manufacturing industries such as the ISIC 3710 (basis steel and iron). By contrast, there was a large number of Japanese companies operating in a manufacturing industry like the ISIC 3819 (other fabricated metal products) but the aggregated amount of investment undertaken (by these companies) was quite small.

B. Labour-intensity of Production

With regard to the discussion in section 5.2, an ideal information used for measuring labour-intensity is a value of wage and salaries of Japanese unskilled workers. However, the data on wages of unskilled labour in Japan are not accessible[13].

[13] Survey of Labour Force in 1976 and 1992 record the wages of unskilled and skilled labour, but the information is not accessible. Also, the definition used for skilled and unskilled labour is quite subjective.

Given the problem of data constraint, an alternative proxy for labour intensity is considered. Following Denekamp (1995) and Milner and Pentecost (1996), the ratio of wage and salaries to the total manufacturing value added is used as a measure for labour-intensity. It should be noted that this information on wages and salaries is quite aggregated, combining those of unskilled and skilled labours. Some industries with the high values of this ratio may be regarded as skilled rather than unskilled labour-intensive industries. Nonetheless, for the purpose of this empirical analysis, the intensity of labour in industry j in Japan is measured as:

JAPLAB = *Value of the total remuneration as a percentage of the total gross value added of Japanese industries j (US $)*[14]

The information is obtained from the UNIDO industrial statistics database.

C. Home Market Size

Market size is commonly measured as a value of industrial sales, which roughly reflects the total demand for domestic outputs (Milner and Pentecost, 1996; Barrell and Pain, 1999; and Girma, Greenaway, and Wakelin, 1999). Another measure used is a value of industrial production. However, the latter may not accurately reflect the size of domestic market since only part of manufacturing output is consumed domestically while other is exported to foreign markets. Obviously, some manufacturing industries with the relatively high intensity of exports would have larger shares of their domestic output being exported.

[14] Other measures for labour intensity are also used (see the estimation section).

In this analysis, a measure used for market size variable is the total demand for intermediate and final products [(domestic productions + imports) - exports]. It is viewed that this measure is the suitable measure since it consists of intermediate and final demands for domestic outputs, together with intermediate and final demands for manufacturing imports. In sum, the market size variable is measured as:

MARK = *Value of the total intermediate and final demand of industry j in Japan (US $)*

The information is obtained from the Japan-Thailand bilateral input-output table[15], constructed by Japanese Institute of Developing Economies, Tokyo, Japan. This table is constructed using the information on the Thai I-O tables and the Japanese I-O table (see more details in appendix 5-1-1). One weakness of employing this bilateral I-O table is that the industrial classification used by the table is more aggregated than that used by the present analysis (70 vs. 85 industries). Therefore, some manufacturing industries would share the same value of Japanese market demands (see appendix 5-1-2)[16].

D. Transportation Costs

Following the transportation costs hypothesis, the combined costs of transporting intermediate inputs from Japan to Thailand and the final outputs

[15] Japan I-O table is not accessible.
[16] Being aware of a problem of industrial misclassification, the converter between *the Bilateral Japanese-Thai I-O table* and *the Thailand's I-O table* (industrial classification used by present analysis) is employed

back to Japan should be considered. Given available data sources, it is possible that an information on the costs of transporting intermediate products from Japan to Thai manufacturing industry j can be obtained from the bilateral Japanese-Thai I-O table (see appendix 5-1-1). These values are calculated according to differences between the values of *fob* (free on broad) and *cif* (cost, insurance, and freight). Similarly, the costs of transporting final products back to Japan could be obtained by subtracting the values of Thai manufacturing exports to Japan (*fob*) with those of Japanese imports from Thailand (*cif*). This information can be obtained from the United Nations COMTRADE database.

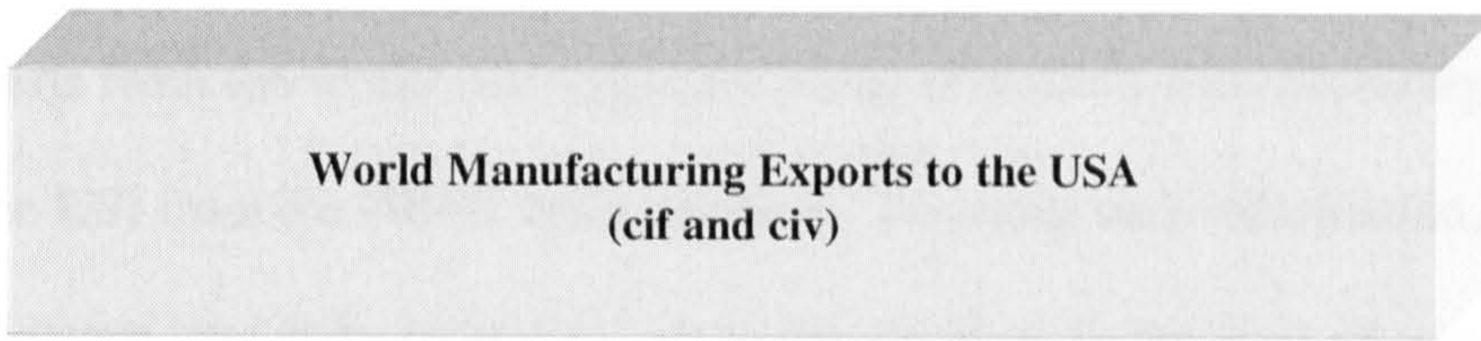
However, due to a discrepancy in the systems of recording and compiling trade statistics between Thailand and Japan, the differences between the values of *cif* and *fob* can in fact represent the discrepancy in the reported values of the merchandise. As suggested by Gehlhar, *et al.* (1997), a more credible way of measuring the costs of transportation is to use the information on the 'custom import value' (*civ*). This information is available at the US trade recording system. The civ value is defined as a price actually paid for the merchandise excluding import duties, freights and insurance, and other charges incurred from the importing of merchandise to the US. Equivalently, the civ value would be comparable to the fob value. The difference between the civ and cif values can represent the actual aggregate costs of all freights, insurance, and other charges incurred from the transportation of manufacturing products from a port of exportation to a port of entry.

However, one drawback to using this information is that the civ information is the statistical record of the US imports from its trading partners. One may argue that the costs of transportation vary across different trading partners (due to differences in the physical distance), and thus the costs of transportation between the USA and Thailand should be different from those between Japan and Thailand. However, as illustrated by Gehlhar, *et al.* (1997), the role of distance in transporting several manufacturing products from the same (different) ports of origin to the different (same) destinations do not matter very much. For instance, a cost of transporting passenger cars from the UK to the US (civ-cif) is in fact lower than a cost of transporting the same product from Mexico to the US. Also, a cost of transporting footwear from Australia to the US is nearly the same as that from Brazil to the US (Gehlhar, *et al.*, 1997). Certainly, there are other factors besides the distance that determines the bilateral transportation costs and they tend to be product-specific. Gehlhar, *et al.* (1997) argues that the variation in the costs of transportation across different product items (between two countries) is much greater than the variation in the costs of transporting a single product item across countries[17]. In other words, the specific characteristics across product items matter more than the physical distances across countries.

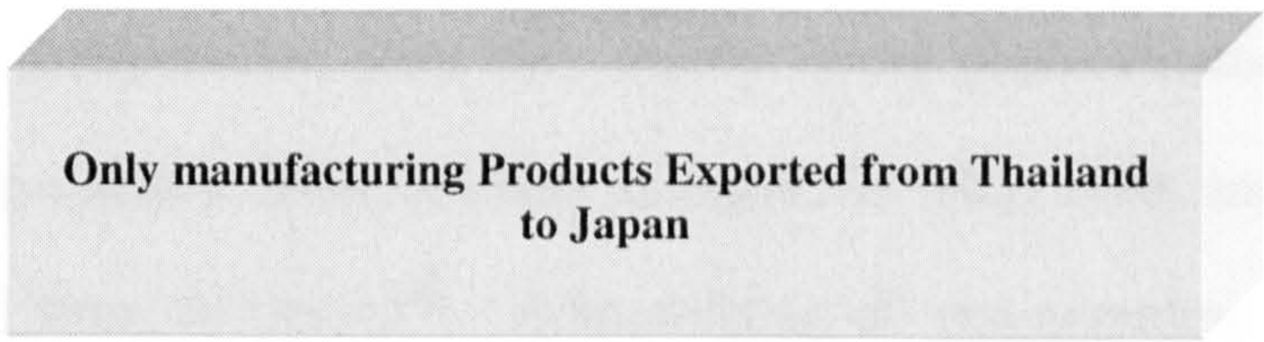
[17] In other words, the variation in the costs of transporting *different commodities* from one country to *the same destination* is greater than the variation in the costs of transporting *the same commodities* from one country to *various destinations*.

Figure 5-1: Procedure Used to Compile Transportation Costs Data

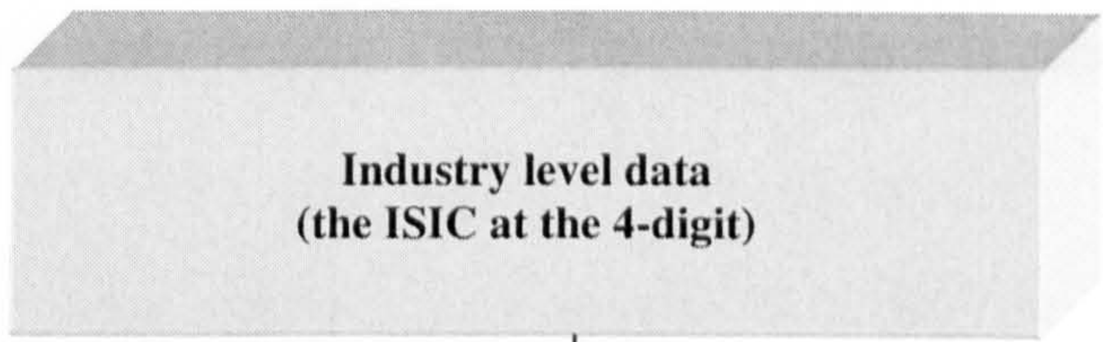
Stage 1: The cif and civ information of world manufacturing exports to the USA is extracted from the NBER trade database



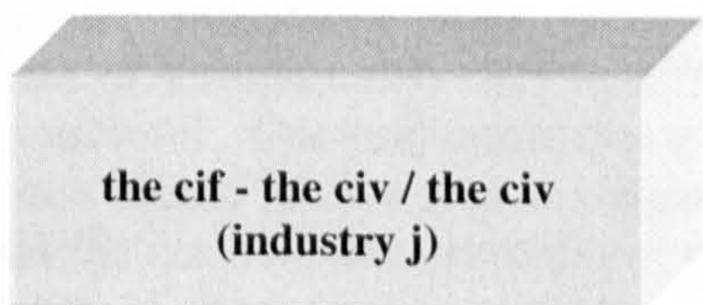
Stage 2: Non-exporting products from Thailand to Japan are excluded



Stage 3: The data are re-classified according the ISIC at the 4-digit level using the concordance table obtained from the UNCTAD



Stage 4: The transportation costs at the industry level are calculated



Hence, in the present analysis, the cif and civ information obtained from the NBER trade database (US imports between 1972-1994)[18] is used as a basis to calculate the transportation costs of final exports from Thailand to Japan (see figure 5-1). The process begins by extracting the information on the US imports from the world (the aggregate value of world's manufacturing exports to the US) from the NBER trade database. By using such information, the role of distance tend to be minimised since the variation in the costs of transporting each manufacturing product across countries to the US tend to offset one another, and thus the remaining is the world transportation costs that vary across manufacturing product items. Secondly, by following the argument that the transportation costs vary greatly across product items, those non-exporting products from Thailand to Japan (in 1985, 1990, and 1995)[19] are excluded from the record[20]. After deleting all non-exporting products, all product items are re-classified according to the 4-digit ISIC level (Rev. 2), using the converter between the SITC and the ISIC obtained from the UNCTAD. In sum, the measure used for the transportation costs of exporting final products under industry j from Thailand to Japan is defined as:

[18] This information is recorded according to the SITC code (standard international trade classification) at the 5-digit level (rev.2).

[19] The list of Japanese imports from Thailand is obtained from the OECD commodities trade statistics classified according to the SITC at the 5-digit level.

[20] One weakness of this procedure is that all product items are given the same weight when calculating the industry-level data on the transportation costs regardless of their volumes being exported. Potentially, those product items with the small trade volumes but high costs of transportation tend to inflate the costs of transportation recorded at the industrial level. One may argue that manufacturing products with the larger exporting volumes should receive greater weights than those with the relatively small volumes, so that the costs of transportation of each industry would reflect the true transportation costs of the principle products in which Thailand exported to Japan.

TRANS = *Difference between the cif and the civ values as a percentage of the civ value (of industry j)*

There are seven manufacturing industries in which no product was exported from Thailand to Japan during the specified periods[21]. The world transportation costs are used for those industries.

E. Government Incentives

There is a problem in measuring government incentives in quantitative terms. Though it is possible to quantitatively measure the privileges that had been granted by the Thai government (BOI) in the forms of tax and tariff exemptions, the data are not accessible. The only accessible information regarding the government incentives is the list of industrial activities eligible for tax and tariff granted by the BOI. However, caution must be used when employing this information. This is because not every firm undertaking investment in those activities is instantaneously guaranteed for tax and tariff exemptions. Firms are also subject to other requirements such as geographical zones of investment, amounts of invested capital, environmental regulations, and minimum export requirements. Nonetheless, for the purpose of this analysis, the government incentive variable is measured as:

GOV = *Dummy variable assigned a value of 1 if foreign investment in industry j is eligible for receiving tax and tariff exemptions from the BOI, and 0 otherwise*

[21] These industries are 3140 (a and b), 3210 (a), 3540, 3841, 3842, 3845 (see appendix 2-1 for the industrial classification).

The information used is obtained from "A Guide to the Board of Investment", published by the Board of Investment of Thailand (various issues).

F. External Trade Preferences

External trade preferences can be measured in terms of the total value of GSP listed products being exported from Thailand to the USA (the NBER Trade Data: US Imports between 1972-94)[22]. As one may know, the US GSP schemes have been implemented since the late 1970s with subsequent modifications in terms of the coverage of the GSP eligible products. Although some products are listed as GSP eligible products, many exports from Thailand to the USA are often denied duty-free entry on arriving at the US ports. This is due to administrative reasons such as a lack of necessary documentation. Therefore, in the analysis, the information used is the exports of GSP eligible products that actually came into the US duty free.

Initially, the values of GSP eligible products being exported from Thailand to the US are recorded according to the harmonised system code (HS). The data are re-classified to the ISIC at the 4-digit level (Rev. 2) using the converter between the HS and the ISIC obtained from the UNCTAD. From the data of Thai GSP exports to the US, it is observed that several Thai industries did not export any GSP products during the specified period despite there being an extensive list of products eligible for receiving GSP privilege under those industries (USTR, 1999). As discussed earlier, the potential for producing and

[22] For the detailed information regarding data and concordances, see Feenstra, R.C (1996), US imports between 1972-1994: Data and concordances, *NBER Working Paper*, no. 5515.

exporting those GSP eligible products may vary across manufacturing activities. This depends on local resources, infrastructure, transportation costs, and the US market size. Therefore, in measuring the GSP variable, two alternative proxies are considered. The main measure is the incidence of GSP eligible products being exported from Thailand to the USA. This represents the potential for producing and exporting GSP products:

$USGSP_1$= *Dummy variable assigned a value of 1 if there had been an incidence of GSP eligible products under industry j exported from Thailand to the US (during the specified period) and 0 otherwise.*

The alternative measure is the intensity of GSP exports to the USA:

$USGSP_2$= *Value of GSP eligible products being exported from Thailand which actually came into the US duty free as a percentage of the total Thai manufacturing exports under industry j to the USA.*

Table 5-2: Summary of Variables, Measures, and Data Sources

Variable	Measure	Source
FDI	• Dichotomous (0,1) • Share capital • Count Number	• Data are complied by the Author
JAPLAB	• Total Wages and salaries / Gross value added	• UNIDO Industrial Statistics data
MARK	• Total intermediate and final demand	• Japanese-Thai I-O table
TRANS	• Freight, insurance, and other charges on exports to Japan	• NBER Trade Data base
GOV	• Incidence of Thai government incentives	• BOI (Thailand)
USGSP	• Incidence of GSP exports • Value of GSP exports / total exports	• NBER Trade Data base

5.4 Estimation Procedure and Results

With the qualitative and quantitative measures used for Japanese FDI (FDIBIN, FDICAP, and FDINUM), the empirical analysis is separated into two parts. The first part estimates the influences of locational variables on the incidence of FDI (FDIBIN) and the second part estimates the influences of those variables on the extent of FDI (FDICAP and FDINUM). The discussions below describe the procedure used for empirical estimation.

5.4.1 Estimation Procedure

The estimation is carried out using the two-stage estimation procedure suggested by Heckman (1979)[23]. In the first stage, a Probit model is used to estimate the effects of locational variables on the incidence of Japanese FDI. The dependent variable takes a value of 1 if there had been Japanese FDI undertaken in industry j (during the specified period) and 0 otherwise (FDIBIN). In the second stage, only the sub-sample of industries that had received Japanese FDI is used to estimate the influences of locational factors on the extent of FDI (FDICAP and FDINUM). In this stage, an ordinary least square (OLS) regression model (with a correction term for selectivity bias) is used for estimation. The information used to calculate this correction term is obtained from the Probit estimates.

[23] An alternative procedure is a Tobit procedure. This procedure allows the independent variable to influence both the probability and the size of FDI being undertaken across manufacturing industries. However, one major drawback to using such procedure is that the influences of locational factors on both the probability and the size of FDI are assumed to be the same.

A. Probit Model

The Probit model can be described as followings. Let z_j^* represents the benefits gained by Japanese firms for undertaking FDI in industry j in Thailand (e.g. cheap costs of unskilled labours), whereas c_j represents the costs of undertaking in FDI (e.g. fixed costs of establishing manufacturing plants). Suppose that z_j^* is not directly observed but what is actually observed is z_j – the incidence of Japanese FDI stocks undertaken in Thai industry j. When z_j^* is greater than c_j, z_j is observed, otherwise z_j is not observed. Assuming that

$$\begin{aligned} z_j &= 1 \quad \text{if} \quad z_j^* > c_j \\ z_j &= 0 \quad \text{if} \quad z_j^* < c_j \end{aligned} \qquad 5.1$$

and w_j represents the locational explanatory variables which influence the probability that z_j takes a value of 1. Hence, the probability that z_j take a value of 1 and 0 would be

$$\begin{aligned} \text{Prob}\,(z_j = 1) &= F\,(\gamma' w_j) \\ \text{Prob}\,(z_j = 0) &= 1 - F(\gamma' w_j) \end{aligned} \qquad 5.2$$

where γ represents the marginal effects of w_j on the probability that FDI is undertaken in industry j and F represents the cumulative distribution function. The form of F can be either the cumulative logistic distribution function or the cumulative normal distribution function. The latter gives rise to the Probit model described as:

$$\text{Prob}\,(z_j = 1) = \int_{-\infty}^{\gamma' w_j} \frac{1}{\sqrt{2\pi}} \exp\left(\frac{-t^2}{2}\right) dt = \Phi(\gamma' w_j) \qquad 5.3$$

where the notation Φ (.) represents the cumulative normal distribution function. The parameters γ can be estimated with the maximum likelihood method[24].

B. OLS Model with Selectivity Bias Adjustments

In the second stage, only the sub-sample of industries receiving FDI is used to estimate the influences of locational factors on the extent of FDI. In this stage, the ordinary least square (OLS) model is employed. A form of regression model can be generally written as:

$$FDI_j = \beta' x_j + \mu_j \qquad 5.4$$

where FDI_j represents the extent of Japanese FDI in industry j, x_j represents a set of explanatory locational variables, β represent marginal effects of x_j on the extents of FDI, and μ_j is the error term with mean zero and constant variance. As argued by Heckman (1976 and 1979), if the sub-group of industry j is randomly drawn from the entire manufacturing sample, the use of ordinary least square estimator would result in unbiased and consistent estimates. On the other hand, if the sub-group of industry j is non-randomly drawn, the use of least square estimator would result in biased and inconsistent estimates. In other words, the problem of sample selection bias is encountered. The expected value of error term μ_j (in equation 5.4) will not be equal zero [$E(\mu_j) \neq 0$], and thus one assumption of best linear unbiased estimation is violated (see Heckman, 1976 for a detailed illustration).

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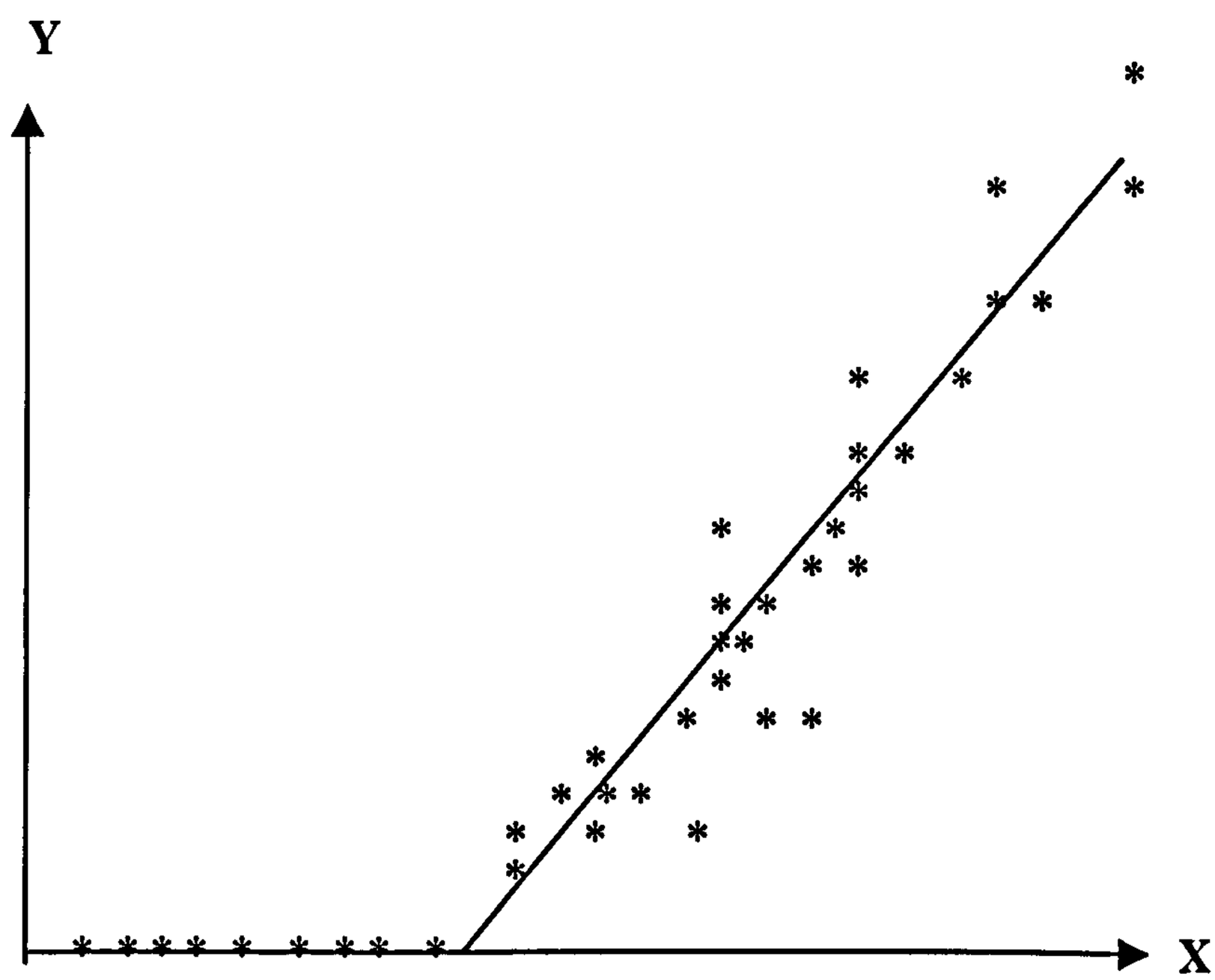
[24] See Madala (1983, pp.25-26) for details of how the model is estimated.

Regarding the sub-sample used in this analysis, it may be argued that the sample is not randomly drawn since only those manufacturing industries with some FDI undertaken are selected. Therefore, the possibility of encountering the sample selection bias problem is very likely. Figure 5-2 shows a case where the estimated regression line of an independent variable *X* (e.g. labour intensity) and a dependent variable *Y* (FDI) is bias and inconsistent when applying the OLS estimator to the sub-sample with only non-zero dependent observations.

Figure 5-2: OLS Regression Line Estimated from the Sample of Non-zero Dependent Variable



The variable *X* is likely to affect both the probability of a Thai manufacturing industry receiving some Japanese FDI and the size of that FDI. In other words, as the intensity of labour in industry j in Japan rises, the probability that the corresponding industry in Thailand receives Japanese FDI also rises, and subsequently the amount of FDI undertaken in that industry rises too.

Therefore, without an inclusion of zero dependent observation, the effect of the explanatory variable X on the probability of having Y undertaken is not taken into account.

According the 2-stage procedure used in this analysis, the Probit model has been firstly estimated, and thus the estimated Probit coefficients (the effect of the independent variable X on the probability of having Y) can be used to correct for the selection bias. As suggested by Heckman (1976 and 1979), the sample selection bias problem can be treated as an ordinary problem of omission bias, in that one important explanatory variable is omitted from the OLS regression model[25]. With an inclusion of such omitted variable, the problem of sample selection bias should be corrected, and thus the ordinary least square estimator can be used to obtain unbiased and consistent parameters. Commonly, this omitted variable is termed as the 'Inverse of Mill's ratio" and the empirical model with the inclusion of this correction term can be described as:

$$FDI_j = \beta' x_j + \rho\sigma\lambda_j + \nu_j \qquad 5.5$$

where λ_j represent the additional regressor (correction term) or so called 'Inverse of Mill's ratio, $\rho\sigma$ represents the parameter of the correction term (the marginal effect of the sample selection on the extent of Japanese FDI), and ν_j is the error term where $E[(\nu_j) = 0]$[26]. The correction term λ_j is defined as

[25] See appendix 5-2 for detail.

[26] For details of how the model is derived, see Heckman (1976 and 1979). Heckman argues that the estimates of β and $\rho\sigma$ are unbiased and consistent, and they are close to the estimates obtained from the alternative maximum likelihood estimator.

$$\lambda_j = \frac{\phi(\gamma' w_j)}{\Phi(-\gamma' w_j)} \qquad 5.6$$

where ϕ represents the normal density function (the height of the normal curve), Φ represents the cumulative normal distribution function (the area under the normal curve), γ is the estimated Probit coefficients, and w_j is the locational variables that affect the probability of Japanese FDI being undertaken. Hence, given the coefficients (γ) obtained from the Probit estimation, one can estimate $\gamma' w_j$ and thus λ_j for each observation. Then, the 'Inverse mill's ratio' (λ_j) can be used as an additional regressor to correct for the sample selection bias.

In summary, the problem of sample selection bias can be treated as a problem of omission bias (Heckman, 1979). The original regression model specified in equation 5.4 is not appropriate since it omits one important independent variable. This omitted variable is termed as the 'Inverse of Mill's ratio' (equation 5.6). With regard to the present analysis of Japanese FDI, the 'Inverse of Mill's ratio' is computed for each observation using the information (estimated coefficients) obtained from the Probit estimation. Subsequently, this correction term is incorporated in the OLS regression model specified in equation 5.5[27].

[27] There are also weaknesses associated with this type of methodology; for example, a strong multi-collinearity between the locational factors x_j and λ_j may result in unreliable estimates. See Heckman (1976), Maddala (1983), and Stolzenberg and Relless (1996) for detailed discussions.

5.4.2 Empirical Results

Two sets of estimated results are discussed: results obtained from the Probit and the OLS models. The next part discusses the results obtained from the Probit model while the following part discusses the results obtained from the OLS model. Finally, the last part compares the cross-sectional results with the pooled Probit and OLS estimates.

A. Probit Model

Tables 5-3 and 5-4 show respectively a summary and detailed estimates of the Probit models of the influences of locational factors on the incidence of Japanese FDI across Thai manufacturing industries.

Table 5-3: Effects of Locational Factors on the Incidence of FDI (Summary of Estimated Results)

Hypothesis	Variable	Estimated Sign and Level of Significance		
		1985	1990	1995
1. Labour intensity	JAPLAB (+)	✔	✔	✔
2. Market size	MARK (+)	✔***	✔**	✔**
3. Transportation costs	TRANS (-)	✔*	✔**	✔
4. Government incentives	GOV (+)	✔*	✔**	✔**
5. Trade preference	$USGSP_1$ (+)	✔***	✔***	✔**

Note: 1) ✔ means an estimated sign is consistent with the expected sign
2) ***denotes 1%, ** denotes 5%, and * denotes 10% levels of significance

In general, it is observed that all estimated coefficients carry the correct signs, as postulated by the hypotheses shown in table 5-1. Excepts for the JAPLAB coefficients and the TRANS coefficient for the 1995 sample, other estimated coefficients are statistically significant at the 10% level.

Table 5-4: Effects of Locational Factors on the Incidence of FDI (Probit Models)

Independent Variable	Expected sign	Estimated coefficients and *t*-statistics		
		1985	1990	1995
CONSTANT	(?)	-1.43** (-2.079)	-0.77 (-1.011)	-1.30* (-1.649)
JAPLAB	(+)	1.10 (0.723)	0.95 (0.626)	1.43 (0.972)
MARK	(+)	4.47*** (2.672)	1.74** (2.013)	1.96** (2.014)
TRANS	(-)	-0.59* (-1.778)	-1.04** (-2.316)	-0.80 (-1.446)
GOV	(+)	0.59* (1.812)	0.85** (2.387)	1.06** (2.428)
$USGSP_1$	(+)	0.87*** (2.454)	1.06*** (2.691)	0.96** (2.307)
Log-likelihood		-43.4	-34.0	-30.1
Likelihood Ratio test$_1$		30.0***	31.1***	36.0***
Likelihood Ratio test$_2$		2.28	2.02	0.30
Correct predictions (%)		74%	84%	85%
Sample size		85	85	85

Note: 1) ***denotes 1%, **denotes 5%, and *denotes 10% levels of significance
2) A ? sign indicates that there is no prior knowledge of the relationship between an independent and a dependent variable.
3) The likelihood ratio test statistics computed as -2(LLU-LLR), where LLU and LLR are the log-likelihood of the unrestricted and restricted models. For the likelihood Ratio test$_1$ (the test for joint effects), the unrestricted model is estimated with all explanatory variables and the restricted model is estimated without these variables. The test statistic has an asymptotic chi-square distribution with 5 degree of freedom. The null hypothesis is that all estimated coefficients are jointly equal to zero. For the Likelihood Ratio test$_2$ (the test for heteroscedasticity), the unrestricted model is the model that allows the variance of the error term to vary with the set of explanatory variables (MARK in this case). The restricted model is the standard Probit model that assumes a constant variance of the error term [see Greene (1993) for detail]. The test statistic has an asymptotic chi-square distribution with 1 degree of freedom (in this case). The null hypothesis of homoscedasticity is rejected when the test statistic exceeds the critical value of χ^2 at 5% (3.84).

Apparently the influences of locational factors on the distribution / allocation of Japanese FDI undertaken before and after the Yen appreciation are not greatly different. Even though FDI activities became much more diversified after 1985[28], the locational factors being examined seem to have a long-term systematic influence on FDI undertaken during both periods (before and after 1985). The effects of each locational explanatory variable on FDI incidence are discussed next.

The estimated coefficients for the JAPLAB variable carry signs consistent with their expected signs but are statistically insignificant across the sample periods. Arguably, the insignificant coefficients for the JAPLAB variable may be due to following reasons. Firstly, because the information used for FDI consists of investment undertaken since the early 1950s, it is possible that an import-substitution strategy pursued by the Thai government during the 1950s-1970s encouraged several companies to produce for Thai market rather than for exports. Because many forms of incentives were granted to foreign investors, there might have been several large-scale assembling projects initiated by Japanese companies during that period (1950s-1970s), and also some of these projects might have been relatively capital-intensive. As observed from the sample, there were large investment projects undertaken in the ISIC 3512 industry (fertiliser and pesticides), the ISIC 3521 industry (paints, vanishes, and lacquers), and the ISIC 3530 industry (petroleum products) during 1960s-1970s, though the levels of Japanese labour intensity

[28], The number of Thai industries receiving Japanese FDI increased from 45 in 1985 to 63 in 1995.

of these industries were relatively low. It is possible that the incidence of FDI undertaken in these capital-intensive industries explains (partially) the weak association between the FDIBIN and JAPLAB variables. On removing such industries from the samples used for estimation, it is found that the explanatory powers of the JAPLAB coefficients increase sharply. Yet they still remain statistically insignificant at the 10% level.

Secondly, the weak association between the JAPLAB and FDIBIN variables might be explained by the fact that some manufacturing activities in Thailand were controlled by the Thai government, and thus they were not freely open for all private investors[29]. Although the intensity of labour of those activities was relatively high in Japan, Japanese manufacturing firms might not have been able to establish their production activities in Thailand due to specific regulations imposed by the Thai government.

Thirdly, the insignificant coefficients for the JAPLAB variable might be explained by unobserved factors in Japan such as specific facilities, services, technology, and government regulations that discouraged Japanese firms from relocating their (unskilled) labour-intensive activities to Thailand.

Furthermore, the weak association might be also due to the proxy used. Referring back to the earlier discussion (section 5.2), it is argued that vertically integrated MNEs tend to retain their capital / technology-intensive

[29] Some industries are listed under the sensitive list for opening up for investment (ASEAN investment area: Temporary exclusion and sensitive list, 1999). However, when incorporating the dummy variables representing these industries, it is found that the significance levels of the JAPLAB coefficients improve only slightly.

activities at home and move their unskilled labour-intensive activities to developing countries. Yet the proxy used for this intensity of unskilled labour is the total wages and salaries of all types of labour in Japan (JAPLAB); the wages of unskilled and skilled labours are not separated. It is possible that the high values of JAPLAB in some industries may actually represent the high intensities of skilled rather than unskilled labour. Hence, this imprecise measure used for unskilled labour intensity may be one of the possible reasons explaining the weak association between the JAPLAB and FDIBIN variables.

To further investigate the effect of labour intensity on the incidence of Japanese FDI, an alternative measure for labour intensity (Thai labour intensity) is used. Similar to the JAPLAB variable, the Thai labour intensity (THAILAB)[30] is measured as a value of the total remuneration over the gross value added of industry j in Thailand (US $). Given that the JAPLAB variable is positively related to the FDIBIN variable, it is also expected that there is a positive relationship between the THAILAB and FDIBIN variables, unless the rankings of factor intensities across manufacturing industries in Thailand and in Japan are different. In other words, if industry j in Japan is characterised as relatively labour intensive, then the corresponding industry in Thailand should be also regarded as relatively labour intensive. Appendix 5-4-1 shows that the coefficients for the THAILAB variable are statistically insignificant across the sample periods; these are similar to the JAPLAB coefficients. However, in contrast to the latter, the former carry negative signs. As mentioned above, if

[30] The information is obtained from the Thailand Input-Output tables (1985, 1990, and 1995) published by the National Board of Economic and Social Development

the rankings of factor intensities across manufacturing industries in Thailand and Japan are not the same, the expected positive association between the THAILAB and FDIBIN variables may not hold. Potentially, the differences in the rankings may be due to the characteristics of the surveyed data used; these are discussed in detail in appendix 5-4-2[31].

Regarding the partial effect of Japanese market size (MARK), it is apparent that the MARK coefficients carry signs consistent with their expected signs and are statistically significant at the 5% level across the sample periods (table 5-3). The significant coefficients imply that Thai manufacturing industries with relatively larger Japanese market size are more likely to receive Japanese FDI. Evidently, these results are in line with the arguments for vertically integrated FDI discussed earlier.

Though the estimated coefficients for the TRANS variable carry signs consistent with their expected sign, the coefficient for the 1995 sample is not statistically significant at the 10% level. From the sample for 1995, it is observed that an aircraft industry (ISIC 3845) had never received FDI undertaken during 1954-95, but that the costs of transporting aircraft components were relatively low (particularly in 1995). In fact, the transportation costs of this industry were not the actual costs of transporting aircraft components from Thailand to Japan. This is because the former never exported any such product to the latter; these transportation costs were the

[31] Another measure is also used for labour intensity. THAILAB(2) is defined as the total wages and salaries per employee obtained from the UNIDO database. Similar to other measures, the estimated coefficients are not statistically significant (see appendix 5-4-3).

world transportation costs (see footnote 21). Hence, it is possible that the weak association between the FDIBIN and TRANS variables could be partly attributable to this. On removing such industry from the sample used for estimation, it is found that the TRANS coefficient (1995) becomes statistically significant at the 10% level.

Overall, other significant coefficients for the 1985 and 1990 samples suggest that the probability of Japanese FDI being undertaken across Thai manufacturing industries increases with decreasing costs of transporting the processed products back to Japan. As argued earlier, the low costs of transportation facilitate the vertically integrated activities carried out between parent firms in Japan and their affiliates in Thailand. Due to the fact that Japanese firms might have considered both the size of Japanese market and the costs of transportation simultaneously, an interaction term (MARK*TRANS) is also incorporated in the estimated model. However, it is found that the coefficient (not shown) is statistically insignificant, thus suggesting that the MARK and TRANS variables do not collectively, though individually, determine the probability of a Thai manufacturing industry having Japanese FDI undertaken. In other words, it is possible that a Thai manufacturing industry j with the largest size of Japanese market would receive FDI even though the costs of transporting manufacturing products under this industry are not the lowest. The relatively large size of the Japanese market may compensate for the moderate costs of transportation.

There is strong evidence supporting the hypothesis that Thai government incentives are effective in promoting FDI. As shown in tables 5-3, the coefficients for the GOV variable carry the correct signs and are statistically significant at the 5% level across the sample periods (except 1985). It may be inferred that those Thai manufacturing industries eligible for receiving government incentives are more likely to receive Japanese FDI. As can be seen in chapter IV, the present results are found to be consistent with the previous findings obtained by Woodward and Rolfe (1993) and Head and Ries (1996), which also found the positive effects of government incentives on the distribution of FDI across Caribbean countries and Chinese provinces[32].

In the earlier discussion on GSP measures, two alternative measures were proposed: the incidence of GSP exports ($USGSP_1$) and the intensity of GSP exports ($USGSP_2$). It is found that the latter do not have any significant effect on the incidence of Japanese FDI, and thus only the results estimated from the first measure are reported. As shown in table 5-3, there is consistent and strong evidence supporting the external trade preference hypothesis. The significant coefficients for the GSP variable imply that Thai manufacturing industries with the potential for producing and exporting GSP eligible products are more likely to receive Japanese FDI. In other words, the trade preferences granted by the US government indirectly affect the distribution / allocation of Japanese FDI across manufacturing industries in Thailand.

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[32] However, Loree and Guisinger (1995) did not find any significant effect of the government incentives on FDI undertaken across DCs. It is argued that the effects tend to operate in conjunction with other locational factors such as local endowments. An interaction term of Japanese labour intensity and government incentives variables (JAPLAB*GOV) are also incorporate in the estimated Probit models, but the coefficients are not statistically significant at the 10% level.

According to table 5-4, the likelihood ratio test statistics ($test_1$) clearly reject the null hypothesis that the restricted models without locational explanatory variables (JAPLAB, MARK, TRANS, GOV, and USGSP) are preferred to the unrestricted ones (see table 5-4 for detailed explanations). Furthermore, the likelihood ratio test statistics for heteroscedasticity ($test_2$) indicate no presence of heteroscedasticity within the estimated models. As indicated by the fraction of correct prediction, the models predict at least 70% of observations for the 1985, 1990 and 1995 samples correctly.

In summary, the locational variables specified in the empirical model are found to be relevant in explaining the incidence of Japanese FDI undertaken across Thai manufacturing industries. The following part investigates further whether such factors also influence the size (the extent) of Japanese FDI.

B. OLS Model with Selectivity Bias Adjustments

In this part, only the sub-sample of Thai industries with some Japanese FDI is used for the second stage of estimation. The coefficients obtained from the previous Probit estimates are used to compute the correction term (LAMDA), which is then incorporated in the OLS regression model (see equation 5-7). The OLS model is estimated for the samples for 1985 (before the Yen appreciation), 1990, and 1995.

Due to the fact that the dependent variable is measured in absolute, not relative terms, the heterogeneous size of manufacturing industries is not taken into

account. Consequently, a problem of heteroscedasticity[33] is encountered for all estimated models. All the results presented in tables below are adjusted for heteroscedasticity using the method devised by White (White, 1980)[34].

FDICAP as the Dependent Variable

Tables 5-5 and 5-6 present respectively a summary and detailed estimates obtained from the OLS regression models with FDICAP (share capital) used as the dependent variable.

Table 5-5: Effects of Locational Factors on the Extent of FDI (FDICAP) (Summary of Estimated Results)

Hypothesis	Variable	Estimated Sign and Level of Significance		
		1985	1990	1995
1. Labour intensity	JAPLAB (+)	✔***	✔**	✔**
2. Market size	MARK (+)	✔*	✔**	✔***
3. Transportation costs	TRANS (-)	✔**	✔*	✔*
4. Government incentives	GOV (+)	✔**	✔**	✔**
5. Trade preference	$USGSP_1$ (+)	✔	✔**	✔***

Note: Details as in table 5-3

[33] Heteroscedasticity occurs when the variance of the error term is not constant. With the existence of heteroscedasticity, the least square estimator is still unbiased but inefficient (Greene, 1993, pp. 386-391). Because the assumption that the distribution of the disturbance tern is homoscedastic is violated, the standard errors of the estimated coefficients are invalid; they are either under / over-estimated, as are the t-statistics. Thus, the proper inferences cannot be drawn when testing the hypotheses. Regarding the present analysis, the existence of heteroscedasticity is found for all estimated OLS models, as indicated by Breusch-Pagan χ^2 test for unknown form of heteroscedasticity (see Greene, 1993, p. 395).

[34] White (1980) developed the method for estimating a covariance matrix that is consistent in the presence of heteroscedasticity of unknown form. As suggested by Greene (1993), this method is useful when the precise nature of heteroscedasticity is unknown. Therefore, when reporting the OLS results, heteroscedasticity consistent t-statistics proposed by White are provided.

Table 5-6: Effects of Locational Factors on the Extent of FDI
OLS Models with Selectivity Bias Adjustments
Dependent Variable: FDICAP

Independent Variable	Expected Sign	Estimated coefficients and asymptotic *t*-statistics		
		1985	1990	1995
CONSTANT	(?)	-104177 (-1.619)	-329808** (-2.215)	-842053*** (-2.999)
JAPLAB	(+)	138460*** (2.765)	267282** (2.133)	459605** (2.401)
MARK	(+)	145186* (1.688)	199644** (2.555)	442572*** (3.408)
TRANS	(-)	-54328** (-2.449)	-207410* (-1.896)	-197649* (-1.798)
GOV	(+)	32088** (2.296)	124647** (2.354)	328256*** (3.150)
$USGSP_1$	(+)	29173 (1.175)	149697** (2.107)	263144*** (2.641)
LAMDA	(+)	60254 (1.397)	303878** (2.005)	604169** (2.573)
Adjusted R-squared		0.19	0.29	0.43
F statistics		2.72***	5.23***	9.02***
Sample size		45	62	63

Note: 1) Adjusted White's heteroscedasticity - consistent t statistics are reported
2) LAMDA is calculated based on information obtained from the Probit estimations presented in table 5-4.
3) F statistics is computed as (ESS/K) / (RSS/N-K-1), where ESS is the explained sum of squares, RSS is the residual sum of squares, and K is the number of degree of freedom. The statistic has the F distribution with (K, N-K-1) degrees of freedom. The null hypothesis is that all the estimated coefficients of explanatory variables are jointly equal zero. If an F statistic exceeds the critical value, the underlying value of R-squared is so high that we reject the suggestion that it could arise by chance.
3) Other details are as in table 5-4

In general, it is observed that all estimated coefficients carry signs consistent with those signs postulated by the locational hypotheses discussed earlier. Apart from the estimated coefficient for the GSP variable (the 1985 sample), all locational coefficients are statistically significant at the 10% level. Similar to the Probit results, the results obtained from the sample for 1985 (before the Yen appreciation), 1990, and 1995 are not greatly different. The results imply that, regardless of time period being examined, the specified locational factors are the long-term determinants of the systematic variation of Japanese FDI across Thai manufacturing industries. Yet caution must be used since the sample data employed may be selective. This is because the current sample data used cover only companies that were in operation in 1995 (see chapter II). Potentially, some companies established prior to that year, but that have gone out of business, were not included.

The coefficients for the JAPLAB variable are all positive and statistically significant at the 5% level, thus confirming the labour intensity hypothesis discussed in section 5.2. The results imply that the intensity of labour in Japan is positively correlated with the amount of share capital held by Japanese companies across manufacturing industries in Thailand. In other words, the greater the intensity of labour in industry j in Japan, the larger the size of investment would tend to be in the corresponding industry in Thailand. On comparing the Probit and OLS estimates, it is observed that there is an inconsistency between the two sets of results. While the OLS results suggest the strong positive relationship between the JAPLAB and FDICAP variables, the Probit results indicate no influence of the JAPLAB on FDIBIN variables.

As earlier discussed, there are many possible reasons explaining the insignificant coefficients for the JAPLAB variable, and one of them is the imprecise measure. Yet, since the JAPLAB coefficients (obtained from the OLS estimations) are highly significant, the imprecise measure used for the JAPLAB variable may not be the main explanation. Rather, this weak association may be due to unobserved industry-specific factors like an import-substitution strategy adopted by the Thai government. Arguably, since FDIBIN is a dichotomous variable measured in term of 0 / 1 variable, the incidence of large-scale investment projects undertaken in relatively capital-intensive industries might explain the weak association between JAPLAB and FDIBIN. However, because FDICAP is a continuous variable measured in terms of the amount of share capital invested, the relatively small value of FDI[35] undertaken in those industries may not greatly weaken the association between JAPLAB and FDICAP.

From table 5-5, the coefficients for the MARK variable carry the expected sign and are statistically significant at the 10% level across the sample periods. In particular, the estimated coefficients for the 1990 and 1995 samples lend strong support to the market size hypothesis. They imply that Thai manufacturing industries with the largest size of Japanese market receive larger amounts of Japanese FDI. In other words, Japanese FDI undertaken across Thai manufacturing industries increases with the increasing size of the

[35] As mentioned before, the values of each investment project undertaken in the ISIC 3512, 3521, and 3530 were relatively large, but the aggregate values of FDI undertaken in these industries were not relatively large.

Japanese market. In particular, those firms being subject to scale economies would be assured that their large volumes of outputs are sufficiently absorbed by the large Japanese market when undertaking large-scale investment in Thailand.

One important point to note with respect to the significant association between MARK and FDICAP is that both variables are measured in absolute terms (not scaled by any variable). The strong correlation between them may be partially due to an indirect industry size effect[36]. However, on comparing the results obtained from the OLS and Probit estimations, the coefficients for the MARK variable are found to be similar in terms of their estimated signs and levels of significance. Both suggest that the size of Japanese markets is one of the most important factors that determine the incidence as well as the extent of Japanese FDI undertaken across manufacturing industries in Thailand.

From the samples for 1990 and 1995, there are extremely large values of MARK in special industrial machinery (ISIC 3824), office and household equipment (ISIC 3825), electrical industrial machinery (3831), and radio, television, and communication equipment industries (ISIC 3832). On excluding these industries from the samples used for estimation, it is found that all estimated coefficients (1990 and 1995) become highly significant (see appendix 5-5-1). Possibly, when the extreme observations are included, the OLS estimator takes account of these extreme observations, thus resulting in a

[36] However, MARK and FDIBIN - the qualitative measure of FDI - are also highly correlated (see previous discussions).

poorly fitted regression line. The standard deviation of error terms becomes large, and thus resulting in large standard errors of each estimated coefficient[37].

There is evidence supporting the transportation costs hypothesis. The significant coefficients for the TRANS variables suggest that the size of Japanese investment undertaken across Thai manufacturing industries increases with decreasing costs of transporting the final products to Japan. These results conform to the argument for vertically integrated type of investment discussed earlier. To investigate further the joint effect of MARK and TRANS on FDICAP, the interaction term (MARK*TRANS) is included in the estimated models. As with the Probit estimations, it is found that the coefficients are statically insignificant indicating a weak interactive influence of these variables on FDICAP. In other words, the results imply that it is possible for a Thai industry j with an increasing size of Japanese market to receive greater Japanese FDI, even though the costs of transportation are rising. This is because the expanding size of the Japanese market may compensate for the rising costs of transportation.

Overall, the significant coefficients for the JAPLAB, MARK, and TRANS variables lend strong support to the theoretical model of vertically integrated MNEs discussed in chapter III (e.g. Zhang and Markusen, 1999). The main implication drawn from these results is that the majority of Japanese FDI in Thailand tends to be of the vertically integrated type, mainly exploiting cheap

[37] See Dougherty (1992, p. 151).

(unskilled) labour resources and subsequently exporting back processed products to serve the final and intermediate market of Japan. Lower costs of transportation greatly facilitate the vertically integrated activities between those parent firms in Japan and their affiliate firms located in Thailand.

The coefficients for the GOV variable on FDICAP are found to be positive and highly significant across the estimated samples. These indicate that larger amounts of FDI stocks are undertaken in industries eligible for receiving fiscal incentives. As earlier discussed, the investment incentives in terms of tax and tariff concessions (as well as subsidies) tend to reduce production costs for foreign investors, thus encouraging more FDI to be undertaken in those industries. In addition, a requirement of the Thai government (the BOI) in terms of a minimum level of investment (in promoted industries) may also explain why those industries receive larger amounts of FDI[38].

Apart from those mentioned above, the significant coefficients for the GOV variable may imply that the Thai government (the BOI) has been quite successful in targeting (promoting) the right types of manufacturing activities for direct investment over past decades. Referring to the discussion in chapter IV, a firm's decision on FDI may be separated into three broad stages. Firstly, it decides whether or not to establish a production facility overseas, then it selects a site for its investment, and finally it decides how large is the investment to be undertaken. Arguably, the fiscal incentives provided by the

[38] In order to be eligible for receiving government incentives, foreign firms in Thailand are required to undertake a minimum amount of share capital. The requirements have been changed from time to time. At present, the minimum amount of capital investment is 1 million Baht (A Guide to Board of Investment, Thailand).

Thai government would influence the second or the third stage of Japanese decisions on FDI, not the first stage. This is because the investment decision made at the primary stage tends to be more influenced by internal factors such as the Yen's appreciation and / or the rising cost of labour in Japan. Hence, when Japanese firms decided to undertake FDI overseas, they must have decided beforehand on the specific activities to be carried out in host countries. Coincidentally, with the fiscal incentives granted by the Thai government, those manufacturing firms were further encouraged to set up their production bases in Thailand[39].

As with the previous Probit results, table 5-6 shows that the estimated coefficients for the $USGSP_2$ variable (the intensity of GSP exports) are not statistically significant across the estimated samples. Therefore, only the coefficients for the $USGSP_1$ variable (the incidence of GSP exports) are reported. It is apparent that the GSP coefficients have the correct signs but are not statistically significant across the sample periods. The estimated coefficients for the 1990 and 1995 samples are statistically significant at the 5% level, but not that for 1985 samples. The significant coefficients imply that those Thai manufacturing industries with the potential for producing and exporting GSP eligible products receive larger amounts of Japanese share capital undertaken. As discussed earlier, the aim of vertically integrated MNEs in developing countries is not only to exploit the labour abundance but

[39] One may argue that Thai government might have selected those labour intensive activities for investment promotion, and thus the GOV and JAPLAB variables may be correlated. However, as can be seen from appendix 5-22, the correlation coefficients of GOV and JAPLAB are relatively low. When estimating the models with GOV and JAPLAB separately, the findings obtained are still consistent with those presented in table 5-6.

also to take advantages of trade privileges granted by large industrialised nations. Due to the fact that local firms in developing countries tend to lack financial and non-financial resources (i.e. technological capabilities and skills) for producing GSP listed products, it is the multinational firms that come to produce and export those products.

On comparing the Probit and the OLS results, an inconsistency is found with respect to the estimated GSP coefficients for the 1985 sample. The Probit result indicates a significant effect of $USGSP_1$ on the incidence of FDI (FDIBIN) while the OLS result indicates no effect of the former on the extent of FDI (FDICAP). Hence, it may be inferred that Thai industries with the potential for producing and exporting GSP products are more likely to receive FDI; however, the amounts of FDI in those industries are not statistically different from those of other industries. As shown in chapter II, Japanese investment has increased substantially after the mid 1980s, and it is possible that the relationship between the $USGSP_1$ and FDICAP variables has become more apparent when the subsequent samples of 1990 and 1995 are used. Obviously, this is supported by the significant GSP coefficients for the 1990 and 1995 samples.

From table 5-6, the coefficients for the LAMDA variable (the correction terms) are highly significant indicating the presence of selectivity bias in the estimated OLS models. The F-statistics clearly reject the null hypothesis that all the estimated coefficients are jointly equal to zero. It is observed that the adjusted R-squared statistic obtained from the estimated sample for 1985

(0.19) is lower than that obtained from the estimated sample for 1995 (0.43). These clearly indicate that the variations in explanatory variables specified in the estimated model explain the variation in Japanese investment stocks recorded at 1995 better than that recorded at 1985. As mentioned earlier, there have been greater amounts of FDI undertaken after the mid 1980s. The higher adjusted R-squared statistics (obtained from the sample for 1995) may suggest that the type of investment activities carried out by Japanese firms after the mid 1980s has become more vertically integrated, and thus better explained by the locational factors specified in the empirical model[40].

FDINUM as the Dependent Variable

As indicated in section 5.3, due to some weaknesses associated with the main measure of authorised share capital (FDICAP), an alternative measure to FDICAP is considered. This measure is a count measure of the number of Japanese companies (FDINUM). The results obtained from the models with FDINUM as the dependent variable are presented in table 5-7 below. It is apparent that, except for the results estimated from the sample for 1985, the results are not greatly different from those results shown in table 5-6. In other words, the effects of the specified locational variables on both the size and the frequency of Japanese FDI across Thai manufacturing industries are quite similar.

[40] As mentioned by Anuroj (1995), the export-promotion policy pursued by the Thai government had become fully effective around the mid 1980s.

Table 5-7: Effects of Locational Factors on the Extent of FDI
OLS Models with Selectivity Bias Adjustments
Dependent Variable: FDINUM

Independent Variable	Expected Sign	Estimated coefficients and asymptotic *t*-statistics		
		1985	1990	1995
CONSTANT	(?)	-5.21 (-0.912)	-27.74*** (-3.282)	-59.27*** (-2.946)
JAPLAB	(+)	7.23* (1.839)	24.74*** (3.186)	47.64*** (3.805)
MARK	(+)	9.42 (1.312)	18.64*** (4.100)	32.38*** (3.798)
TRANS	(-)	-2.15 (-1.233)	-11.22* (-1.896)	-9.31 (-1.229)
GOV	(+)	2.33** (2.064)	11.40*** (3.483)	23.26*** (3.093)
$USGSP_1$	(+)	2.94 (1.369)	13.72*** (3.523)	17.76** (2.531)
LAMDA	(+)	2.25 (0.608)	18.46*** (2.121)	33.41* (1.890)
Adjusted R-squared		0.24	0.50	0.56
F statistics		3.33**	11.23***	10.07***
Sample size		45	62	63

Note: Details are as in table 5-6

The significant coefficients for the JAPLAB variable (the 1990 and 1995 samples) imply that the Thai manufacturing industries with the highest intensities of Japanese labour receive the greatest number of Japanese companies. Also, the positive coefficients for the MARK variable (1990 and 1995) imply that the numbers of Japanese companies operating across Thai manufacturing industries are partially determined by the size of intermediate and final demands of Japan.

The estimated TRANS coefficient for 1995 sample is, however, statistically insignificant. This is inconsistent with the estimated coefficient obtained from the model with FDICAP as the dependent variable (table 5-4). However, as shown in appendix 5-5-2, the coefficient becomes highly significant after excluding the extreme values of the MARK variable (ISIC 3824, 3825, 3831, and 3832). Specifically, it is observed that the coefficient becomes significant when the ISIC 3831 industry (electrical industrial machinery) is removed from the sample used for estimation. Looking further at the sample of FDICAP and FDINUM within the ISIC 3831 industry, it is noticed that there is an inconsistency between the levels of foreign direct investment undertaken (FDICAP vs. FDINUM). To clarify, a number of new Japanese companies (FDINUM) operating in this industry (during 1991-95) were relatively small, as were the costs of transportation. However, the corresponding value of share capital invested by these companies (FDICAP) was relatively large, more than 10 million US$ per firm[41]. Therefore, it may be a case that the inconsistency

[41] Possibly, the nature of production activities in this industry is characterised as a large-scale production. Only a few large Japanese firms with sufficient amounts of capital are able to undertake FDI there.

between the levels of FDICAP and FDINUM explain why FDICAP is more negatively correlated with TRANS than FDINUM.

It is apparent that signs and significance levels of both the GOV and $USGSP_1$ coefficients presented in table 5-6 and table 5-7 (1990 and 1995) are similar. These results imply that those manufacturing industries with the fiscal incentives granted and / or the potential for producing and exporting the USGSP eligible products receive larger amounts / numbers of Japanese FDI.

Alternative models for count data

Due to the small values and discrete nature of the count data, it is advisable to use an alternative model that takes into account these characteristics, and which could improve on the OLS estimates (Madala, 1983; Greene, 1993). As suggested by Greene (1993), a simple model applicable to the count data is a Poisson regression model. This model is described in appendix 5-6-1 and the estimated results are presented in appendix 5-6-2[42]. From appendix 5-6-2, it is apparent that all the estimated coefficients are statistically significant at the 5% level, excepts for the estimated TRANS coefficients for the 1995 sample[43]. In contrast to table 5-6, appendix 5-6-2 shows that all the estimated coefficients for 1985 sample are now statistically significant at the 5% level. These indicate that the locational explanatory variables discussed in section 5.2 influence the inter-industry variation in the number of Japanese investments at that period. Possibly, the inconsistency between the OLS and

[42] There are also weaknesses associated with this model and these are discussed in appendix 5-6-1.
[43] Similar to the previous results, the coefficient becomes statistically significant when excluding the ISIC 3831 industry from the sample used for estimation.

the Poisson estimates may be due to the fact that the number of Japanese investment undertaken before the mid 1980s was relatively small as compared to that after. Thus, the OLS estimator is not quite applicable to the small count number of Japanese investment undertaken during that period.

C. Pooled Probit and OLS Model with Selectivity Bias Adjustment

Given the cross-sectional data of eighty-five manufacturing industries over three consecutive periods (1985, 1990, and 1995), a set of pooled data can be formed. As noted by Hsiao (1986, p1.), the pooled data possess advantages over cross-sectional data; for instance, it gives the researcher a large number of data points, thus reducing the collinearity among the explanatory variables, as well as gains in the degrees of freedom, which lead to more efficient estimates. The aim of this section is to compare the results obtained from the cross-sectional model with those obtained from the pooled model. The estimated results of the pooled Probit and OLS model are presented in table 5-8. Column I shows the estimate coefficients obtained from the pooled Probit model while column II and III show the results obtained from the pooled OLS model with FDICAP and FDINUM as the dependent variable. Time dummies (periods of 1985 and 1995) and sectoral dummies (the 2-digit ISIC level) are incorporated to allow for the time and sectoral heterogeneity[44].

[44] The likelihood Ratio test statistic indicates that the unrestricted Probit model (model with time and sectoral dummies) is preferred to the restricted Probit model (model without time and sectoral dummies). Also, by performing the F test for a linear restriction, the statistics indicate that the unrestricted OLS model (model with time and sectoral dummies) is preferred to the restricted OLS model (model without time and sectoral dummies). See tables 5-4 and 5-6 for detailed explanations of these test statistics.

Table 5-8: Effects of Locational Factors on the Incidence and the Extent of FDI (Pooled Probit and OLS Models with Selectivity Bias Adjustments)

Independent Variable	Expected sign	Estimated coefficients and *t*-statistics		
		Probit	OLS (FDICAP)	OLS (FDINUM)
CONSTANT	(?)	-2.20*** (-2.704)	-448119*** (-3.444)	-40.97*** (-4.248)
JAPLAB	(+)	2.43** (2.075)	330533*** (2.846)	41.18*** (4.413)
MARK	(+)	1.95*** (3.193)	261410*** (4.099)	23.81*** (5.872)
TRANS	(-)	-0.82*** (-2.668)	-102268*** (-2.233)	-5.45 (-1.464)
GOV	(+)	0.82*** (3.752)	104026*** (3.325)	10.09*** (4.272)
$USGSP_1$	(+)	1.16*** (4.782)	113511*** (2.837)	11.89*** (3.893)
LAMDA	(+)	-	171388** (2.422)	13.44** (2.454)
Log-likelihood		-108.0	-	-
Likelihood Ratio test$_1$		109.8***	-	-
Adjusted R-squared		-	0.35	0.51
F Statistics		-	6.72***	12.09***
Sample size		255	170	170

Note: 1) Adjusted White's Heteroscedasticity – Consistent 't' values are reported for OLS estimates
2) Details are as in table 5-4 and 5-6

In general, it is observed that all locational coefficients are statistically significant at the 5% level; the exception being the TRANS coefficients estimated from the model with FDINUM as the dependent variable. When comparing the pooled results with the cross-sectional results (tables 5-4, 5-6, and 5-7), it is observed that they are similar in terms of signs and levels of significance obtained.

In contrast to the cross-sectional results presented in table 5-4, table 5-8 shows that the coefficient for the JAPLAB variable becomes statistically significant at the 5% level when being estimated by the 'pooled Probit model' with sectoral dummies[45]. Referring back the earlier discussions, the insignificant coefficients for the JAPLAB variable may be partially explained by an import-substitution strategy pursued by the Thai government. Several incentives provided by the government during 1950s-1970s might have encouraged large-scale investment projects to be undertaken in relatively capital-intensive industries, particularly those industries classified under the ISIC 35 sector (ISIC 3512, ISIC 3521, and ISIC 3530)[46]. Apparently, as was observed in the pooled Probit estimations, the coefficient for the ISIC 35 sector is found to be positive and statistically significant at the 5% level (see appendix 5-7), thus lending support to the argument made earlier. This significant coefficient suggests that Thai manufacturing industries classified under the ISIC 35 sector

[45] The results obtained from the random-effect Probit model are also similar (see appendix 5-8).

[46] The forms of Japanese investment undertaken in those industries may become more vertically integrated at present due to the recent change in industrial and investment policies of the Thai government. However, it is difficult to evaluate their current activities due to a lack of detailed information.

tend to have higher probabilities of receiving investment undertaken than others.

Similar to the cross-sectional results (table 5-4), the coefficients for the MARK, TRANS, USGSP, and GOV variables are found to be statistically significant at the 1% level. These confirm the significant roles of such locational variables in determining the probability of a Thai manufacturing industry receiving Japanese FDI. From the pooled Probit estimations, it is found that the time dummy coefficients for 1985 and 1995 are statistically insignificant (see appendix 5-7). These insignificant coefficients suggest that the probabilities of Japanese FDI being undertaken across Thai manufacturing industries in each period are not statistically different.

Columns II and III in table 5-8 show the estimated results obtained from the pooled OLS models with FDICAP and FDINUM as the dependent variable. It is found that, whether being estimated by the models with FDICAP or with FDINUM, all locational coefficients (except one) are statistically significant at the 5% level. These significant coefficients lend further support to the cross-sectional results presented in tables 5-6 and 5-7. As with the case of the cross-sectional estimations, it is observed that the coefficient for the TRANS variable (the model with FDINUM as the dependent variable) becomes statistically significant at the 10% level when the electrical machinery industry (ISIC 3831) is excluded from the sample for estimation. Unlike the pooled model with FDICAP, the time dummy coefficient for 1985 included in the pooled model with FDINUM is found to carry the negative sign and be

statistically significant at the 10% level (see appendix 5-7). This implies that fewer numbers of investment projects were initiated at that period. This finding is consistent with the estimated results shown in table 5-7 where the cross-sectional estimates obtained of 1985 sample are statistically insignificant, probably due to the relatively small numbers of investment undertaken between the period of 1954-1985.

With respect to the sectoral dummies (the models with FDICAP and FDINUM as the dependent variable), it is found that the coefficients for not only the ISIC 35 sector (chemical) but also the ISIC 38 sector (fabricated metal, machinery, and electrical equipment) are statistically significant at the 5% level. Referring back to the previous descriptive analysis (chapter II), the greatest amount of Japanese FDI were concentrated in the fabricated metal, machinery, and electrical equipment sector (ISIC 38) and to a lesser extent in the chemical sector (ISIC 35). It is possible that there were unobserved sectoral-specific factors that determined the extent of FDI. One possible factor may be agglomeration benefits gained from the concentration of firms in those industries, in terms of available well-trained labours and / or large demands / supplies of Japanese intermediate products (Krugman, 1991) (see discussions in chapter III). Particularly, with respect to the second benefit, there has been empirical evidence suggesting that supplying firms from Japan tend to establish their production plants in host locations where many Japanese manufacturing producers are located. The aim of these supplying firms is to serve large intermediate demands of those existing Japanese producers (Smith and Florida, 1993). Hence, the reason why the ISIC 38 and ISIC 35 received

greater amount of FDI undertaken may be partially attributable to this agglomeration factor (Ratanavichien, 1999)[47]. The input-output linkages among Japanese firms will be discussed and examined in detail in the next chapter.

Marginal effects

Although it has been found that all locational variables specified in the model are relevant in explaining the extent of FDI, the marginal effect of each locational factor has not been discussed. Due to the fact that each explanatory variable is differently scaled[48], it is not appropriate to interpret the magnitudes of each locational coefficient directly from the estimated results. Therefore, table 5-9 shows the marginal effects of each coefficient being expressed in term of a percentage change. The procedure used to calculate these marginal effects is described under table 5-9.

From table 5-9, it is apparent that the intensity of labour has the strongest effect on the extent of Japanese investment, whether measured in terms of share capital or number of companies. An increase in the intensity of labour in Japan by 1% leads to an increase in the stock of share capital (FDICAP) and / or the number of Japanese companies (FDINUM) across manufacturing in Thailand by almost 2%. This supports the common view that the main

[47] From the survey carried out Ratanavichien (1999), it was found that Japanese manufacturing firms chose to undertake FDI in Thailand partly to supply their key intermediate inputs to other pre-existing Japanese firms there.

[48] Especially, in the Probit estimation, the iteration process is sensitive to the scaling of different explanatory variables. Therefore, all variables have to be scaled in such a way that their minimum and maximum values are in similar rage (between 0 and 1).

motives for FDI in developing countries is to exploit the abundance of cheap unskilled labour.

Table 5-9: Marginal Effects of Locational Factors on the Extent of FDI (% Change)

Dependent Variable	Independent variable	
	FDICAP	FDINUM
JAPLAB	1.86	1.66
MARK	1.54	1.00
TRANS	-0.89	-0.34
GOV	1.41	0.98
USGSP₁	1.40	1.05

Note: The elasticity (%) is computed as:

$$\frac{\partial y_j / \bar{y}_j}{\partial x_k / \bar{x}_k} = \frac{\partial y_j}{\partial x_k} \times \frac{\bar{x}_k}{\bar{y}_j} = \beta_k \times \frac{\bar{x}_k}{\bar{y}_j}$$

where y_j = Dependent variable j (FDICAP or FDINUM)

x_k = Explanatory variable k (JAPLAB, MARK, TRANS, GOV, USGSP)

$\bar{y}_j$, $\bar{x}_k$ = An average mean of dependent variable j and an explanatory variable k (the sub-sample with FDI)

β_k = An estimated coefficient of explanatory variable k obtained from the pooled OLS models shown in table 5-8

With regard to the effect of MARK, it is observed that the partial effect of Japanese market size on FDICAP (the size of investment) is stronger than that on FDINUM (the frequency of investment). Possibly, this may be explained by the fact that the large size of Japanese market encourages manufacturing firms to undertake large-scale investment. Especially, those firms being subject to scale economies would be assured that large volumes of their products are sufficiently absorbed by the large final and intermediate demands of Japan.

Besides labour intensity and market size, it is found that the effects of USGSP privilege are also significant, implying the important role of these trade privileges (granted by US government) in promoting and diversifying manufacturing activities of Japanese firms in Thailand[49]. In other words, FDI undertaken in Thailand is not only aimed at exploiting the cheap unskilled labour but also at exporting those labour intensive products to an industrialised market like the USA.

As observed from table 5-9, a decrease in the costs of transporting the final products back to Japan by 1% leads to an increase in the stocks of Japanese FDI undertaken across Thai manufacturing industries by less than 1%. This effect of transportation cost is very marginal as compared to other locational effects. Possibly, this may be explained by the fact that there are many types of transportation costs being considered by Japanese firms: costs of importing intermediate products from Japan to Thailand, costs of exporting back processed product from Thailand to Japan, or costs of exporting products to the third countries. Due to the limited information available, this study only examines one of them: the costs of transporting back the final products from Thailand to Japan.

5.5 Conclusions

The aim of this chapter was to identify and investigate the locational determinants of Japanese direct investment undertaken across manufacturing

[49] Given that there is the potential for producing and exporting these products.

industries in Thailand. Five locational hypotheses were formulated theoretically: labour intensity of production, market size, transportation costs, government incentives, and external trade preferences. These were empirically tested using the information on Japanese FDI stocks recorded at 1985, 1990, and 1995. The empirical analysis was separated into two parts. The first investigated the influences of locational factors on the incidence of FDI, while the second investigated their effects on the extent of FDI. The Heckman two-stage procedure was used for these different stages of estimations. In the first stage, a Probit model was used to estimate the probability of a Thai industry having some Japanese FDI. FDI was measured as a dichotomous variable, being assigned a value of 1 if a Thai industry had received some FDI and 0 otherwise. In the second stage, the OLS model with selectivity bias adjustments was used to estimate the effects of locational factors on the extent of FDI. In this stage, the extent of FDI was alternatively measured in terms of share capital and count measure of the number of Japanese-owned firms. The reason why the alternative count measure was used is that there are some weaknesses associated with the value of share capital discussed in chapter II. Finally, the cross-sectional model was estimated using the samples for 1985 (pre-Japanese Yen appreciation), 1990, and 1995. These cross-sectional results were subsequently compared with the results estimated from a pooled model.

With a few exceptional cases, the empirical results were consistent in terms of the estimated signs and levels of significance. These indicate that all the specified locational variables were relevant in explaining both the incidence

and the extent of Japanese FDI across Thai manufacturing activities. Although proxying problems in the measures used for both the dependent and independent variables are unavoidable (due to the limited data available), three main conclusions can be drawn from the empirical findings.

Firstly, the endowment factors in terms of labour intensity of production played the most important roles in determining the extent of Japanese FDI across Thai manufacturing industries. As indicated by the OLS results, the majority of Japanese FDI in Thailand tended to be of vertically integrated type, using cheap (unskilled) labour resources for labour-intensive activities and exporting back processed products to serve the final and intermediate demands of Japan. Lower costs of transportation also facilitated trading activities among parent firms in Japan and their affiliate firms operating in Thailand.

Secondly, apart from the endowment factors, the policy factor in terms of the trade preference granted by the US government to Thai manufacturing exports was found to be the significant factor. It influenced both the allocation as well as the level of Japanese FDI across Thai manufacturing industries. Indirectly, this significant finding indicate that the preferential trade policy pursued by the governments of DMEs toward manufacturing exports originated from DCs could in fact promote and diversify FDI activities in the latter. However, this is also conditional upon the potential for producing and exporting such privileged products. Apart from the GSP, the policy factor in terms of fiscal incentives (tax and tariff exemptions) granted by the Thai government also

played the active role in shaping the manufacturing pattern of FDI. As indicated by the Probit and OLS results, the Thai government has been quite successful in targeting (selecting) the right manufacturing activities for foreign investment. Due to the fact that Japanese firms were likely to decide beforehand what type of manufacturing activities to be carried out overseas, several Thai fiscal incentives for investment on those activities further encouraged Japanese firms to set up production bases there.

Lastly, it may be possible that all these empirical findings are generalised to the case of FDI in other Asian industrialising countries, especially ASEAN countries. As argued in chapter 1, the form (nature) of FDI in these countries has recently changed, as have the determinants of such FDI. The recent FDI tend to be of vertically integrated type, mainly influenced by the abundance of local resource / factor endowments. Empirically, this chapter sheds more lights on the roles of locational endowments, trade costs, and policy factors, in determining the manufacturing distribution / pattern of recent Japanese FDI in one of these countries.

Appendix 5-1-1

The Bilateral Input-Output Table between Thailand and Japan

The Thai-Japanese I-O table is a commodity by commodity table covering all the economic transactions undertaken in and between Thailand and Japan. It is designed to depict the industrial network extended over the two economies. The table is complied out of two national tables of Thailand and Japan. The uniform sector classification is constructed with 8, 60, and 118 sectors, each of which convertible to the corresponding I-O sectors in the Thai and Japanese national tables. For an illustration, the simplified format of the I-O table is shown below.

From the first column, A^{JJ} shows the flow of goods and services produced and used by Japanese industries classified into 60 sectors. The values of goods and services are evaluated at producers' price. A^{TJ} gives the flow of goods produced by Thai industries but used by Japanese industries (i.e. Japan's import matrix of intermediate goods from Thailand evaluated at producers' price). B^{J} shows international freights and insurance imposed upon imported goods from Thailand. A^{WJ} is Japan's import matrix of intermediate inputs from the rest of the world (evaluated at c.i.f). In addition to the ordinary transaction, A^{WJ} embraces the values of service import and direct purchase from all countries (including Thailand). D^{J} is a vector of custom duties and commodity taxes levied on imported goods to Japan. E^{T} represents the total

intermediate input of Japan and V^J is value added of Japanese domestic industries. Finally, X^J is the total inputs of Japan.

In the second column of the table, the input composition of Thai industries is shown. A^{JT} is Thailand's (intermediate) import matrix from Japan. A^{TT} is the matrix of intermediate transactions among Thai domestic industries. B^T depicts international freight and insurance imposed upon imported goods from Japan. For the remaining in the second column (A^{WT}, D^T, V^T, E^T, and X^T), they are described in the same way as in the first column but the country in which transactions take place is changed from Japan to Thailand.

The third column shows the total intermediate output of Japan and Thailand, and the fourth and fifth columns show the flow of goods and services absorbed for meeting final demands in Japan and Thailand respectively. F^{JJ} is Japanese final demand for own goods and services and F^{TJ} is that for imported goods from Thailand (Japan's final-demand import matrix from Thailand). On the other hand, F^{TT} is Thailand's final demand for Thai goods and services and F^{JT} is that for imported goods from Japan. B^J and B^T are the international freight and insurance imposed on imported goods from Thailand and Japan respectively. F^{WJ} and F^{WT} are the Japan and Thailand's final demands for imported goods from the rest of the world, and D^J and D^T are the value of custom duties and commodity taxes levied on imported goods for final demands to Japan and Thailand.

FX shown in the sixth column is the total final demand and GJ and GT in the column 7 and 8 are the total demands of Japan and Thailand respectively. L^J is the export matrix of Japan and L^T is that of Thailand, both presented in relation to fourteen countries: China, Hong Kong, Indonesia, Korea, Malaysia, Taiwan, the Philippines, Singapore, the USA, the UK, France, West Germany, East Germany, and the rest of the world. X^J and X^T shown in the column 12 are the total outputs of Japan and Thailand, and Q^J and Q^T shown in the column 11 are the statistical discrepancies, possibly due to inconsistent values of trade statistics and misclassification of industrial sectors between the two countries.

The valuation of each national table is converted from local currencies to US Dollars. There is a concordance between the uniform industry classification of the I-O table and the International Standard of Industry Classification, either at the 3 or 4 digit level.

Example of the Format of the Bilateral Input-Output Table of Thailand- Japan in 1990, published by Institute of Developing Economies, Japan, 1996

To From	AJ 01→AJ 60	AT 01→AT 60	ET	FJ 01→FJ 04	FT 01→FT 04	FX	GJ	GT	LC →LW	QX	XX
AJ 01 ↓ AJ 60	A^{JJ}	A^{JT}		F^{JJ}	F^{JT}				L^{J}	Q^{J}	X^{J}
AT 01 ↓ AT 60	A^{TJ}	A^{TT}		F^{TJ}	F^{TT}				L^{T}	Q^{T}	X^{T}
BF	B^{J}	B^{J}		B^{J}	B^{T}						
CW 01 ↓ CW 60	A^{WJ}	A^{WT}		F^{WJ}	F^{WT}						
DT	D^{J}	D^{T}		D^{J}	D^{T}						
ET	E^{J}	E^{T}									
VV 01 ↓ VV 04	V^{J}	V^{T}									
XX	X^{J}	X^{T}									

Note : Blanks in the table are sub-totals

Appendix 5-1-2

The Converter between the Industrial Classifications of The Thailand's Input-Output Table and the Bilateral Japanese-Thai Input-Output Table

Bilateral Japanese-Thai I-O Table		Thailand I-O table
Code	Description	
027	Slaughtering, canning, and preservation of meat	3111 (a and b)
028	Dairy products	3112
029	Canning and preservation of fruits and vegetable	3113
030	Canning and preservation of seafood	3114
031	Animal and vegetable oil	3115 (a and b)
032	Rice milling	3116 (a)
033	Cassava and tapioca milling	3116 (c)
034	Flours and other grain milling	3116 (b and d)
035	Sugar, Confectionery, and Bakery products	3117 (a), 3118, 3119
036	Coffee and tea processing	3121 (b)
037	Other food products	3117 (b), 3121 (a and c)
038	Animal feeds	3122
039	Liquor	3131, 3132, 3133
040	Soft drinks and carbonated water	3134
041	Tobacco processing	3140 (a and b)
042	Spinning	3211
043	Weaving	3211
044	Textile bleaching and finishing	3211
045	Made-up textile goods	3212 and 3219
046	Knitting and wearing apparel	3213 and 3220
047	Other textile goods	3214 and 3215
048	Tanneries and leather finishing	3231
049	Leather products	3233
050	Footwear	3240
051	Sawn mill and plywood	3311
052	Wood and cork products	3312 and 3319
053	Wooden furniture and fixtures	3320
054	Pulp, paper, and paper products	3411
055	Paper products	3412 and 3419
056	Printing and publishing	3420
057	Basic industrial chemicals	3511
058	Fertiliser and pesticide	3512

059	Synthetic products	3513
060	Paints, vanishes, and lacquers	3521
061	Drugs and medicines	3522
062	Soap and cleaning preparation	3523 (a)
063	Perfumes and cosmetics	3523 (b)
064	Other chemical products	3529
065	Petroleum products	3530 and 3540
066	Tires and tubes	3551
067	Other rubber products	3559
068	Plastic wares	3560
069	Ceramic and earthen wares	3610
070	Glass and glass products	3620
071	Structural clay products	3691
072	Cement	3692
073	Other non-metallic products	3693
074	Primary iron and steel	3710
075	Secondary steel products	3710
076	Non-ferrous metal	3720
077	Cutlery and hand tools	3811
078	Metal furniture and fixtures	3812
079	Structural metal products	3813
080	Other fabricated products	3819
081	Engines and turbines	3821
082	Agricultural machinery and equipment	3822
083	Wood and metal working machinery	3823
084	Other industrial machinery	3824 and 3829
085	Electrical appliances for household and industry	3825 and 3829, 3831, 3833
086	Radio, TV, audio, and telecommunication equipment	3832
087	Cable wire and other electric appliances	3839 (a, b, and c)
088	Ship building and repairing	3841
089	Railway equipment	3842
090	Motor vehicles	3843
091	Motorcycle and other transport equipment	3844
092	Aircraft	3845
093	Scientific equipment	3851
094	Photographic and optical goods	3852
095	Watches and clocks	3853
096	Other manufacturing products	3901, 3902, 3903, and 3909

Appendix 5-2-1

Mean Values and Standard Deviations of the Independent Variables

(A). Period of 1985

Variables	Means	Standard Deviation	Minimum	Maximum
FDICAP	11939	32728	0	181015
FDINUM	1.87	2.91	0	17
JAPLAB	0.35	0.11	0.12	0.65
MARK	14980685	16681789	24380	103522110
TRANS	0.07	0.05	0.00	0.24
GOV	0.65	0.47	0	1
$USGSP_1$	0.71	0.45	0	1
$USGSP_2$	0.43	0.42	0	1

(B). Period of 1990

Variables	Means	Standard Deviation	Minimum	Maximum
FDICAP	41701	114786	0	955040
FDINUM	6.8	10.19	0	55
JAPLAB	0.34	0.11	0.13	0.66
MARK	38029925	43329385	235291	183954450
TRANS	0.06	0.04	0.00	0.24
GOV	0.65	0.47	0	1
$USGSP_1$	0.77	0.41	0	1
$USGSP_2$	0.41	0.37	0	1

(C). Period of 1990

Variables	Means	Standard Deviation	Minimum	Maximum
FDICAP	77296	195432	0	1408296
FDINUM	9.58	15.88	0	79
JAPLAB	0.35	0.12	0.10	0.66
MARK	38029925	43329385	235291	183954450
TRANS	0.06	0.05	0.00	0.32
GOV	0.72	0.44	0	1
$USGSP_1$	0.77	0.41	0	1
$USGSP_2$	0.44	0.38	0	1

Note: 1) FDICAP is expressed in 1000US$
2) The sample of MARK in 1990 are also used for 1995 sample due to unavailable data of Japanese I-O table in 1995

Appendix 5-2-2

Correlation Matrix for the Independent Variables

(A). Period of 1985

GSP	0.10			
GOV	-0.20	0.15		
TRANS	0.06	-0.09	-0.03	
MARK	-0.11	0.15	0.13	-0.10
	JAPLAB	*GSP*	*GOV*	*TRANS*

(B). Period of 1990

GSP	0.15			
GOV	-0.14	0.03		
TRANS	-0.03	-0.22	-0.12	
MARK	-0.16	0.15	0.06	-0.19
	JAPLAB	*GSP*	*GOV*	*TRANS*

C. Period of 1995

GSP	0.11			
GOV	0.09	0.37		
TRANS	-0.09	-0.29	-0.23	
MARK	-0.16	0.19	0.02	-0.15
	JAPLAB	*GSP*	*GOV*	*TRANS*

Appendix 5-3

Sample Selection Bias as a Specification Error

(Heckman, 1979)

Consider a two-equation model with a random sample of J observations. Equation for individual j are

$$Y_{1j} = X_{1j}\beta_1 + U_{1j} \quad (1)$$

$$Y_{2j} = X_{2j}\beta_2 + U_{2j} \quad (2)$$

where X_{kj} is a $1 \times K_k$ vector of exogenous regressors, β_k is a $K_k \times 1$ vector of parameters, and

$$E(U_{kj}) = 0, E(U_{kj}, U_{k*j*}) = \begin{cases} \sigma_{kk*}, & j = j* \\ 0, & j \neq j* \end{cases}$$

Assuming that the joint density of U_{1j} , U_{2j} is h (U_{1j} , U_{2j}). Suppose that one seeks to estimate equation 1 but the data on Y_1 are missing for certain observations. Thus, the population regression function for equation (1) may be written as

$$E(Y_{1j} | X_{1j}) = X_{1j}\beta_1 \quad (3)$$

while the regression function for the sub-sample of available data is

$$E\,(Y_{1j} \mid X_{1j}, \text{sample selection rule}) = X_{1j}\beta_1 + E(U_{1j} \mid \text{sample selection rule}) \quad (4)$$

If the conditional expectation of U_{1j} is zero, the regression function for the selected sub-sample is the same as the population regression function. Least squares estimators can be used to estimate β_1 on the selected sub-sample. However, suppose that data are available on Y_{1j} if $Y_{2j} \geq 0$. If $Y_{2j} \leq 0$, there is no observation on Y_{1j}. Hence,

$$\begin{aligned} E(U_{1j} \mid X_{1j}, \text{sample selection rule}) &= E(U_{1j} \mid X_{1j}, Y_{2j} \geq 0) \\ &= E(U_{1j} \mid X_{1j}, U_{2j} \geq X_{2j}\beta_2) \qquad (5) \end{aligned}$$

In the case of independence between U_{1j} and U_{2j}, the data on Y_{1j} are missing randomly, and thus the conditional mean of U_{1j} is zero. However, if U_{1j} and U_{2j} are not independent, the sub-sample regression function is

$$E\,(Y_{1j} \mid X_{1j}, Y_{2j} \geq 0) = X_{1j}\beta_1 + E(U_{1j} \mid U_{2j} \geq X_{2j}\beta_2) \qquad (6)$$

Therefore, if Y_{1j} are non-randomly selected, the final term of equation 6 has to be included in order to estimate the parameter β_1, otherwise the bias arising from the sample selection is encountered. As illustrated by Heckman (1979), the final term can be computed using the estimates obtained from the Probit model discussed earlier.

Appendix 5-4-1

Effects of Locational Factor on the Incidence of FDI (Probit Models - Thai Labour Intensity)

Independent Variable	Expected Sign	Estimated coefficients and *t*-statistics		
		1985	1990	1995
CONSTANT	(?)	-0.66 (-0.798)	-0.22 (-0.003)	-0.60 (-0.729)
THAILAB	(?)	-1.24 (-0.577)	-1.33 (-0.830)	-0.64 (-0.390)
MARK	(+)	4.51*** (2.603)	1.67** (1.914)	1.92** (1.970)
TRANS	(-)	-0.62* (-1.855)	-1.16*** (-2.442)	-0.86 (-1.471)
GOV	(+)	0.646** (1.957)	0.89*** (2.483)	1.15*** (2.689)
$USGSP_1$	(+)	0.85*** (2.377)	1.09*** (2.738)	0.95** (2.299)
Log-likelihood		-43.5	-33.8	-30.5
Likelihood Ratio test$_1$		30.4***	31.5***	36.0***
Likelihood Ratio test$_2$		1.8	0.34	0.46
Correct predictions (%)		0.75	0.81	0.84
Sample size		85	85	85

Note: Details are as in table 5-4

Appendix 5-4-2

Characteristics of the Sample Data Used for Thai Labour Intensity (THAILAB)

According to the National Board of Economic and Social Development, the industrial data were surveyed from a group of firms (both local and foreign firms), and to some extents differences in the production methods used by these firms could alter the ranking of factor intensities across manufacturing industries in Thailand. Illustratively, let's assume that there are three different choices of production methods (A, B, and C) that can be used to produce goods under sector 1 and sector 2, and the intensity of capital used for each method is ranged as follows: A > B > C. Furthermore, assuming that there are two types of firms, Japanese firms and local firms. Local firms consist of both Thai firms and foreign firms operating in Thailand and the production techniques used by local firms are the weighted-average of those used by Thai and foreign firms. Finally, let's assume that firms in sector 1 in Japan adopt the production technique A and those in sector 2 in Japan adopt the production technique B, so do local firms in sectors 1 and 2 in Thailand.

With the above assumptions, the positive relationship between JAPLAB and FDIBIN implies that the techniques A and B used by firms in sectors 1 and 2 in Japan are positively related to the incidence of Japanese FDI undertaken across those sectors in Thailand. In other words, Japanese firms adopting the production technique A (B) in Japan are less (more) likely to undertake FDI in

sector 1 (2) in Thailand. Because local firms in Thailand are assumed to adopt the same production techniques, it follows that the techniques A and B used by those firms in sectors 1 and 2 in Thailand should also be positively related to Japanese FDI undertaken across those sectors. Therefore, the relationship between Thai labour intensity and Japanese FDI undertaken across manufacturing sectors in Thailand should be positive[50].

On the other hand, assuming that foreign firms in sectors 1 and 2 in Thailand adopt the techniques A, while Thai firms in those sectors adopt the production techniques C. If the number of Thai firms in sector 1 (under the survey) is much greater than that of foreign firms, then the weighted-average of the production techniques (the level of capital-intensity) used in sector 1 by local firms in Thailand in general would be between B and C. In contrast, if the number of Thai firms in sector 2 is much lower than that of foreign firms[51], then the weighted-average of the level of capital-intensity in sector 2 would be between A and B.

Hence, sector 2 in Thailand becomes relatively capital-intensive sector, while sector 1 relatively labour-intensive. Since Japanese FDI tend to be undertaken in sector 2 rather than sector 1 (as discussed above), the relationship between Thai labour-intensity and Japanese FDI in Thailand across sectors 1 and 2

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[50] Though local firms in the sectors 1 and 2 adopt the production techniques B and C, the positive relationship still hold, since the ranks of factor intensity across sectors in both countries are the same: the lower capital-intensive technique is used in sector 2 in both countries.

[51] This is possible since the information on labour intensity is collected from the manufacturing survey, which may be composed on the sample of firms with different nationalities.

would be negative[52]. From above illustration, it is thus possible that the coefficients of THAILAB carry negative rather than positive signs[53].

[52] This illustration could be extended to include different factors of production, capital, skilled labour, and unskilled labour. If foreign and the local firms in Thailand employ different amounts of capital, skilled and unskilled labour, the weighted-average of the production techniques between the two sectors may be also different, depending on the number of the local and the foreign firms being included in the survey.

[53] One may argue that negative signs obtained from the estimation are due to the factor intensity reversal. With a rising cost of labour in Japan, firms in sector 1 in Japan may switch from the labour-intensive to capital-intensive techniques, due to the relatively high elasticity of substitution between labour and capital in that sector. On the other hand, with the relatively low cost of labour in Thailand, manufacturing firms in that sector in Thailand may switch from the capital-intensive to labour-intensive techniques. Hence, it appears that sector 1 in Japan is relatively capital-intensive sector, while in Thailand is relatively labour-intensive sector. However, as argued by Leontief (1964), the factor intensity reversal is not quite common and may happen in only limited group of industries. Therefore, the factor intensity reversal should not be the main reason explaining the negative relationship between the THAILAB and FDIBIN variables. For details, see Leontief, W.W. (1964), "An international comparison of factor costs and factor use, *American Economic Review*, Vol. 54, pp. 335-45

Appendix 5-4-3

Effects of Locational Factors on the Incidence of FDI
(Probit Models - Alternative measure for Thai Labour Intensity)

Independent Variable	Expected Sign	Estimated coefficients and *t*-statistics		
		1985	1990	1995
CONSTANT	(?)	-0.36 (-0.530)	-0.21 (-0.307)	-0.44 (-0.554)
THAILAB (2)	(?)	-3.49 (-1.310)	-0.56 (-0.521)	-0.84 (-0.715)
MARK	(+)	4.59*** (2.749)	1.82** (2.042)	2.03** (2.072)
TRANS	(-)	-0.71** (-1.986)	-1.10** (-2.366)	-0.86 (-1.521)
GOV	(+)	0.61* (1.881)	0.86** (2.444)	1.14*** (2.668)
$USGSP_1$	(+)	0.81** (2.258)	1.00** (2.461)	0.92** (2.210)
Log-likelihood		-42.6	-34.0	-30.3
Likelihood Ratio test$_1$		32.2***	31.0***	36.4***
Likelihood Ratio test$_2$		1.7	0.28	0.40
Correct predictions (%)		0.73	0.79	0.83
Sample size		85	85	85

Note: Details are as in table 5-4

Appendix 5-5-1

Effects of Locational factors on the Extent of FDI
OLS Models with Selectivity Bias Adjustments
Dependent Variable: FDICAP (Restricted Sample)

Independent Variable	Expected Sign	Estimated coefficients and asymptotic *t*-statistics	
		1990	1995
CONSTANT	(?)	-150272*** (-5.837)	-836027*** (-5.290)
JAPLAB	(+)	103346** (2.614)	314901** (2.557)
MARK	(+)	112740*** (8.985)	473883*** (8.016)
TRANS	(-)	-80468*** (-3.897)	-171823*** (-3.601)
GOV	(+)	65178*** (5.689)	349283*** (6.429)
$USGSP_1$	(+)	68537*** (4.862)	256579*** (5.083)
LAMDA	(+)	182671*** (4.467)	18.22*** (3.411)
Adjusted R-squared		0.49	0.72
F statistics		10.21**	26.44**
Sample size		58	59

Note: 1) Four industries are excluded from the samples for estimation due to extreme value of MARK. These are special industrial machinery (ISIC 3824), office and household equipment (ISIC 3825), electrical industrial machinery (ISIC 38310), and radio, television, and communication equipment (ISIC 38320).
2) Other details are as in table 5-6

Appendix 5-5-2

Effect of Locational Factors on the Extent of FDI
OLS Models with Selectivity Bias Adjustments
Dependent Variable: FDINUM (Restricted Sample)

Independent Variable	Expected Sign	Estimated coefficients and asymptotic *t*-statistics	
		1990	1995
CONSTANT	(?)	-26.82*** (-3.673)	-65.83*** (-3.243)
JAPLAB	(+)	18.30*** (3.021)	41.01*** (3.759)
MARK	(+)	19.65*** (4.739)	37.73*** (4.136)
TRANS	(-)	-10.02** (-2.296)	-10.78* (-1.735)
GOV	(+)	11.67*** (4.062)	27.30*** (3.516)
$USGSP_1$	(+)	13.54*** (4.316)	20.06*** (3.214)
LAMDA	(+)	18.82*** (2.714)	41.62** (2.495)
Adjusted R-squared		0.50	0.48
F statistics		10.82	9.96**
Sample size		58	59

Note: Details are as appendix 5-5-1

Appendix 5-6-1

Poisson Regression Model for Count data

The Poisson model assumes that each dependent variable y_j is drawn from a Poisson distribution with parameter λ_j, which is related to the independent variable, X_j. The model can be described as

$$\text{Prob}(Y_j = y_j) = \frac{e^{-\lambda_j}\lambda_j^{y_j}}{y_j!}, \qquad y_j = 0,1,2... \tag{1}$$

where the most common formulation for λ_j is

$$\ln \lambda_j = \beta' x_j \tag{2}$$

It can be thus shown that

$$E[y_j \mid x_j] = \text{Var}[y_j \mid x_j] = \lambda_j = e^{\beta' x_j} \tag{3}$$

and thus

$$\frac{\partial E[y_j \mid x_j]}{\partial x_j} = \lambda_j \beta \tag{4}$$

These parameter can be estimated with the maximum likelihood techniques (see Maddala, 1983; Greene, 1993 for more details).

One major weakness of the Poisson model is that it implicitly assumes the variance of y_j to be equal to its population mean. This is quite unrealistic for the data used in the majority of applied research. Also, the Poisson model assumes that each count of y_j is independent from one another: y_1, y_2, y_3 ... take place independently. However, with regard to the case of Japanese FDI, such assumption may not hold due to the fact that Japanese firms tend to follow one another overseas to supply intermediate inputs. The initial investment undertaken by one Japanese manufacturing producer tends to be followed by other intermediate suppliers from Japan. For more details, see the next chapter on Japanese vertical linkages (chapter VI).

Appendix 5-6-2

Effects of Locational Factors on the Extent of FDI
Poisson Models for Count Data
Dependent Variable: FDINUM

Independent Variable	Expected Sign	Estimated coefficients and *t*-statistics		
		1985	1990	1995
CONSTANT	(?)	-1.67*** (-3.614)	-1.06*** (-3.660)	-1.81*** (-6.419)
JAPLAB	(?)	1.64** (2.008)	2.51*** (5.713)	3.22*** (9.544)
MARK	(+)	2.10*** (7.058)	1.15*** (15.792)	1.39*** (23.376)
TRANS	(-)	-0.70*** (-3.184)	-0.66*** (-4.101)	-0.85 (-0.633)
GOV	(+)	0.79*** (3.307)	0.91*** (7.336)	1.23*** (8.005)
$USGSP_1$	(+)	1.35*** (4.082)	1.27*** (6.327)	1.15*** (5.717)
Log-likelihood		-149.05	-290.13	-393.49
Likelihood Ratio test$_1$		130.5***	559.6***	901.6***
Sample size		85	85	85

Note: Details are as in table 5-6

Appendix 5-7

Pooled Probit and OLS Models with Selectivity Adjustments (The Estimated Coefficients of Time and Industry Dummies)

Independent Variable	Expected sign	Estimated coefficients and *t*-statistics		
		Probit	OLS (FDICAP)	OLS (FDINUM)
1985	(?)	-0.30 (-1.236)	-6299 (-0.353)	-3.28*** (-2.213)
1995	(?)	-0.08 (-0.335)	27889 (1.165)	1.58 (0.936)
ISIC 31	(?)	0.72 (1.170)	98555*** (2.772)	5.22 (1.581)
ISIC 32	(?)	0.35 (0.559)	74534** (2.440)	3.88 (1.292)
ISIC 33	(?)	0.57 (0.774)	91294** (2.483)	3.03 (1.134)
ISIC 34	(?)	-0.12 (-0.174)	9022 (0.413)	-0.33 (-0.113)
ISIC 35	(?)	1.26*** (1.971)	155180*** (3.606)	13.44*** (3.440)
ISIC 36	(?)	0.42 (0.587)	99418*** (3.024)	3.08 (0.892)
ISIC 37	(?)	-0.55 (-0.629)	49590 (0.858)	-2.18 (-0.598)
ISIC 38	(?)	0.73 (1.232)	109941*** (3.346)	6.82** (2.210)

Note: Details are as in table 5-8

Appendix 5-8

Effects of Locational Factors on the Incidence of FDI (Random-effects Probit Model)

Independent Variable	Expected Sign	Estimated coefficients and *t*-statistics
CONSTANT	(?)	-3.55** (-1.962)
JAPLAB	(?)	7.73** (1.974)
MARK	(+)	12.55*** (2.742)
TRANS	(-)	-4.74*** (-2.670)
GOV	(+)	2.20** (2.086)
$USGSP_1$	(+)	1.22** (2.012)
Log-likelihood		-89.55
Likelihood Ratio test$_1$		50.61***
Correct predictions (%)		0.79
Sample size		250

Note: Details are as in table 5-4

Chapter VI

Vertical Linkages and Japanese FDI in Thailand

Chapter VI

Vertical Linkages and Japanese FDI in Thailand

6.1 Introduction

One stylised fact about Japanese firms is that they tend to follow one another overseas to supply (and sometimes source) intermediate inputs. There has been evidence suggesting that Japanese suppliers in the auto vehicle industry tend to undertake FDI in the US locations where other Japanese auto assemblers are located (Smith and Florida, 1993). Furthermore, electrical firms from Japan tend to undertake FDI in the EU when other pre-existing[1] Japanese electrical firms (members of the same 'Keiretsu' group) have established production plants there (Belderbos and Sleuwaegen, 1996).

In the context of Japanese FDI in Thailand, a survey conducted by Ratanavichien (1999) indicates that one reason for Japanese firms undertaking FDI is to supply intermediate parts and components to other pre-existing Japanese firms in Thailand. Using a sample of Japanese companies (promoted by the BOI) in her survey, Anuroj (1995) also finds that Japanese firms in Thailand tend to carry out intermediate transactions with each other rather than with local Thai firms.

[1] These are firms that have already established manufacturing plants in a host country.

Potentially, there are several reasons explaining "why Japanese manufacturing producers and intermediate suppliers tend to follow one another overseas". Firstly, the nature of the industrial system in Japan is that manufacturing firms within the same industrial group (called 'Keiretsu') are linked to one another by sub-contracting arrangements (Aoki, 1988; Hatch and Yamamura, 1996; Miyashita and Russell, 1996)[2]. As indicated by Aoki, almost 70 per cent of manufacturing activities of large Japanese producers are carried out by medium and small suppliers[3]. Normally, the relationship between the former and the latter tends to be long-term rather than short-term one due to financial and non-financial ties between them. The former usually holds part of the share capital in the latter and provide the latter with financial, marketing, and technical assistance (Asanuma, 1989; Miyashita and Russell, 1996). Hatch and Yamamura (1996, p. 69) state that "member firms in the Keiretsu network are legally independent but are bound together by a set of tangible and intangible commitments (e.g. cross-shareholding, intra-group trade, and capital, technology, as well as personnel transfers).

Therefore, when the large Japanese manufacturing firms decide to undertake FDI overseas, they may induce (and / or persuade) their suppliers to undertake

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[2] The term 'Keiretsu' refers to a group of thousands of companies that work together for a few large corporate firms (Miyashita and Russell, 1996). There are two types of Keiretsu groups, the horizontal and vertical groups. The ***horizontal group*** composes of one large commercial bank, trading and financial companies, and several large manufacturing companies, which are inter-linked to one another by the cross share-holdings and trading relations. Large manufacturing firms inside each horizontal group also have their own vertical Keiretsu groups. Each ***vertical group*** is made up of one large manufacturing firm and hundreds / thousands of smaller manufacturing firms supplying intermediate products to that large firm.

[3] For discussions regarding the benefits of sub-contracting system in Japan, see for example, Nakatani (1984), Koike (1987), and Asanuma (1989).

FDI with them. The main reason for persuasion by large Japanese firms is because the former could ensure sufficient availability of key intermediate inputs. Also, they could avoid transaction costs incurred via intermediate imports as well as costs in dealing with local suppliers (Kimura and Pugel, 1995; Banerji and Sambharya, 1996)[4]. Also, the former would benefit from a close co-ordination and direct exchange of information when the latter is located nearby (Aoki, 1988; Asanuma, 1989). On the other hand, the motives for the latter following the former overseas are to secure the market positions, to save costs of transportation, and to ensure timing / deliveries of intermediate products. Because the 'just-in-time' system require flexible and punctual deliveries of such intermediate inputs, suppliers from Japan are likely to follow their main customers (large producers) overseas to avoid long shipping delays and costs of transporting intermediate parts and components. By the same token, due to the need for flexible and punctual deliveries, large producers may also attempt to transplant their supplying network in a host country by persuading several suppliers to establish production plants with them (Head, Ries, Swenson, 1995).

In many developing countries, host governments may seek to forge links between foreign producers and indigenous suppliers by imposing local content requirements[5]. However, large Japanese investors tend to bring with them their main intermediate suppliers because local supporting industries are not

[4] There are also other transaction costs such as longer delivery schedules, higher inventory costs, monitoring costs, and a possibility of supply disruptions from shipping delays (Dunning, 1993).

[5] A certain proportion of local inputs must be used by foreign firms for manufacturing productions.

well-developed, and also the qualities of local intermediate supplies do not meet minimum standards required by Japanese firms (Anuroj, 1995).

As more and more Japanese producers and suppliers establish production plants in a particular host country, an agglomeration / accumulation of these firms may also act as an incentive for subsequent firm to undertake FDI there. By locating production plants close to one another, Japanese firms gain agglomeration benefits in terms of large demands and supplies of intermediate inputs and outputs (Krugman and Venables, 1995; Puga and Venables, 1996). On the one hand, by being close to several suppliers of different intermediate products, the users of such intermediates benefit from a variety of intermediate inputs. They would save costs of importing those intermediates from Japan. On the other hand, by being close to numbers of producers using intermediate outputs, suppliers of such intermediates benefit in terms of sales (and probably profits) due to high demands for the products. They would also save the cost of exporting parts of their outputs back to Japan.

Hence, with respect to the above reasons, one may anticipate that firms with related manufacturing activities in Japan would tend to follow one another overseas, partly to supply (source) intermediate inputs (outputs). However due to industrial differences in the nature of technology and the length of value-added chain, the degree of input-output linkages[6] across manufacturing

[6] The term 'linkages' is used to describe the interdependency or relationship among firms or among industries. Studies of linkage effects are based on two different approaches: the direct relationship and the input-output approaches. The former focuses on the direct relationship between firms (e.g. technological and financial assistance), while the latter applies Leontief's input-output coefficients to measure the linkage effects. The present analysis is in line with the second approach.

industries in Japan also tends to differ. For example, the intensity of the vertical linkage among Japanese firms in the motor vehicle industry (ISIC 3843) is likely to be higher than that in the printing and publishing industry (ISIC 3420). This is because the structure of the former is a multi-production process. Many parts and components are required for assembling a single motor vehicle. Because different intermediate inputs tend to be produced by different specialised suppliers, a large auto assembler is likely have a long-term relationship with all these suppliers to secure consistent qualities, as well as to avoid disruptions in supplies and delays in deliveries.

Following the above argument, it may be expected that firms in industries with relatively strong input-output linkages in Japan will tend to follow each other overseas since they are tightly tied to one another through intermediate sales and purchases. The stronger the input-output linkages among firms in a given industry in Japan, the more likely it is that they would follow one another in establishing production facilities overseas, and consequently the greater the outward FDI would tend to be. For Japanese inward FDI in Thailand, it may be thus anticipated that there is a positive relationship between the extent of FDI undertaken by Japanese firms in Thailand and the existing intensity of the input-output linkages among those firms in Japan. In other words, the extent of the FDI stock (due to Japanese firms) in a given industry in Thailand is expected to correspond positively with the intensity of the input-output linkages (among those firms) in that (and related) industries in Japan.

The aim of this chapter is to extend the previous empirical analysis by examining the effects of Japanese input-output linkages on the extent of FDI. There are several reasons why these factors were not previously examined in conjunction with other locational factors. Primarily, there is little empirical knowledge of the extent of the linkage effects on the pattern of FDI in developing countries. It is not clear whether such effects operate systematically across manufacturing industries or only within particular industries. Also, it is not certain whether such effects are relevant at the level of industrial aggregation used by the previous analyses: they may be more (or less) profound at the broader level of industrial classifications. Lastly, there is a problem in measuring the linkage variables due to a lack of appropriate data.

With the caveats noted above, the reminder of this chapter proceeds as follows. Section 6-2 elaborates the concepts of industrial linkages and discusses the measures used, section 6-3 reports on the qualitative analysis on the association between Japanese industrial linkages and FDI, section 6-4 proceeds to the quantitative analysis, and section 6-5 concludes.

6.2 Concepts and Measures

This section is separated into two parts. The first part elaborates the concept of industrial linkages and the second part discusses possible measures of these variables.

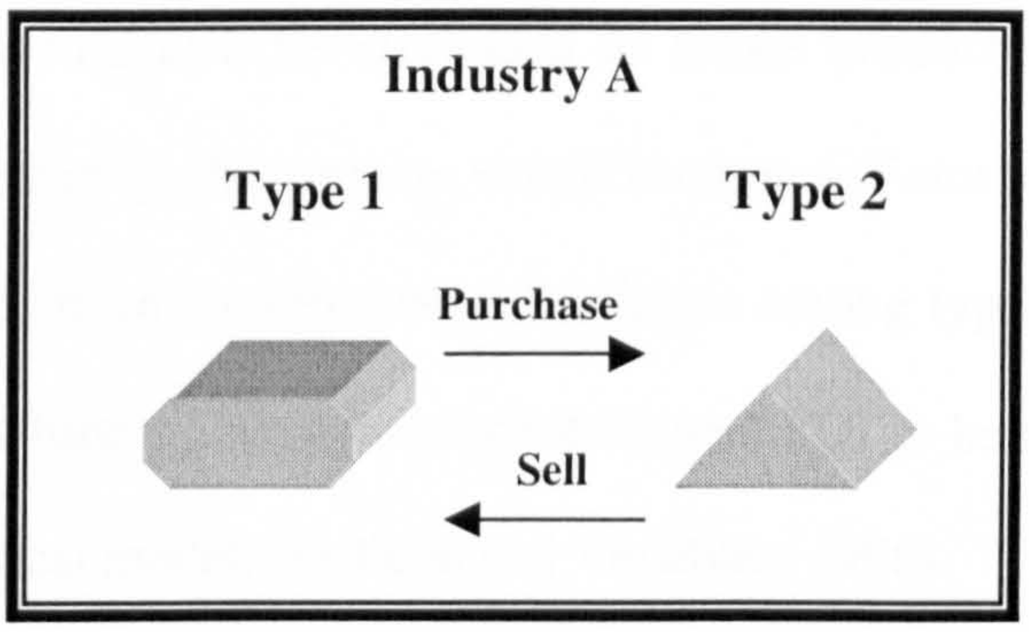
6.2.1 Intra- and Inter-industrial Linkages

Input-output linkages may be described as the interdependency among firms for their sales and purchases of intermediate products. These intermediate transactions can be further classified into those carried out among manufacturing firms *within* the same industries and those carried out among firms *between* industries. The former are termed intra-industrial linkages and the latter inter-industrial linkages.

a. Intra-industrial Linkage

Assume that there are two types of firms operating in industry A in Japan: types 1 and 2 (figure 6-1). Different types of firms engage in different stages of production; type 1 firms are large assembling firms using intermediate products partly supplied by type 2 firms. Assume that each of the type 1 and 2 firms produces a differentiated product.

Figure 6-1: Intermediate Sales and Purchases between Type 1 and 2 Firms within Industry A in Japan



Potentially, when some of the type 1 firms decide to locate production activities in Thailand[7], some of the type 2 firms (members of the same Keiretsu groups) may also choose to locate their production activities there. As discussed earlier, the former may persuade the latter to locate manufacturing plants close to them. This is because the former would save on costs of importing part of their key inputs from Japan and have a greater certainty about the time deliveries of intermediate products. Also, they would benefit from the close co-ordination and exchange of technical information with the latter. On the other hand, the latter would benefit in terms of saving costs of exporting some of their outputs back to Japan.

As more and more type 2 firms (supplying firms) undertaking FDI in Thailand, other type 1 firms (assembling firms) from Japan may also choose to locate production plants there. This is because type 1 firms can source a variety of intermediate inputs supplied by type 2 firms, thus saving their costs of importing some intermediate parts from Japan. In turn, with an expansion in numbers of type 1 firms in Thailand, the remaining type 2 firms based solely in Japan would also be motivated to locate production activities in Thailand. Consequently, this process would become self-reinforcing whereby the benefits gained from the input-output linkages among types 1 and 2 firms in Thailand act as further incentives for subsequent FDI to be undertaken (for the formal theoretical model, see Puga and Venables, 1996).

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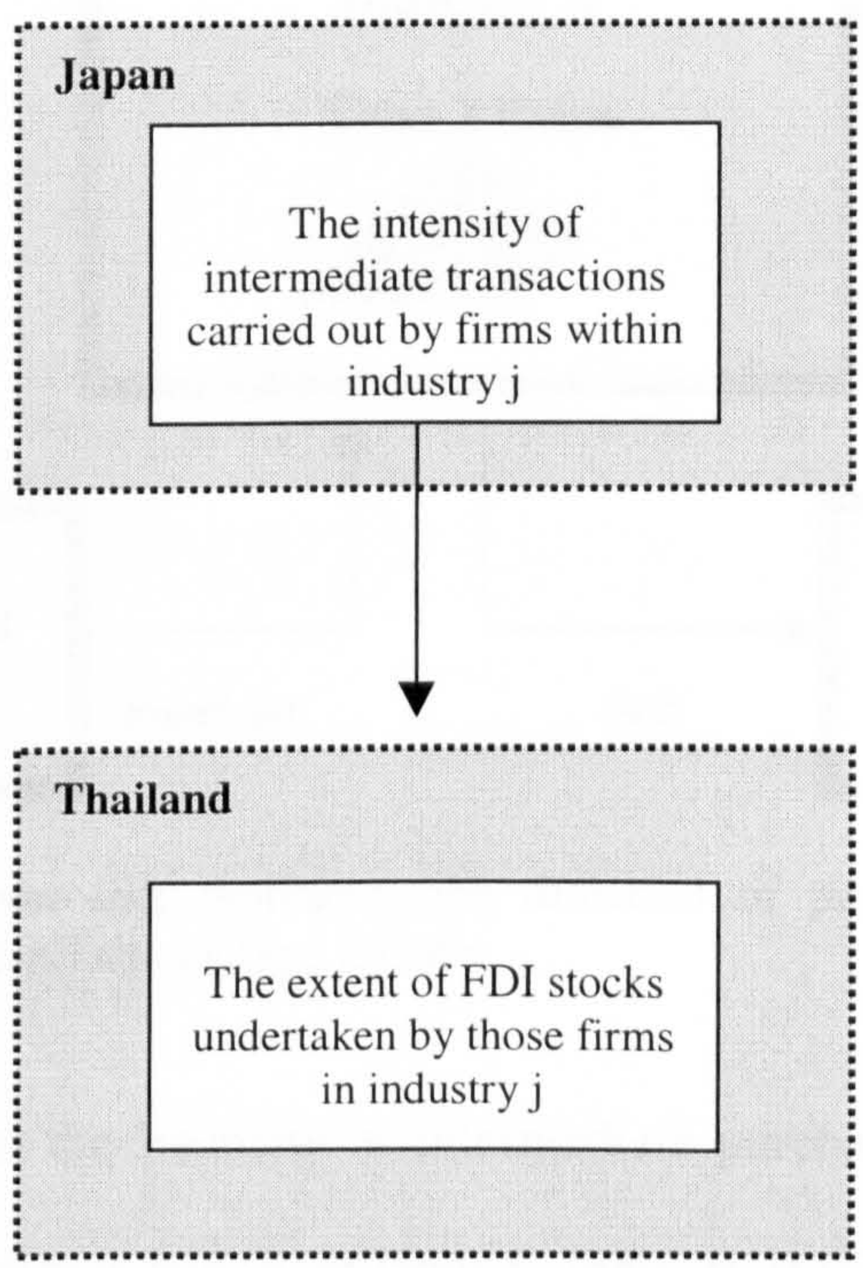
[7] They may undertake FDI in Thailand to take advantages of cheap unskilled labours, fiscal incentives, and external trade preferences (see chapter V).

Yet, the extent to which types 1 and 2 firms in industry A follow one another overseas must depend on the degree of interdependency among them. Partly, this may be reflected by the intensity of sales and purchases of intermediate products. The higher the intensity, the more likely it is that they would have followed one another to Thailand, and thus the greater the investment stocks would tend to be. In the long run, it may be thus anticipated that the stocks of FDI[8] undertaken by Japanese firms in a given Thai industry will correspond positively with the intensity of intermediate transactions carried out by those firms *within* that corresponding industry in Japan, ceteris paribus (figure 6-2).

Figure 6-2: Relationship between the Intra-industrial Linkages among Manufacturing Firms in Japan and the Extent of FDI in Thailand



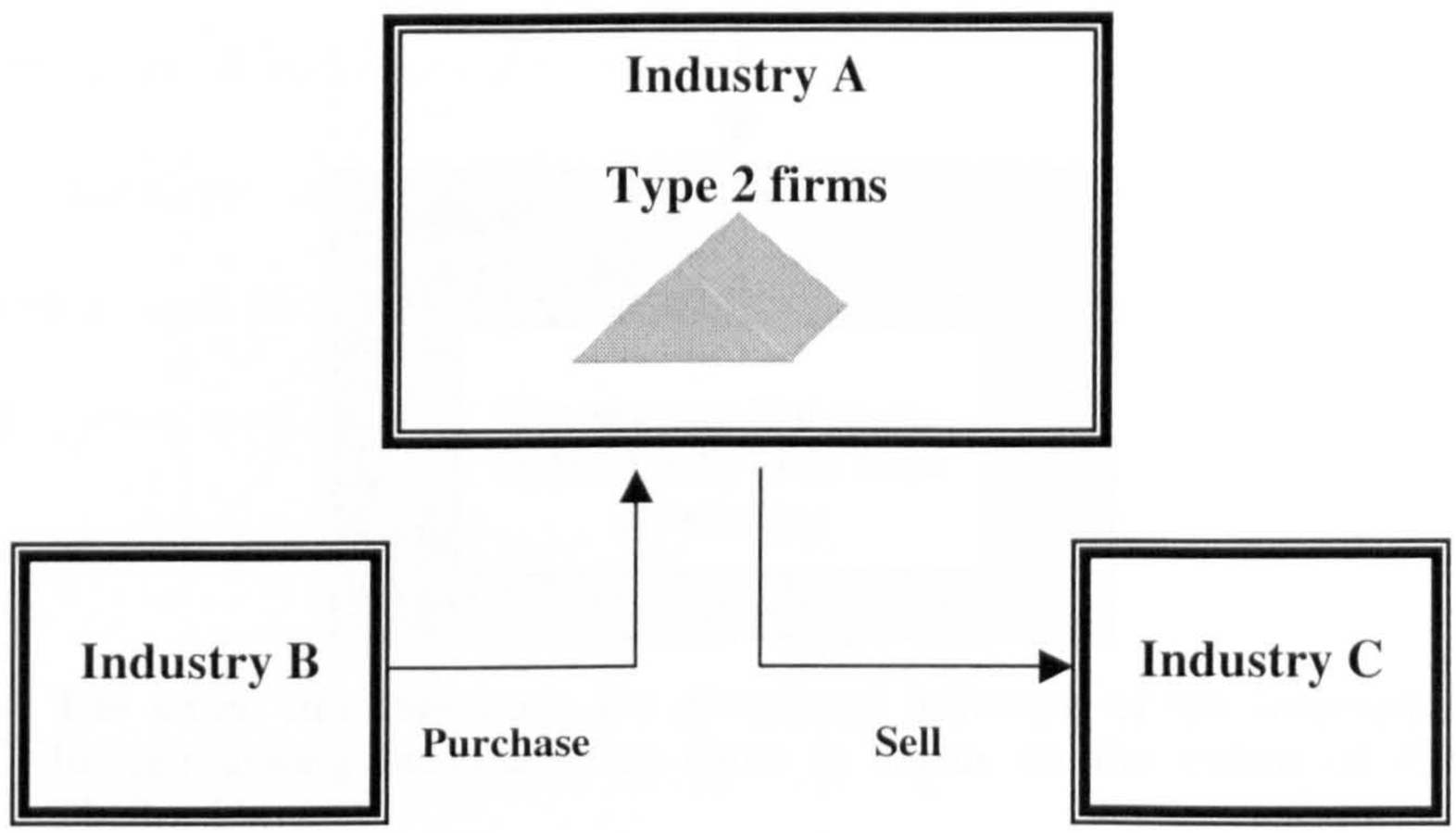
Note: The arrow line represents the directional influence of the intra-industrial linkage among manufacturing firms in Japan on the extent of FDI in Thailand.

[8] The stocks of FDI imply the outcome of many 'flows' of FDI undertaken by Japanese firms.

B. Inter-industrial Linkage

Japanese firms in industry A may not only sell and purchase their intermediate outputs / inputs among themselves but also with other firms in different industries. Figure 6-3 shows a case where type 2 firms in industry A purchase their intermediate inputs from manufacturing firms in industry B and sell their intermediate outputs to firms in industry C. For reasons similar to those discussed previously, when some of those firms in industry B and / or C decide to locate their production plants in Thailand, some of the type 2 firms from industry A may also choose to locate production plants there.

Figure 6-3: Intermediate Sales and Purchases between Type 2 Firms in Industry A and Other Firms outside That Industry in Japan

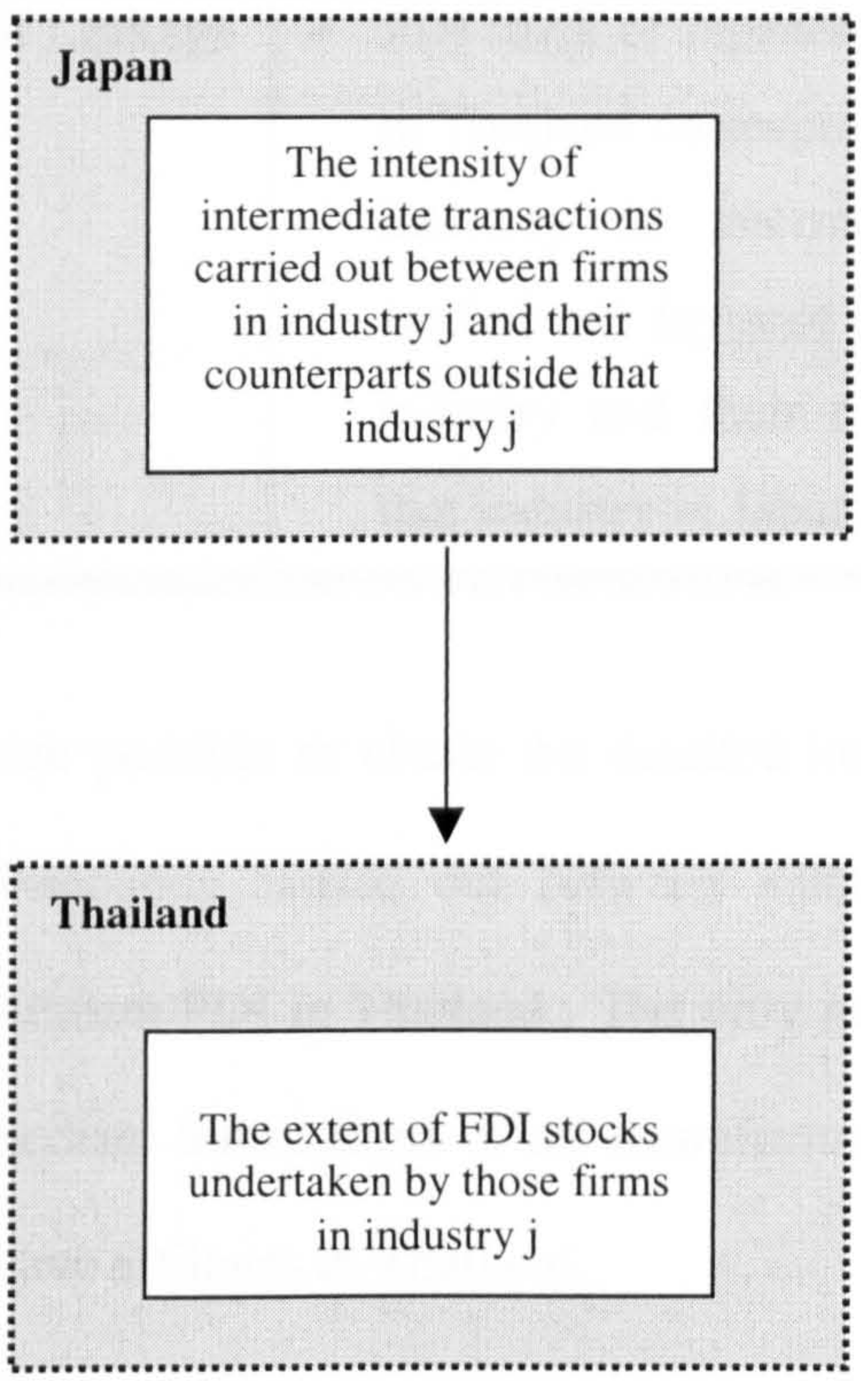


Note: The dark arrow line represents the direction of purchases and sales of intermediate products by type 2 firms

Arguably, the higher the intensity of intermediate purchases (sales) between type 2 firms in industry A and those firms in industry B (C), the more likely it is that the former would follow the latter to Thailand. As a consequence, the greater the investment stocks would tend to be in industry A there. It may be hypothesised that, in the long run, the stocks of FDI undertaken by Japanese

firms in a given industry in Thailand will correspond positively to the intensity of intermediate transactions carried out *between* those firms in that industry and their counterparts outside that industry in Japan, ceteris paribus.

Figure 6-4: Relationship between the Inter-industrial Linkages among Manufacturing Firms in Japan and the Extent of FDI in Thailand



Note: The arrow line represents the directional influence of the inter-industrial linkage among manufacturing firms in Japan on the extent of FDI in Thailand.

6.2.2 Linkage Measures

Using the concepts of intra- and the inter-industrial linkages, the aim of this analysis is to investigate the effects of such linkages on the extent of Japanese FDI undertaken across manufacturing industries in Thailand. As discussed above, two hypotheses are subject to empirical testing, the intra-industrial linkage and the inter-industrial linkage hypotheses (table 6-1).

Table 6-1: Summary of the Linkage Hypotheses

1. Intra-industrial Linkage	➢ FDI stock of Japanese firms in industry j in Thailand corresponds positively to the intensity of intermediate transactions carried out by those firms *within* that industry in Japan.
2. Inter-industrial Linkage	➢ FDI stock of Japanese firms in industry j in Thailand corresponds positively to the intensity of intermediate transactions carried out *between* those firms in that industry and their counterparts outside that industry in Japan.

Unfortunately, it is not possible to obtain the detailed information regarding the intermediate transactions carried out between manufacturing firms in Japan that have undertaken FDI in Thailand. The only information available is that on the intermediate transactions of all manufacturing firms in Japan, whether or not they have affiliates in Thailand.

This information can be obtained from the Japanese-Thai bilateral Input-Output table for 1990[9]. Obviously, one weakness of using such information is that it includes intermediate transactions carried out by all Japanese firms, not only those firms with manufacturing affiliates in Thailand. Nevertheless, for the purpose of this analysis, the data are used as proxies for the intra- and the

[9] As mentioned in chapter V, Japanese I-O table is not accessible. For details about Japanese-Thai bilateral I-O table, see appendix 5-1.

inter-industrial linkages. To measure these linkage variables, two proxies are used. First is the intra-industrial linkage:

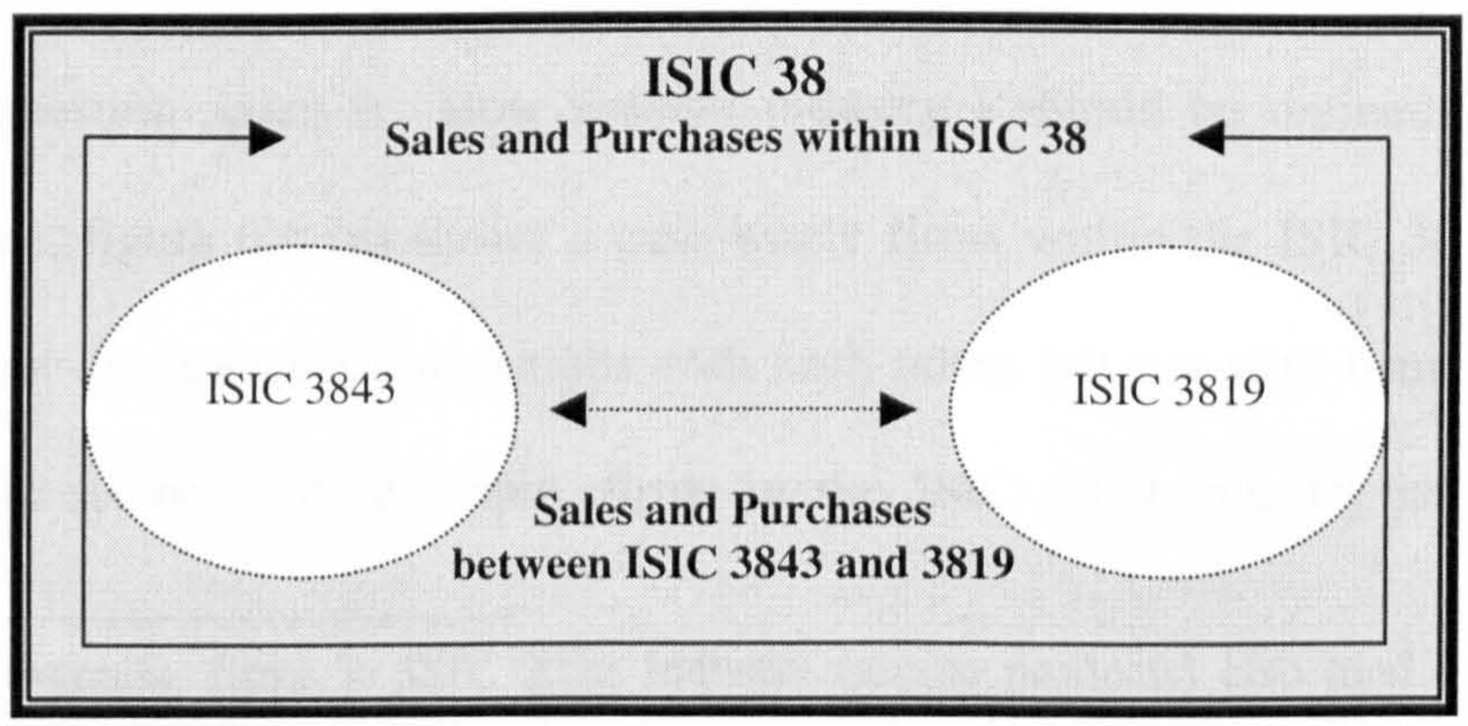
$LINK_1$ = *Value of intermediate sales and purchases carried out among firms within industry j as a proportion of the total production of industry j*

and the second is the inter-industrial linkage variable:

$LINK_2$ = *Value of intermediate sales and purchases carried out between firms in industry j and other manufacturing firms outside that industry as a proportion of the total production of industry j*[10]

As mentioned earlier, it is not clear whether the effects of Japanese industrial linkage are relevant at the level of industrial aggregation used by the previous analyses (the 4-digit ISIC level). They may be more (or less) profound at the broader level of industrial classifications. In other words, even though $LINK_1$ is defined as intermediate transactions among manufacturing firms within industry j, the main question is "Which level of industrial classification should be used in defining industry j?".

Figure 6-5: $LINK_1$ Measured at the 4- and 2-digit ISIC Level



[10] Intermediate transactions carried out with non-manufacturing firms are excluded.

Illustratively, figure 6-5 shows cases where $LINK_1$ is measured both at the 4- and 2- digit ISIC levels. Manufacturing activities classified at the 4-digit level are referred as 'industry', while those classified at the 2-digit level are referred as 'sector'. When $LINK_1$ is measured at the 4-digit ISIC level, intermediate transactions carried out by Japanese firms in ISIC 3843 industry (motor vehicles) and ISIC 3819 industry (fabricated metal) are regarded as 'inter-industrial' transactions. However, when working at the 2-digit ISIC level, these intermediate transactions are regarded as 'intra-sectoral' transactions (transactions between firms within the ISIC 38 sector). Thus, it is not clear whether FDI (measured at the 4-digit level) would be correlated with $LINK_1$ measured at the same level of classification (4-digit). Potentially, if firms in the ISIC 3819 industry tend to supply inputs to firms in the ISIC 3843 industry more than to firms in their own industry (and if this is also a case for every firm in other industries)[11], then $LINK_1$ (2-digit) is preferable to $LINK_1$ (4-digit).

With regard to $LINK_2$, though being defined as intermediate transactions carried out between firms in industry j and those outside that industry, the main question again is "How broadly industry j should be defined?". To illustrate, figure 6-6 (a) shows a case where firms within the ISIC 38 sector carry out intermediate transactions with each other, but not with firms in the ISIC 32 sector. For example, firms in the ISIC 3819 industry carry out

[11] For example, firms in ISIC 3211 industry (textile products) also tend to sell / purchase intermediate products with firms in ISIC 3220 industry (garments) more than with firms in their own industry.

intermediate transactions with firms in the ISIC 3843 industry, but not with firms in the ISIC 3211 or 3220 industries, and vice versa.

When $LINK_2$ is measured at the 4-digit level, all intermediate transactions carried out between firms in the ISIC 3819 industry and all firms outside that industry are considered inter-industrial [see figure 6-6 (b)]. However, when $LINK_2$ is measured at the 2-digit level, only the intermediate transaction carried out between firms in the ISIC 3819 industry and firms in the ISIC 3211 and 3220 industries are considered inter-sectoral [see figure 6-6 (c)].

Figure 6-6 (a): Intermediate Transactions among Firms in the ISIC 38 and the ISIC 32

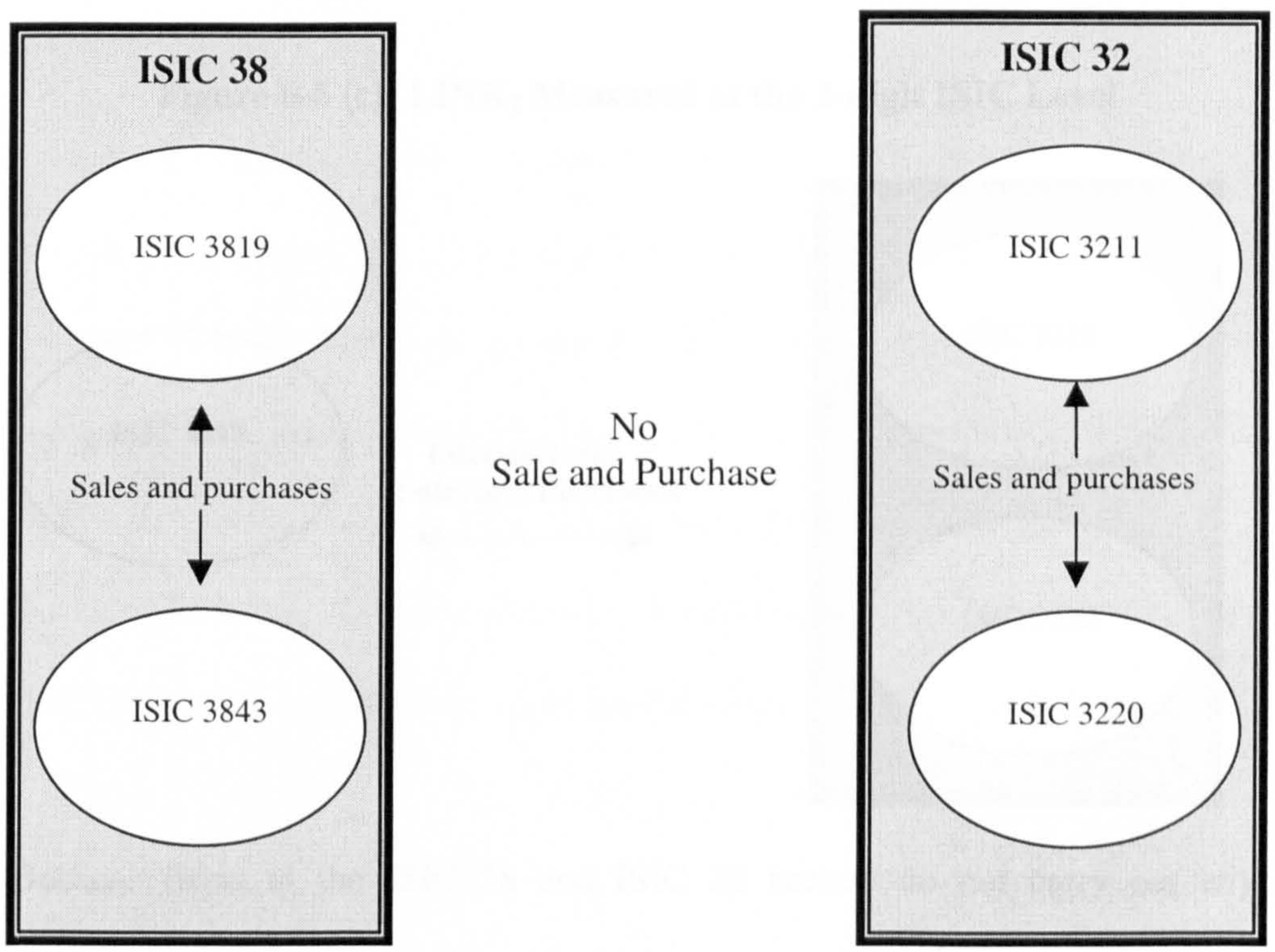


Figure 6-6 (b): $LINK_2$ Measured at the 4-digit ISIC Level

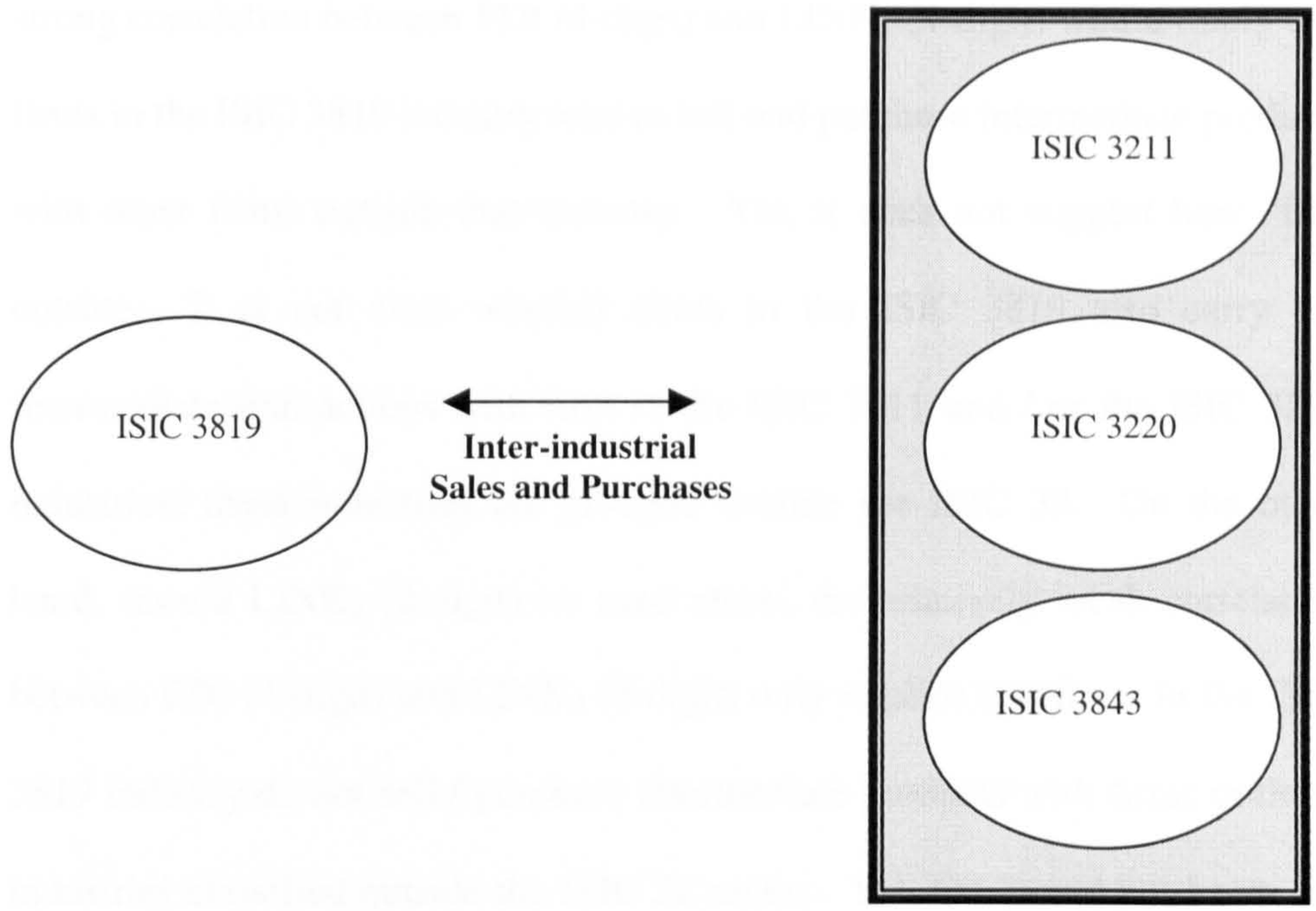
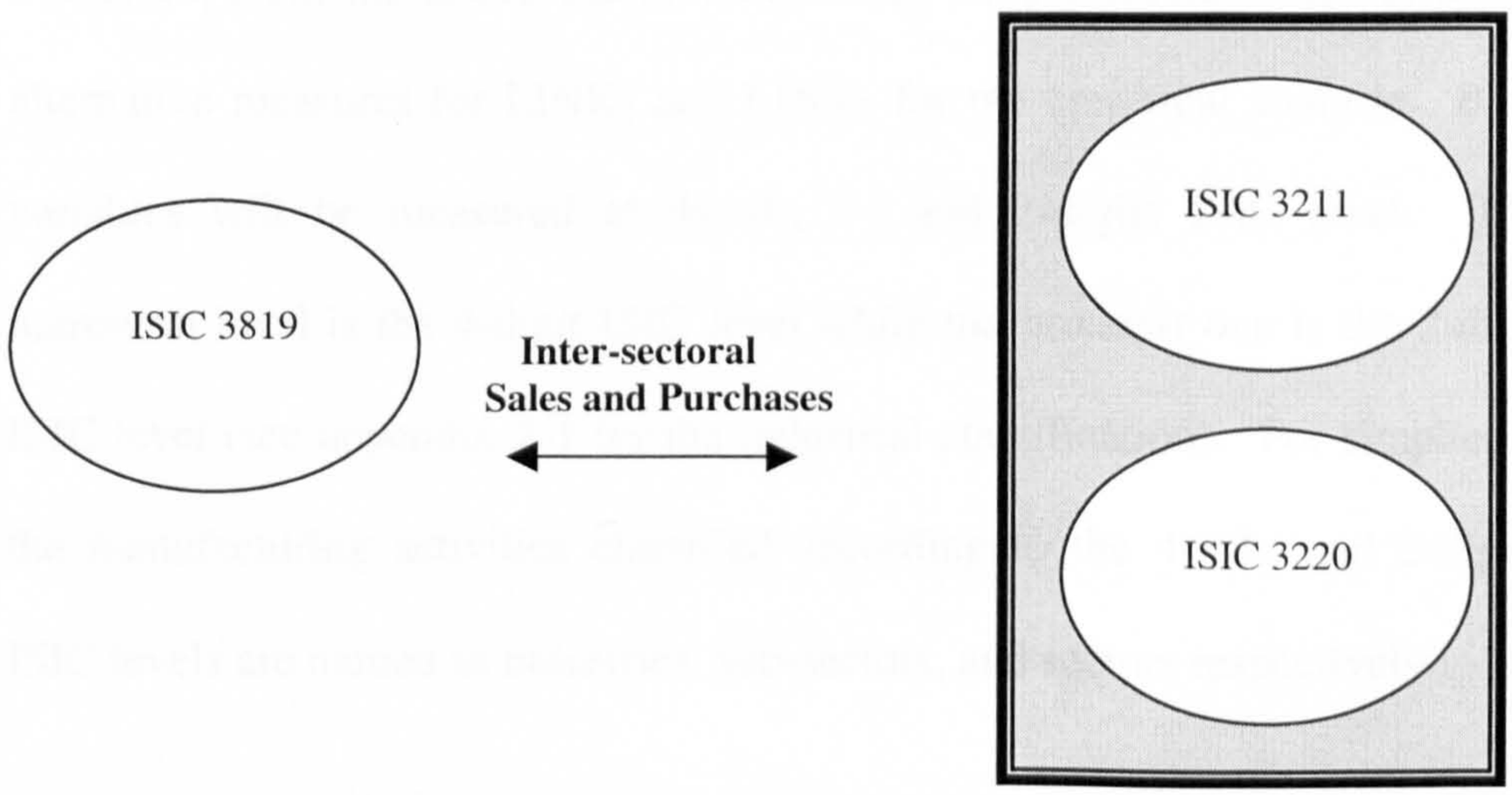


Figure 6-6 (c): $LINK_2$ Measured at the 2-digit ISIC Level



Because firms in the ISIC 38 and ISIC 32 sectors do not carry out any transactions with one another, the correlation between FDI (4-digit) and $LINK_2$ measured at the 2-digit level would be weaker than that between FDI (4-digit) and $LINK_2$ measured at the 4-digit level. Yet, should $LINK_2$ (4-digit)

be used alone, a narrow implication would be drawn. To clarify, the relatively strong correlation between FDI (4-digit) and $LINK_2$ (4-digit) would imply that firms in the ISIC 3819 industry tend to sell and purchase intermediate products with other firms outside that industry. Yet, it does not suggest how "far" outside. It is not clear whether firms in the ISIC 3819 also carry out intermediate transactions with firm in the ISIC 3211 and / or the ISIC 3220 industries; these industries are grouped outside the ISIC 38. On the other hand, should $LINK_2$ (2-digit) be used alone, the relatively weak correlation between FDI (4-digit) and $LINK_2$ (2-digit) only implies that firms in the ISIC 3819 industry do not sell / purchase intermediate products with firms in those industries classified outside the ISIC 38 sector. Yet one would not know the extent of inter-industrial transactions inside that sector (ISIC 38).

Therefore, from the above elaboration, it may be preferable to use different alternative measures for $LINK_1$ and $LINK_2$ for the empirical analysis. Both variables will be measured at the 4-, 3-, and 2-digits ISIC level. The narrowest level is the 4-digit ISIC level while the broadest one is the 2-digit ISIC level (see appendix 2-1 for the industrial classification). For simplicity, the manufacturing activities classified according to the 4-, 3-, and 2-digits ISIC levels are named as industries, sub-sectors, and sectors respectively.

6.3 Qualitative Analysis

As mentioned earlier, due to the lack of empirical knowledge regarding the nature and the extent of linkage effects in Asian developing countries, it is not

immediately clear whether such effects operate systematically across manufacturing industries or only within particular industries. This section qualitatively examines the linear association between Japanese FDI stocks in Thailand and the input-output linkages in Japan. Firstly, the correlation coefficients of FDI stocks and different measures for linkage variables are considered, and then the relationships between the two are further discussed using histograms.

Table 6-2 shows the correlation coefficients between Japanese FDI (FDICAP and FDINUM) and the intensities of the intra- and the inter-industrial linkages ($LINK_1$ and $LINK_2$). FDI is classified according to the 4-digit ISIC level while each linkage variable is classified according to the 4-, 3-, and 2-digit ISIC levels respectively. From table 6-2, three observations may be made.

Table 6-2: Correlation Coefficients between $LINK_{1 \text{ and } 2}$ and FDI

Level of Aggregation	Intra-/inter-industrial Linkages	Share capital / Number of investment	
		FDICAP (4-digit)	FDINUM (4-digit)
Industry level (4-digit)	$LINK_1$	**0.41**	**0.42**
	$LINK_2$	0.03	0.09
Sub-sectoral level (3-digit)	$LINK_1$	**0.29**	**0.29**
	$LINK_2$	0.06	0.09
Sectoral level (2-digit)	$LINK_1$	**0.25**	**0.24**
	$LINK_2$	0.09	0.11

Note: Only industries with Japanese investments undertaken are included (Japanese investments are recorded at the period of 1995).

Firstly, the correlation coefficients between FDI and $LINK_1$ are higher than are those between FDI and $LINK_2$, whether classified at the industry, sub-sector, or sector level. The differences in the correlation coefficients imply that the linear association between FDI stocks and the input-output linkages among Japanese firms within the same industries (intra-industrial linkage) is

stronger than that between FDI and the linkages among firms between industries (inter-industrial linkage). As may be seen from table 6-2, there is hardly any indication of a positive linear association between FDI and $LINK_2$; the correlation coefficients tend to be below 0.10.

Secondly, when comparing the correlation coefficients between FDI and $LINK_1$ measured at different ISIC levels, it is apparent that Japanese FDI is more strongly related to $LINK_1$ measured at the industry level (4-digit) than that at the sub-sectoral (3-digit) or the sectoral level (2-digit). These correlation coefficients suggest that the positive linear association between FDI and the intra-industrial linkage at the industry level (4-digit ISIC level) is stronger than the associations between FDI and the linkage at the sub-sectoral or at the sectoral levels (3- or 2-digit ISIC levels).

Finally, using two different measures for FDI stocks (FDICAP and FDINUM), table 6-2 shows that the correlation coefficients between $LINK_1$ and FDICAP and $LINK_1$ and FDINUM are similar; they are the highest when $LINK_1$ is measured at the industry level (4-digit ISIC level).

In summary, the correlation coefficients shown in table 6-2 indicate that there is a strong positive linear association between FDI and $LINK_1$ and a weak linear association between FDI and $LINK_2$. Moreover, the linear association between FDI and $LINK_1$ measured at the industry level is higher than that at the sub-sectoral or the sectoral levels.

Figure 6-7: Pattern of $LINK_1$ across Manufacturing Industries (4-digit ISIC Level)

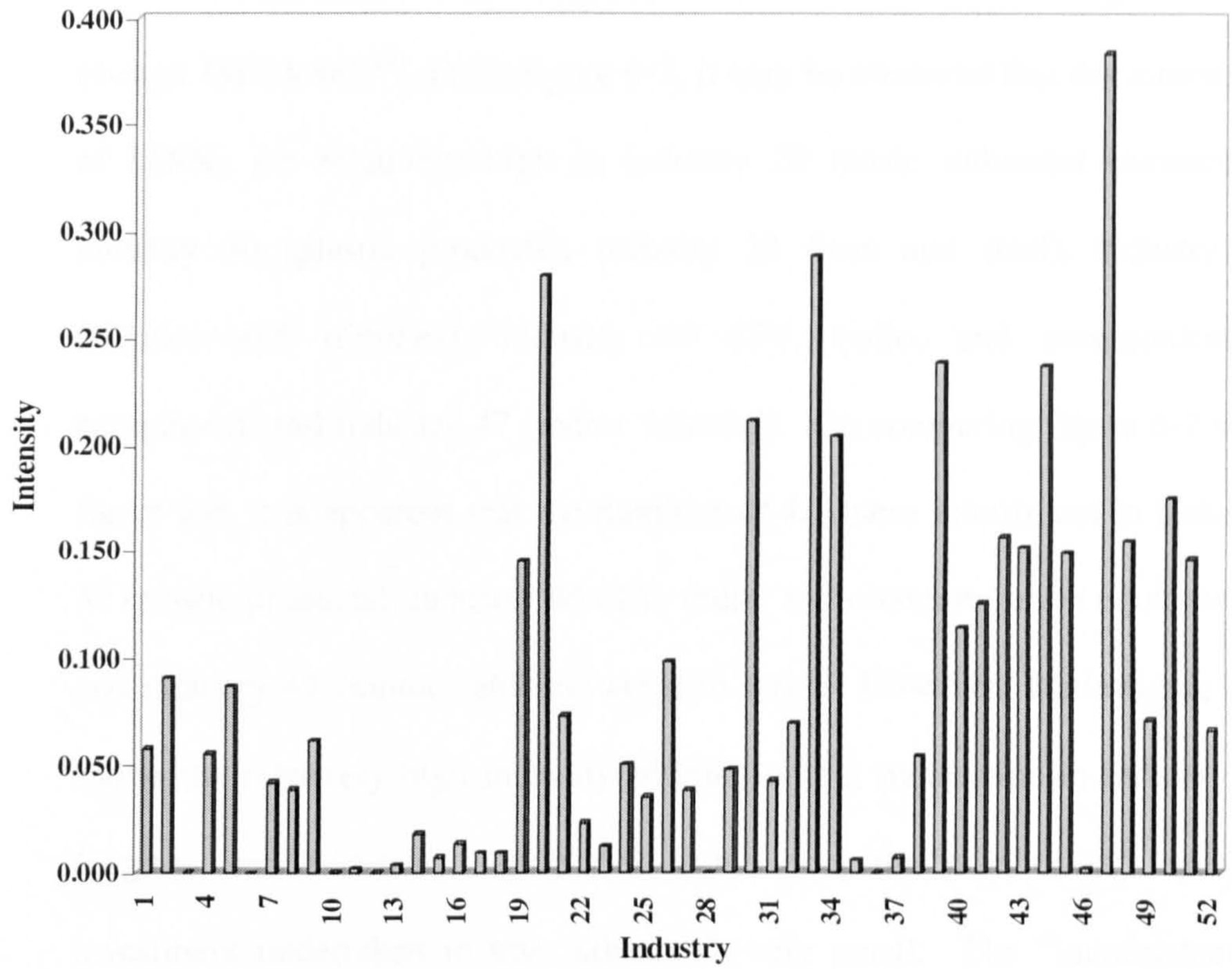
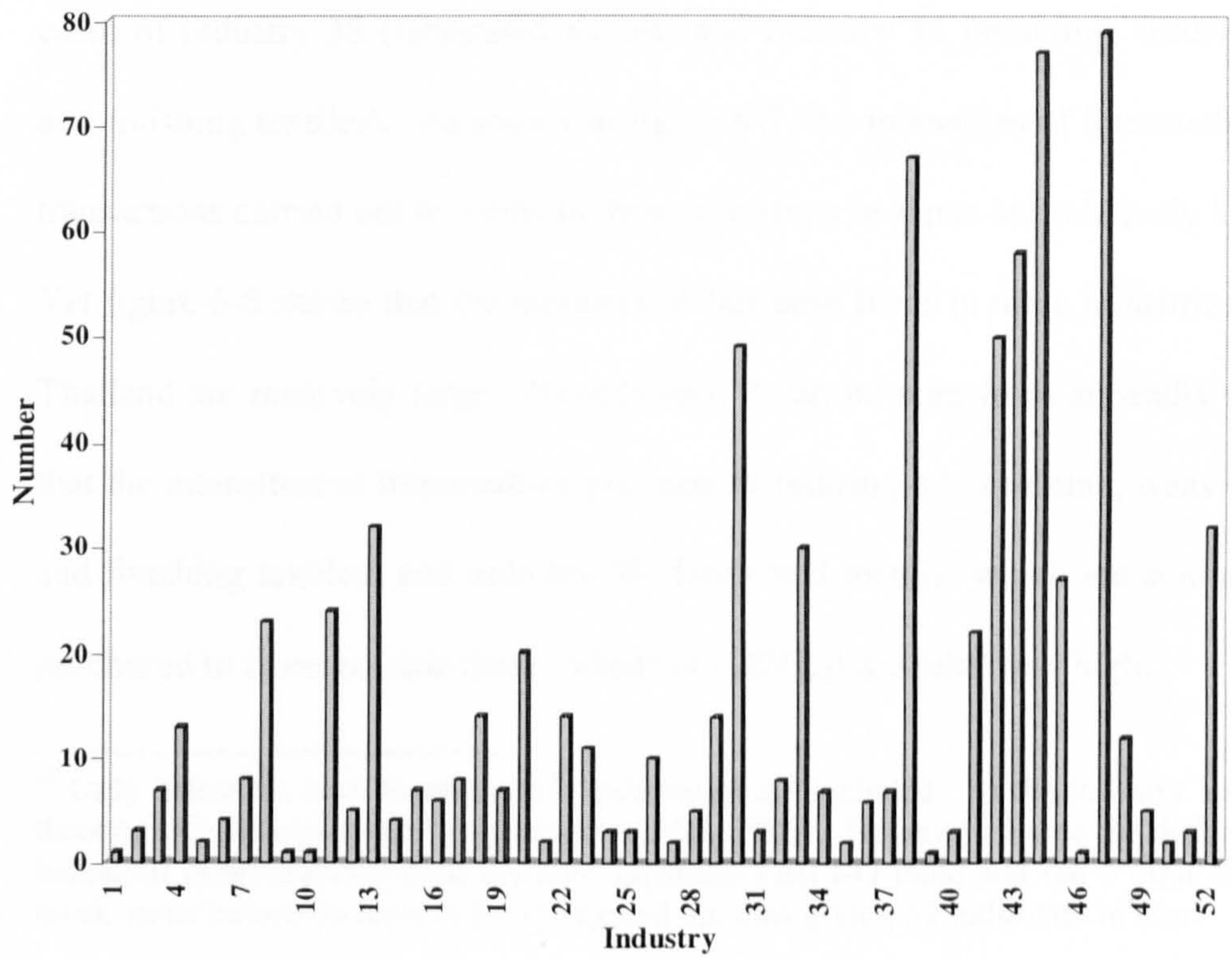


Figure 6-8: Pattern of FDINUM across Manufacturing Industries (4-digit ISIC level)



To consider the relationship between FDI and $LINK_1$ further, figure 6-7 and 6-8 show the patterns of FDINUM and $LINK_1$ across manufacturing industries (4-digit ISIC level)[12]. From figure 6-7, it may be observed that the intensities of $LINK_1$ are relatively high in industry 20 (basic industrial chemicals), industry 30 (plastic products), industry 33 (iron and steel), industry 39 (engines and turbines), industry 44 (TV, radio, and communication equipment), and industry 47 (motor vehicles). On comparing figure 6-7 with figure 6-8, it is apparent that the numbers of Japanese investment in industry 30 (plastic products), industry 44 (TV, radio, and communication equipment), and industry 47 (motor vehicles) are also large. However, while figure 6-7 shows the relatively high intensity of input-output transaction in industry 39 (engines and turbines), figure 6-8 shows that the number of Japanese investment undertaken in this industry is very small. The "inconsistency" between the intensities of the intra-industrial linkages in Japan and the numbers of Japanese investments undertaken in Thailand is also found in the cases of industry 38 (fabricated metals) and industry 11 (spinning, weaving, and finishing textiles). As shown in figure 6-7, the intensities of intermediate transactions carried out by firms in these industries in Japan are relatively low. Yet figure 6-8 shows that the numbers of Japanese firms in these industries in Thailand are relatively large. Nonetheless, it can be seen from appendix 6-1 that the intensities of intermediate products of industry 11 (spinning, weaving, and finishing textiles) and industry 38 (fabricated metals) which are sold and purchased to firms outside these industries ($LINK_2$) are relatively high.

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[12] Only industries with Japanese FDI undertaken are included. At the industry level, there are 62 industries receiving Japanese FDI (1995). However, due to the different industrial classifications used between Japanese-Thai I-O table and the 4 digit ISIC level, some industries have to be aggregated up, thus giving 52 industries in total.

Hence, from these descriptive statistics, it may be inferred that Japanese FDI undertaken in some manufacturing industries in Thailand was partially influenced by the intra-industrial linkages, while in others it could be partially influenced by the inter-industrial linkages. Whether these intra- and inter industrial linkages systematically influence the variation of FDI stocks across Thai manufacturing industries as a whole will be examined quantitatively in the next section.

6.4 Quantitative Analysis

This section extends the previous pooled OLS models with selectivity bias adjustments (see table 5-8 in chapter V) to incorporate the linkage variables ($LINK_1$ and $LINK_2$)[13]. This section is divided into two parts. The first investigates the effects of $LINK_1$ (intra-industrial linkages) on the extent of Japanese FDI (FDICAP and FDINUM) while the second examines the effects of $LINK_2$ (inter-industrial linkages). As discussed before, three different measures for $LINK_1$ and $LINK_2$ are used: those at the industry (4-digit), sub-sectoral (3-digit), and sectoral (2-digit) levels.

6.4.1 Intra-industrial Linkage

A summary of the estimated coefficients of $LINK_1$ is presented in table 6-3 and the detailed estimates are shown in tables 6-4 and 6-5. From table 6-3, it is apparent that, except for the coefficient of $LINK_1$ measured at the 2-digit

[13] Since the larger sample size of pooled data provides more efficient and reliable estimates, the pooled model is preferred to the cross-sectional model.

level, other coefficients carry signs consistent with those expected (all +), and are statistically significant at the 10% level. These significant coefficients lend support to the hypothesis of intra-industrial linkage shown in table 6-1.

Table 6-3: Effects of $LINK_1$ on the Extent of FDI (Summary of Estimated Results)

$LINK_1$	Share capital / Number of Investment	
	FDICAP (4-digit)	FDINUM (4-digit)
Industry level (4-digit)	✔**	✔**
Sub-sectoral level (3-digit)	✔*	✔***
Sectoral level (2-digit)	✔**	✔

Note: 1) ✔ means an estimated sign is consistent with the expected sign (+)
2) ***denotes 1%, ** denotes 5%, and * denotes 10% levels of significance

The significant coefficients for $LINK_1$ at the 4-digit ISIC level confirm that the amount of share capital / number of Japanese companies in a given Thai industry is positively correlated with the intensity of input-output linkage among Japanese firms in that industry in Japan. In other words, Japanese firms undertaking FDI in Thai industry j (during 1954-95) tended to sell and / or purchase their intermediate products to / from other pre-existing Japanese firms within that industry. For example, firms undertaking FDI in the motor vehicle industry (ISIC 3843) tend to carry out intermediate transactions with other pre-existing firms in that industry.

The significant coefficients for $LINK_1$ measured at the 3- and 2-digit ISIC level imply that Japanese firms undertaking FDI in Thai industry j also tended to carry out intermediate transactions with other pre-existing firms in related industries that are grouped within the same sub-sector or the same sector.

Table 6-4: Pooled OLS Models with Selectivity Bias Adjustments

Linkage Variable: $LINK_1$

Dependent Variable: FDICAP

Independent Variable	Expected sign	Estimated coefficients and asymptotic *t*-statistics		
		Model I	Model II	Model III
CONSTANT	(?)	-456745*** (-3.585)	-456320*** (-3.568)	-368061*** (-3.550)
JAPLAB	(+)	305267*** (2.958)	341090*** (2.982)	304566*** (2.817)
MARK	(+)	229491*** (4.215)	251125*** (3.979)	255368*** (4.109)
TRANS	(-)	-73054* (-1.867)	-95844** (-2.127)	-72519* (-1.863)
GOV	(+)	107398*** (3.463)	101239*** (3.278)	99426*** (3.365)
USGSP1	(+)	108583*** (2.912)	108492*** (2.788)	98669*** (2.810)
$LINK_1$(4-digit)	***(+)***	***372618*** (2.009)***	-	-
$LINK_1$(3-digit)	***(+)***	-	***238245** (1.727)***	-
$LINK_1$(2-digit)	***(+)***	-	-	***266737*** (2.401)***
LAMDA	(+)	172376** (2.566)	170228** (2.488)	163905** (2511)
Adjusted R-squared		0.36	0.36	0.34
F statistics		6.71***	6.47***	6.87***
Sample size		170	170	170

Note: 1) Sectoral dummies (ISIC 38) are omitted from model III due to its high correlation with $LINK_1$ (see appendix 6-2-1). The model cannot be estimated without the removal of this dummy.
2) Other details are as in table 5-8 (Chapter V).

Table 6-5: Pooled OLS Models with Selectivity Bias Adjustments

Linkage Variable: $LINK_1$

Dependent Variable: FDINUM

Independent Variable	Expected sign	Estimated coefficients and asymptotic *t*-statistics		
		Model I	Model II	Model III
CONSTANT	(?)	-41.77*** (-4.665)	-42.12*** (-4.647)	-37.03*** (-4.511)
JAPLAB	(+)	38.85*** (4.706)	42.66*** (4.847)	39.75*** (4.473)
MARK	(+)	20.87*** (5.831)	22.37*** (5.963)	23.48*** (5.907)
TRANS	(-)	-2.76 (-0.823)	-4.55 (-1.306)	-3.82 (-1.121)
GOV	(+)	10.40*** (4.681)	9.70*** (4.326)	9.04*** (4.319)
USGSP1	(+)	11.43*** (4.056)	11.18*** (3.946)	11.07*** (3.960)
$LINK_1$(4-digit)	***(+)***	***34.34*** (2.367)***	-	-
$LINK_1$(3-digit)	***(+)***	-	***33.43**** (2.798)***	-
$LINK_1$(2-digit)	***(+)***	-	-	***21.38 (1.399)***
LAMDA	(+)	13.53*** (2.683)	13.27*** (2.630)	13.03** (2.529)
Adjusted R-squared		0.53	0.53	0.50
F statistics		12.31***	12.35***	12.71***
Sample size		170	170	170

Note: Details are as in table 6-4

By way of illustration, firms in the ISIC 3843 industry not only purchase / sell intermediate products from / to other pre-existing firms in the motor vehicle industry but also from / to those firms in related industries classified under the same sub-sector (ISIC 384) or the same broad sector (ISIC 38)[14].

Referring back to table 6-4 and 6-5, it may be observed that the estimated signs and significance levels of other locational coefficients (JAPLAB, MARK, TRANS, GOV, and USGSP1) are similar to those obtained from the models without $LINK_1$ (see table 5-8 in chapter V). However, the explanatory powers of the transportation costs variable (TRANS) slightly decrease when $LINK_1$ at the 4-digit level is incorporated into the models (whether with FDICAP and FDINUM as the dependent variable). This may be explained by the fact that some Japanese firms directly purchased / sold their key intermediate products with other pre-exiting Japanese firms in Thailand, instead of importing (exporting) those intermediates from (to) Japan. Therefore, the role of transportation costs became less significant for them[15].

When comparing the adjusted R-squared statistics showed in tables 6-4 and 6-5 (the unrestricted models with $LINK_1$) to those presented in table 5-8 (the restricted models without $LINK_1$), only a small change is observed. Table 5-8 shows that the adjusted R-squared statistics obtained from the estimated

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[14] It is observed that $LINK_1$ is correlated with some of the other explanatory variables. However, when estimating the models without those variables, the results are still robust (see appendices 6-2 and 6-3).

[15] However, the information used for transportation costs is the costs of exporting final products back to Japan. Therefore, caution must be used when making an inference regarding the influence of transportation costs incurred when importing the intermediate products from Japan.

models with FDICAP and FDINUM as the dependent variable are 0.35 and 0.51, while table 6-4 and 6-5 show that those are about 0.36 and 0.53 respectively. When looking further at the marginal effect of $LINK_1$ on FDI (see appendix 6-5), it may be observed that the effect of $LINK_1$ (at the industry level) is relatively small as compared to the effects of other locational factors such as labour intensity. A 1% change in the intensity of Japanese intra-industrial linkage leads to a less than 0.50% change in the amount of share capital / number of Japanese companies across manufacturing industries in Thailand. With the small increase in the adjusted R-squared statistics and the small marginal effect of $LINK_1$, one may question whether $LINK_1$ should be included in the empirical model. To test this, the F-test for a linear restriction is performed[16]. It is found that the unrestricted models with $LINK_1$ included ($LINK_1$ measured at the 4-and 3-digit levels) are preferable to the restricted models without $LINK_1$ included (both for the models with FDICAP and FDINUM as the dependent variable). Hence, despite the small marginal effect of $LINK_1$, the input-output linkages among Japanese firms within the same industry (or within the same sub-sector) are still relevant in explaining the inter-industrial variation in Japanese FDI in Thailand.

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[16] The F statistic is computed as $[(RSS_r - RSS_u)/(N-1)] / [RSS_u / (NT-N-K)]$, where RSS_r is the residual sum of squares from the restricted model (the model *without* $LINK_1$) and RSS_u is the residual sum of squares from the unrestricted model (the model *with* $LINK_1$). N-1 is the number of restrictions, and (NT-N-K) is the number of degrees of freedom in the unrestricted model. The statistic has the F distribution with [(N-1), (NT-N-K)] degrees of freedom. The null hypothesis is that the restricted model is to be preferred to the unrestricted one. In this case, the null hypothesis will be rejected at the 5% level if the F statistic exceeds the critical value of 3.84 with (1,152) degree of freedom. It is found that the F-statistics computed from the estimates of the unrestricted models with $LINK_1$ measured at the 4- and 3-digits (whether with FDICAP and FDINUM as the dependent variable) exceed this critical value.

6.4.2 Inter-industrial Linkage

Table 6-6 below shows a summary of the effects of input-output linkages among Japanese firms *between* industries / sectors. It is apparent that $LINK_2$ variables, whether measured at the industry level (4-digit) or the sub-sector level (3-digits), are positively and significantly correlated with both FDINUM and FDICAP[17]. These confirm the hypothesis of inter-industrial linkages shown in table 6-1. However, there is no evidence supporting the effect of $LINK_2$ when it is measured at the 2-digit level.

Table 6-6: The Effects of $LINK_2$ on the Extent of FDI (Summary of Estimated Results)

$LINK_2$	Share capital / Number of Investment	
	FDICAP (4-digit)	FDINUM (4-digit)
Industry level (the 4-digit)	✔**	✔***
Sub-sectoral level (the 3-digit)	✔*	✔**
Sectoral level (the 2-digit)	✔	✔

Note: 1) ✔ means an estimated sign is consistent with the expected sign (+)
2) ***denotes 1%, ** denotes 5%, and * denotes 10% levels of significance

The significant coefficients for $LINK_2$ at the 4-digit level imply that Japanese firms undertaking FDI in Thai industry j tended to sell / purchase their intermediate products to / from pre-existing Japanese firms outside that industry. For example, firms in the ISIC 3843 tend to sell / purchase intermediate products to / from other pre-existing firms outside that industry (outside ISIC 3843).

[17] It can be seen from appendix 6-4-2 and 6-4-3 that the significance levels of these coefficients are robust even when both $LINK_1$ and $LINK_2$ are included in the estimated model.

Table 6-7: Pooled OLS Models with Selectivity Bias Adjustments

Linkage Variable: $LINK_2$

Dependent Variable: FDICAP

Independent Variable	Expected sign	Estimated coefficients and asymptotic *t*-statistics		
		Model I	Model II	Model III
CONSTANT	(?)	-461625*** (-3.594)	-469640*** (-3.720)	-354017*** (-3.646)
JAPLAB	(+)	335939*** (2.930)	325072*** (2.840)	317125*** (2.852)
MARK	(+)	266914*** (4.212)	263601*** (4.143)	260416*** (4.105)
TRANS	(-)	-108698** (-2.454)	-105359** (-2.407)	-90364** (-2.085)
GOV	(+)	99967*** (3.173)	98436*** (3.160)	94334*** (3.330)
USGSP1	(+)	105162*** (2.647)	105371*** (2.688)	101239*** (2.827)
$LINK_2$(4-digit)	***(+)***	***55696*** (2.307)***	-	-
$LINK_2$(3-digit)	***(+)***	-	***91025** (2.890)***	-
$LINK_2$(2-digit)	***(+)***	-	-	***60845 (0.655)***
LAMDA	(+)	168240** (2.427)	164512** (2.416)	158178** (2.497)
Adjusted R-squared		0.35	0.35	0.33
F statistics		6.41***	6.43***	6.75***
Sample size		170	170	170

Note: Details are as in table 6-4.

Table 6-8: Pooled OLS Models with Selectivity Bias Adjustments

Linkage Variable: $LINK_2$

Dependent Variable: FDINUM

Independent Variable	Expected sign	Estimated coefficients and asymptotic *t*-statistics		
		Model I	Model II	Model III
CONSTANT	(?)	-43.38*** (-4.532)	-43.04*** (-4.590)	-37.07*** (-4.007)
JAPLAB	(+)	42.14*** (4.634)	40.65*** (4.495)	40.37*** (4.457)
MARK	(+)	24.79*** (6.185)	24.02*** (5.944)	23.75*** (5.890)
TRANS	(-)	-6.59** (-2.032)	-5.75* (-1.702)	-4.73 (-1.281)
GOV	(+)	9.37*** (4.027)	9.55*** (4.094)	9.50*** (4.325)
USGSP1	(+)	10.45*** (3.576)	11.10*** (3.731)	11.14*** (3.946)
$LINK_2$(4-digit)	**(+)**	***9.90**** ***(3.271)***	-	-
$LINK_2$(3-digit)	**(+)**	-	***8.74***** ***(1.971)***	-
$LINK_2$(2-digit)	**(+)**	-	-	***9.81*** ***(0.640)***
LAMDA	(+)	12.88*** (2.501)	12.78** (2.459)	12.64** (2.518)
Adjusted R-squared		0.53	0.53	0.50
F statistics		12.40***	11.68***	12.51***
Sample size		170	170	170

Note: Details are as in table 6-4.

However, as discussed earlier, these significant coefficients for $LINK_2$ (the 4-digit) do not indicate how 'far' outside. In other words, the coefficients only indicate that firms in the ISIC 3843 industry carries out transactions with other pre-existing firms outside that industry (i.e. firm in the ISIC 3819 industry). Yet, it is not clear whether they also did with those firms in industries classified outside the ISIC 38 (i.e. firms in the ISIC 3220 industry). Using the alternative measures ($LINK_2$ measured at the 3 and 2-digit levels), it is apparent that firms in the ISIC 3843 industry also carried out intermediate transactions with other pre-existing Japanese firms outside the 'sub-sector' under which that industry is classified (i.e. outside the ISIC 384). Yet, they did not carry out any transactions with those firms outside the 'sector' under which such industry is classified (i.e. no transaction outside the ISIC 38). In other words, Japanese firms undertaking FDI in the ISIC 3843 industry did not tend to sell / purchase intermediate products to / from other pre-existing firms in the ISIC 3220 industry.

The insignificant coefficients for $LINK_2$ measured at the sectoral level (the 2-digit) are possibly explained by the fact that firms in different broad sectoral groups are less dependent on each other for their intermediate sales and purchases. For example, firms in the motor vehicle industry (ISIC 3843) are more likely to carry out intermediate transactions with their counterparts in related industries classified under the same sector (ISIC 38) than those under different sectors (e.g. ISIC 32 - textile products). Hence, when firms in the ISIC 32 sector undertake FDI overseas, Japanese firms in the motor vehicle

industry (being classified in the ISIC 38) are unlikely to follow those firms there, since they are not tightly linked to one another.

Referring back to section 6.3 (qualitative analyses), the correlation coefficients between FDI (FDICAP and FDINUM) and $LINK_2$ (the 4-and 3-digits level) are quite low (less than 0.10), indicating a weak linear association between the two. However, as evidenced by the estimated results presented in table 6-7 and 6-8, the coefficients for $LINK_2$ variables are statistically significant, suggesting a partial effect of $LINK_2$ on the extent of Japanese FDI. This could possibly be explained by the effects of $LINK_2$ becoming more apparent after controlling for other locational effects[18].

As with the adjusted R-squared statistics obtained from the models with $LINK_1$ (table 6-4 and 6-5), those obtained from the models with $LINK_2$ (table 6-7 and 6-8) are around 0.35 (for the models with FDICAP as the dependent variable) and 0.53 (for the models with FDINUM as the dependent variable). Like the marginal effect of $LINK_1$, that of $LINK_2$ (at the industry level) on Japanese FDI is relatively small as compared to those of other locational variables (see appendix 6-5). A 1% change in the intensity of Japanese inter-industrial linkage leads to about a 0.50% change in both the amount and number of Japanese FDI stocks undertaken across Thai manufacturing industries. However, when performing the F-test for a linear restriction, it is

[18] In supporting this argument, the correlation coefficients between the regression residuals taken from the restricted models without $LINK_2$ (table 5-8) and $LINK_2$ (measured at the 4- and 3-digits level) are computed. It is found that the correlation coefficients between the regression residuals and $LINK_2$ are higher than that between Japanese FDI and $LINK_2$. The former is found to be between 0.15 and 0.20 while the latter is between 0.03 and 0.09.

found that the unrestricted models with $LINK_2$ (measured at the 4- and 3-digits) are preferred to the restricted ones (the models without $LINK_2$).

In summary, the main inference to be drawn from tables 6-3 to 6-6 is that Japanese firms in industry j in Thailand tended to carry out intermediate transactions with other pre-existing Japanese firms in the same industry as well as in related industries that are classified under the same sector. Beyond this sectoral level (the 2-digit level), there is no evidence indicating that Japanese firms in *sector j* came to sell / purchase intermediate products with other pre-existing firms in *sector i* in Thailand.

6.4.3 Disentangling the Effects of $LINK_2$

So far, it has been argued that Japanese firms undertaking FDI in industry j in Thailand tended to sell / purchase their intermediate inputs and outputs to / from Japanese counterparts in that industry (4-digit level), as well as in other related industries classified under the same sector (3-digit). However, it remains unclear whether the motive for those firms coming was to sell or to purchase their intermediate products.

Given the data used, it is not possible to disaggregate the information on intermediate transactions carried out by firms *within* industry j into intermediate sales and intermediate purchases. However, it is possible to do so for the intermediate transactions carried out *between* firms in industry j and their counterparts outside that industry. In other words, $LINK_2$ can be disaggregated into:

$LINK_2$ (sale) = *Value of intermediate sales of industry j to all manufacturing firms outside that industry as a proportion of the total production of industry j*

and

$LINK_2$(purchase)= *Value of intermediate purchases of industry j from all manufacturing firms outside that industry as a proportion of the total production of industry j*

Both variables are measured at the 4- and 3-digit levels[19]. Tables 6-9 and 6-10 present the estimated coefficients for $LINK_2$ (*sale*) and $LINK_2$ (*purchase)* measured at the 4- and 3-digit levels with respect to the models with FDICAP and FDINUM as the dependent variable. All the coefficients for $LINK_2$ (*sale*) are statistically significant at the 10% level while those for $LINK_2$ (*purchase*) are statistically insignificant across the estimated models. Evidently, the significant results suggest that Japanese firms undertaking FDI in Thai industry j tended to sell rather than to purchase intermediate products with other pre-existing firms there. These findings support the earlier argument that large Japanese manufacturing producers may attempt to transplant their production networks to a host country by persuading their suppliers to undertake FDI with them. This is due to the lack of local intermediate supplies, the high costs of transportation, and the unique Japanese style of management that require prompt deliveries and closed co-ordination.

[19] They are not measured at the 2-digit level because the previous results indicate no effect of $LINK_2$ at the 2-digit level on FDI.

Table 6-9: Pooled OLS Models with Selectivity Bias Adjustments

Linkage Variable: $LINK_2$ (Sale) and $Link_2$ (Purchase)

Dependent Variable: FDICAP

Independent Variable	Expected sign	Estimated coefficients and asymptotic *t*-statistics	
		Model I (4-digit)	Model II (3-digit)
CONSTANT	(?)	-462665*** (-3.786)	-476354*** (-4.009)
JAPLAB	(+)	338979*** (2.794)	320483*** (2.624)
MARK	(+)	268503*** (4.236)	263497*** (4.136)
TRANS	(-)	-109973*** (-2.660)	-105364** (-2.421)
GOV	(+)	98450*** (3.166)	98569*** (3.201)
USGSP1	(+)	105069*** (2.635)	105219*** (2.683)
$LINK_2$ (sale)	**(+)**	***65638*** (2.488)***	***84024** (1.803)***
$LINK_2$ (Purchase)	**(+)**	***56960 (0.580)***	***21161 (0.781)***
LAMDA	(+)	168170** (2.433)	165117** (2.479)
Adjusted R-squared		0.35	0.34
F statistics		6.11***	6.04***
Sample size		170	170

Note: Details are as in table 5-8.

Table 6-10: Pooled OLS Models with Selectivity Bias Adjustments

Linkage Variable: $LINK_2$ (Sale) and $Link_2$ (Purchase)

Dependent Variable: FDINUM

Independent Variable	Expected sign	Estimated coefficients and asymptotic *t*-statistics	
		Model I (4-digit)	Model II (3-digit)
CONSTANT	(?)	-42.49*** (-4.496)	-47.64*** (-5.263)
JAPLAB	(+)	42.52*** (4.533)	37.51*** (4.229)
MARK	(+)	24.71*** (6.125)	23.95*** (6.100)
TRANS	(-)	-6.33* (-1.847)	-5.75* (-1.843)
GOV	(+)	9.35*** (3.993)	9.64*** (4.382)
USGSP1	(+)	10.81*** (3.668)	11.00*** (4.001)
$LINK_2$ (sale)	***(+)***	***8.77**** ***(3.208)***	***9.38**** ***(2.781)***
$LINK_2$ (Purchase)	***(+)***	***5.69*** ***(0.918)***	***3.95*** ***(0.865)***
LAMDA	(+)	13.01** (2.462)	13.19*** (2.821)
Adjusted R-squared		0.53	0.52
F statistics		11.61***	11.35***
Sample size		170	170

Note: Details are as in table 5-8.

Referring back to the descriptive analysis (chapter II), the average size of investment undertaken by Japanese firms in Thailand was found to be relatively small as compared to that in DMEs. Also, it was argued that much FDI in Thailand might have been undertaken by relatively small- and medium-size firms (Board of Investment of Thailand, 1995). Evidently, the present findings further suggest that these small- and medium-size Japanese firms might have been manufacturing suppliers that actually came to serve large Japanese intermediate demands in Thailand. In other words, they came to supply parts and components to large Japanese assembling firms.

On comparing this with previous empirical analyses (Anuroj, 1995; Maruhashi, 1995; Ratanavichien, 1999), the findings of the former lend support to those of the latter; a significant relationship between the presence of Japanese manufacturing assemblers and intermediate suppliers in Thailand is found. However, the main distinction between the two analyses is that the present analysis is conducted at the industry level while the previous analyses were conducted at the firm level (i.e. they used the sample of Japanese firms in particular industries). Thus, the evidence presented here suggests further that the effects of Japanese input-output linkages on FDI in Thailand are not confined to particular industries but operate systematically across all manufacturing industries.

6.5 Conclusions

The aim of this chapter was to examine the effects of the input-output linkages among manufacturing firms in Japan on the extent of investment undertaken across manufacturing industries in Thailand. The concepts of intra- and inter-industrial linkages were first introduced and the measures used for these linkage variables were described. From the qualitative analyses, it was found that the correlation coefficients between Japanese FDI and the intra-industrial linkages (measured at the industry level) were relatively high, indicating a strong linear association between the two variables. By contrast, the linear association between Japanese FDI and the inter-industrial linkages was found to be relatively weak, whether the latter was measured at the industry, sub-sectoral, or sectoral levels. With regard to the findings from the quantitative analyses, three main conclusions can be drawn.

Firstly, Japanese firms undertaking FDI in a given industry in Thailand tended to carry out intermediate transactions with other pre-existing Japanese firms in that industry, as well as in related industries which are classified under the same sector. Yet, beyond this sectoral-level (the 2-digit ISIC level), there was no evidence indicating that Japanese firms in a broadly defined sector j (e.g. ISIC 38) tended to sell / purchase intermediate products with other firms in a broadly defined sector i (e.g. ISIC 32).

Secondly, the significant relationship between $LINK_2$ (sales) and the extent of Japanese FDI implies that Japanese firms that have undertaken FDI in Thailand tend to sell rather than to purchase their intermediate products to /

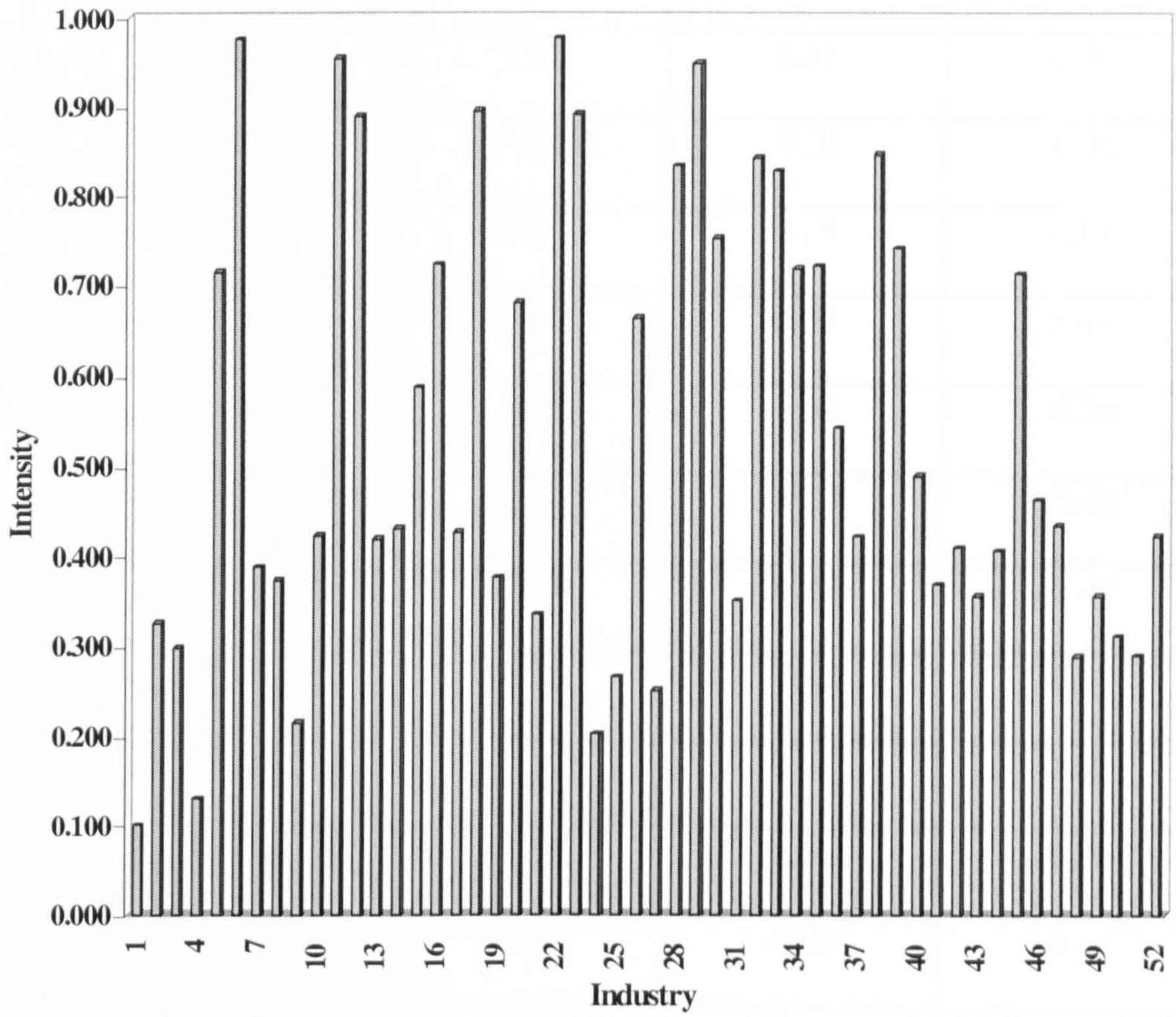
from other pre-existing Japanese firms there. These empirical findings lend support to the common view that manufacturing firms from Japan are likely to follow large manufacturing producers overseas in order to supply them with intermediate products. Since the former aim to serve the large intermediate demands of the latter, the costs of transporting the processed products back to Japan might not be a major concern. Likewise, since the latter could directly purchase parts of their key intermediate inputs from the former, the costs of importing those intermediates from Japan might not be very significant for them[20].

Lastly, although it was shown that the input-output linkages among Japanese firms partially influenced the pattern of Japanese FDI in Thailand over the past decades, the marginal effects of these variables were found to be relatively small compared to those of other locational determinants. Thus, the locational factors previously examined (see chapter V) appeared to play more important roles in determining the extent of vertically integrated FDI, which has been the active form of FDI in Asian developing countries over recent decades.

[20] However, the costs of transportation are still important for firms that do not supply / source intermediate outputs / inputs to / from other Japanese firms in Thailand.

Appendix 6-1

Pattern of $LINK_2$ across Japanese Manufacturing Industries (4-digit ISIC Level)



Appendix 6-2-1

The Correlation Coefficients between $LINK_1$ and Other Variables

	$LINK_1$ (4-digit)	$LINK_1$ (3-digit)	$LINK_1$ (2-digit)
JAPLAB	-0.16	-0.20	-0.15
MARK	0.56	0.41	0.40
TRANS	-0.39	-0.37	-0.45
GOV	0.09	0.15	0.13
USGSP1	0.05	0.09	0.05
LAMDA	-0.38	-0.34	-0.38
DUMMY ISIC 31	-0.25	-0.33	-0.48
DUMMY ISIC 32	-0.32	-0.37	-0.49
DUMMY ISIC 33	-0.16	-0.12	-0.17
DUMMY ISIC 34	-0.02	0.11	0.10
DUMMY ISIC 35	-0.03	0.02	-0.05
DUMMY ISIC 36	-0.06	-0.09	-0.06
DUMMY ISIC 37	0.35	0.33	0.43
DUMMY ISIC 38	0.45	0.45	0.71

Appendix 6-2-2

Pooled OLS Models with Sub-groups of Independent Variables

Linkage Variable: $LINK_1$

Dependent Variable: FDICAP

Independent Variable	Expected sign	Estimated coefficients and asymptotic *t*-statistics		
		Model I	Model II	Model III
CONSTANT	(?)	-97868** (-2.388)	-84298** (-2.295)	-83002** (-2.167)
JAPLAB	(+)	73117 (1.195)	77343 (1.495)	26311 (0.495)
GOV	(+)	44898** (3.018)	44636*** (3.281)	50408*** (3.644)
USGSP1	(+)	32440* (1.920)	28779** (2.309)	37080*** (2.891)
$LINK_1$(4-digit)	*(+)*	*799255**** *(3.368)*	-	-
$LINK_1$(3-digit)	*(+)*	-	*615286**** *(3.209)*	-
$LINK_1$(2-digit)	*(+)*	-	-	*561405**** *(3.146)*
Adjusted R-squared		0.21	0.13	0.10
F statistics		8.56***	5.57***	4.15***
Sample size		170	170	170

Note: 1) All sectoral dummies, MARK, TRANS, and LAMDA are excluded.

2) Other details are as in table 5-8

Appendix 6-2-3

Pooled OLS Models with Sub-groups of Independent Variables

Linkage Variable: $LINK_1$

Dependent Variable: FDINUM

Independent Variable	Expected sign	Estimated coefficients and asymptotic *t*-statistics		
		Model I	Model II	Model III
CONSTANT	(?)	-10.31*** (-2.950)	-9.71*** (-2.843)	-8.56** (-2.543)
JAPLAB	(+)	14.40** (2.446)	15.71*** (2.767)	9.98* (1.755)
GOV	(+)	5.31*** (4.277)	5.19*** (4.740)	5.83*** (5.265)
USGSP1	(+)	5.64*** (3.173)	5.11*** (3.522)	6.17*** (4.772)
$LINK_1$(4-digit)	*(+)*	*67.20*** (4.187)*	-	-
$LINK_1$(3-digit)	*(+)*	-	*57.10*** (3.561)*	
$LINK_1$(2-digit)	*(+)*	-	-	*42.63*** (3.210)*
Adjusted R-squared		0.31	0.11	0.17
F statistics		13.76***	10.48***	6.93***
Sample size		170	170	170

Note: 1) All sectoral dummies, MARK, TRANS, and LAMDA are excluded.

2) Other details are as in table 5-8

Appendix 6-3-1

The Correlation Coefficients between $LINK_2$ and Other Variables

	$LINK_2$ (4-digit)	$LINK_2$ (3-digit)	$LINK_2$ (2-digit)
JAPLAB	-0.06	-0.10	-0.09
MARK	-0.10	-0.02	0.19
TRANS	0.05	-0.04	-0.20
GOV	0.12	0.18	0.12
USGSP1	0.15	0.11	0.07
LAMDA	-0.08	-0.14	-0.27
DUMMY ISIC 31	-0.30	-0.48	-0.70
DUMMY ISIC 32	0.15	0.23	0.38
DUMMY ISIC 33	0.02	-0.06	-0.03
DUMMY ISIC 34	0.06	0.06	0.12
DUMMY ISIC 35	0.26	0.40	0.35
DUMMY ISIC 36	0.04	0.09	-0.16
DUMMY ISIC 37	0.16	0.27	0.56
DUMMY ISIC 38	-0.14	-0.17	-0.09

Appendix 6-3-2

Pooled OLS Models with Sub-groups of Independent Variables

Linkage Variable: $LINK_2$

Dependent Variable: FDICAP

Independent Variable	Expected sign	Estimated coefficients and asymptotic *t*-statistics		
		Model I	Model II	Model III
CONSTANT	(?)	-249326*** (-3.635)	-260521*** (-3.918)	-214891*** (-3.294)
JAPLAB	(+)	182675*** (2.533)	187917*** (2.646)	172291** (2.332)
MARK	(+)	236323*** (4.169)	235314*** (4.132)	233499*** (4.013)
TRANS	(+)	-84731*** (-2.331)	-82922*** (-3.254)	-83866** (-2.135)
GOV	(+)	88318*** (3.411)	86836*** (3.330)	91137*** (3.597)
USGSP1	(+)	67478*** (2.473)	70899*** (2.618)	71882*** (2.891)
$LINK_2$(4-digit)	***(+)***	***44256**** ***(1.688)***	-	-
$LINK_2$(3-digit)	***(+)***	-	***59680**** ***(1.881)***	-
$LINK_2$(2-digit)	***(+)***	-	-	***-29783*** ***(-0.378)***
LAMDA	(+)	116298*** (2.732)	117736*** (2.774)	112748*** (2.759)
Adjusted R-squared		0.34	0.34	0.33
F statistics		10.72***	10.75***	10.56***
Sample size		170	170	170

Note: 1) Sectoral dummies are excluded.

2) Other details are as in table 5-8.

Appendix 6-3-3

Pooled OLS Models with Sub-groups of Independent Variables

Linkage Variable: $LINK_2$

Dependent Variable: FDINUM

Independent Variable	Expected sign	Estimated coefficients and asymptotic *t*-statistics		
		Model I	Model II	Model III
CONSTANT	(?)	-24.04*** (-4.647)	-24.01*** (-4.684)	-20.03*** (-4.196)
JAPLAB	(+)	24.16*** (4.541)	24.18*** (4.488)	28.58*** (4.139)
MARK	(+)	20.89*** (5.633)	20.51*** (5.519)	20.26*** (5.447)
TRANS	(+)	-4.97** (-2.186)	-4.61** (-1.995)	-4.62* (-1.878)
GOV	(+)	8.13*** (4.248)	8.15*** (4.281)	8.64*** (4.708)
USGSP1	(+)	6.57*** (3.406)	7.34*** (3.722)	7.75*** (4.122)
$LINK_2$(4-digit)	***(+)***	***8.06**** ***(3.931)***	-	-
$LINK_2$(3-digit)	***(+)***	-	***6.76***** ***(2.318)***	-
$LINK_2$(2-digit)	***(+)***	-	-	***-4.88*** ***(-0.498)***
LAMDA	(+)	7.57** (2.547)	7.64*** (2.988)	7.25*** (2.586)
Adjusted R-squared		0.48	0.47	0.46
F statistics		18.81***	18.07***	17.44***
Sample size		170	170	170

Note: Other details are as in appendix 6-3-2

Appendix 6-4-1

The Correlation Coefficients between $LINK_1$ and $LINK_2$ at Different Levels of Industrial Aggregation

Level of Aggregation	Correlation Coefficient
$LINK_1$ (4-digit) and $LINK_2$ (4-digit)	-0.07
$LINK_1$ (3-digit) and $LINK_2$ (3-digit)	0.13
$LINK_1$ (2-digit) and $LINK_2$ (2-digit)	0.32

Appendix 6-4-2

Pooled OLS Models with Selectivity Bias Adjustments
Linkage Variable: $LINK_1$ and $LINK_2$
Dependent Variable: FDICAP

Independent Variable	Expected sign	Estimated coefficients and asymptotic *t*-statistics	
		Model I (4-digit level)	Model II (3-digit level)
CONSTANT	(?)	-474354*** (-3.753)	-475283*** (-3.816)
JAPLAB	(+)	312193*** (3.095)	335397*** (2.960)
MARK	(+)	235891*** (4.359)	253831*** (4.032)
TRANS	(-)	-80675** (-2.161)	-99098** (-2.281)
GOV	(+)	101671*** (3.255)	96358*** (3.131)
USGSP1	(+)	99321*** (2.692)	101453*** (2.644)
$LINK_1$	(+)	***386692*** (2.069)*	***221644** (1.628)*
$LINK_2$	(+)	***68610**** (2.942)*	***82625**** (2.826)*
LAMDA	(+)	168989** (2.587)	164068** (2.477)
Adjusted R-squared		0.37	0.35
F statistics		6.55***	6.19***
Sample size		170	170

Note: Details are as in table 5-8.

Appendix 6-4-3

Pooled OLS Models with Selectivity Bias Adjustments
Linkage Variable: $LINK_1$ and $LINK_2$
Dependent Variable: FDINUM

Independent Variable	Expected sign	Estimated coefficients and asymptotic *t*-statistics	
		Model I (4-digit level)	Model II (3-digit level)
CONSTANT	(?)	-44.00*** (-5.011)	-43.05*** (-4.941)
JAPLAB	(+)	39.73*** (4.973)	42.14*** (4.901)
MARK	(+)	21.68*** (6.100)	22.61*** (6.044)
TRANS	(-)	-3.72 (-1.262)	-4.85 (-1.519)
GOV	(+)	9.67*** (4.368)	9.25*** (4.100)
USGSP1	(+)	10.26*** (3.783)	10.54*** (3.743)
$LINK_1$	***(+)***	***36.13*** (2.544)***	***31.91*** (2.703)***
$LINK_2$	***(+)***	***8.71*** (3.677)***	***7.54* (1.721)***
LAMDA	(+)	13.10*** (2.754)	12.71*** (2.628)
Adjusted R-squared		0.55	0.53
F statistics		12.74***	11.86***
Sample size		170	170

Note: Details are as in table 5-8.

Appendix 6-5

Marginal Effects of the Independent Variables on the Extent of Japanese FDI (% Change)

Dependent Variable	Independent variable	
	FDICAP	FDINUM
JAPLAB	1.73	1.57
MARK	1.35	0.88
TRANS	-0.63	-0.17
GOV	1.46	1.01
$USGSP_1$	1.34	1.01
$LINK_1$ *(4-digit)*	0.46	0.30
$LINK_2$ *(4-digit)*	0.50	0.46

Note: 1) The elasticity (%) is computed as according to the procedure described under table 5-9 (chapter V).
2) The marginal effects of $LINK_1$ (4-digit) and other locational variables are computed using the estimated coefficients presented in table 6-4 (FDICAP) and 6-5 (FDINUM). For, those of $LINK_2$ (4-digit), they are computed using the estimated coefficients presented in table 6-7 and 6-8

Chapter VII

Conclusion, Implication, and Future Research

Chapter VII

Conclusions, Implications, and Future Research

7.1 Introduction

As discussed in chapter I, the main motivation behind this thesis is the lack of the industry-level analyses of FDI determinants in the context of non-industrialised countries. It is not widely understood how FDI is distributed across manufacturing activities in those countries, i.e. whether it tends to be distributed in a random fashion or concentrated in particular manufacturing activities. More importantly, the principal factors governing FDI distribution across Asian industries over recent decades are not fully addressed by previous studies.

The aim of this thesis is to investigate the effects of locational and linkage factors on the inter-industry distribution of Japanese FDI in an Asian industrialising country, specifically in the context of Thailand. Firstly, the pattern of Japanese FDI across manufacturing activities in Thailand was described, then the principal factors influencing that FDI pattern were discussed, and finally the effects of those factors were examined quantitatively using a cross-section econometric methodology.

The remainder of this chapter is organised as follows. Section 7.2 summarises the main findings of this study, section 7.3 draws some implications from those findings, and finally section 7.4 provides suggestions for further research works.

7.2 Summary

The limited availability and the inconsistency of FDI data are commonly encountered by FDI studies for developing countries. As with others, the present study was faced with such data problems. Chapter II began by describing the procedure used to compile the industry-level data on Japanese FDI in Thailand. Firstly, the information on Japanese companies was gathered from different sources, namely the Board of Investment of Thailand, the Japanese Chamber of Commerce (Thailand), the directory of Japanese factories in Thailand, the Japanese-Thailand trade directory, and the survey of Japanese companies in Asia by JETRO (1997 eds.). Because the information acquired is inconsistent across data sources, it was cross-checked at the Department of Commercial Registration (DCR) (Ministry of Commerce). The DCR keeps officially declared records of all business companies registered in Thailand, including establishment date, core activities of companies, authorised share capital, changes in the authorised share capital (from one year to another), and percentage of foreign ownership. Finally, the information at the company level (authorised share capital) was aggregated up to the industry-level, classified according to the 4-digit ISIC level. This produced a new and more reliable database on FDI in an Asian industrialising country.

In the descriptive analysis, three main findings were identified. Firstly, Japanese 'outward' FDI was mostly concentrated in the electrical machinery and transport equipment sectors. These sectors are characterised as multi-production process sectors with different production stages requiring different types of factor inputs (Tran Van Thu, 1989; Hatch and Yamamura, 1996; Machado, 1996; Lindblad, 1998). It is likely that Japanese firms seek to locate different manufacturing activities in a wide range of countries where the corresponding factor inputs used are abundant, i.e. skilled labour-intensive activities are located in DMEs while unskilled labour-intensive activities are located in DCs. Secondly, on comparing Japanese 'outward' FDI in Asia with that in the USA / EU, it was found that the average size of investment undertaken in the former was much smaller than that in the latter. The differences in the size of investment may imply that different types of FDI activities were being carried out and also that different factors may have governed the patterns of these FDI activities. Thirdly, it was found that Japanese FDI was not evenly distributed across manufacturing industries in Thailand but was mainly concentrated in the fabricated metal, industrial machinery, and electrical equipment sector (ISIC 38). Similarly, it was observed that non-Japanese FDI in Thailand was concentrated in this sector. It is thus possible that locational-specific factors of Thailand played important roles in influencing this manufacturing pattern of Japanese and non-Japanese FDI. Within the ISIC 38 sector, Japanese FDI varied greatly from one sub-sector (or industry) to another. Some capital- / technology-intensive industries such as rail equipment

(ISIC 3842) and aircraft (ISIC 3845) did not receive any FDI while other labour-intensive industries, like TV, radio, and communication equipment (ISIC 3832) and motor vehicles (ISIC 3843) received disproportionately large amounts of FDI.

Empirically, the main research questions to be answered are "Why was FDI undertaken in some but not other industries?", and "Why did some industries receive greater FDI than others?". Before seeking to identify and investigate the determinants of FDI composition, chapter III reviewed and evaluated different theories of FDI determinants in order to identify an appropriate theoretical approach for the present analysis. The chapter classified FDI theories into three broad groups, namely the capital-market, firm / industry-organisation, and locational approaches, and subsequently evaluated them in the light of their explanatory power about the characteristics, motivations, and directions of FDI. In this review it was found that different theories tend to focus on particular aspects of FDI determinations. For example, the firm / industry-organisation approach concentrates on the characteristics of FDI while the locational approach focuses more on the directional aspect of FDI, i.e. where FDI is directed. Arguably, a suitable theoretical basis for an empirical analysis depends largely on the specific aims of the analysis, i.e. whether it seeks to examine the characteristics, the motivation, or the direction of FDI.

In the context of the present analysis, the focus is on the directional aspect of FDI across manufacturing activities in an industrialising country, and thus it is argued

that theories using the capital-market approach were inappropriate. This is because those theories focus on the macro-aspect of FDI determinants, which tend to affect short- run flows rather than long-run stocks of FDI. Further, theories using the firm / Industry-organisation approach are not suitable for the present analysis, since they neglect the differences in the objectives of a multinational firm when undertaking FDI across several countries. As argued in chapter III, multinational firms operating in DMEs tend to be horizontally integrated, aiming to serve the large markets of those countries. Potentially, activities carried out by these firms will be associated with the monopolistic characteristics of the industry in which they operate. On the other hand, multinational firms operating in non-industrialised countries tend to be vertically integrated, aiming to exploit differences in the resource (or factor) endowments across locations rather than to serve the relatively small markets of those countries. Referring to the descriptive analysis (chapter II), it was found that the manufacturing sectors in which Japanese outward FDI is concentrated is the electrical machinery and transport equipment sectors, which tend to be multi-product in structure. Thus, Japanese firms may seek to establish production plants in a wide range of locations according to local endowments. Further, it was apparent in chapter II that the manufacturing pattern of Japanese FDI in Thailand was similar to that of non-Japanese FDI in Thailand, with much investment was undertaken in the fabricated metal, industrial machinery, and electrical equipment sector (ISIC 38). Potentially, locational-specific factors of Thailand such as endowments and policy factors might have been the principal determinants of this industrial pattern of

Japanese and Non-Japanese FDI. Hence, it was concluded that the locational approach to the determinants of FDI was more suitable than other approaches. In line with the eclectic paradigm proposed by Dunning (1973, 1981, and 1988), the ownership and internalisation advantages of Japanese FDI were taken as given, and the focus of this research was on investigating the influence of the locational determinants of FDI.

Chapter IV reviewed the empirical studies that have tested the hypotheses derived from theories using the capital market, the firm / industry-organisation, and the locational approaches. It was found that some hypotheses were repeatedly tested while others were rarely tested. The difference in the number of studies testing each hypothesis may depend on the perceived relative importance of the various hypotheses as well as of the availability of data. Furthermore, it was argued that the results obtained from the various FDI studies were sensitive to the differences in the measures, the types of sample, and the estimation techniques used. Although there was strong and consistent support for some hypothetical influences (e.g. exchange rate, market size, and agglomeration economies), these hypotheses were tested in different contexts. Some were tested in the context of DMEs while others were tested in the context of DCs. Also, some were tested using country-level data while others were tested using firm- / industry-level data. These variations make it difficult to identify a set of commonly supported or refuted hypotheses.

The most important finding from the empirical review was that there has been relatively few empirical studies that examine the micro determinants of FDI in the context of developing or industrialising countries. This shortage of FDI studies may be explained by two facts. Firstly, most FDI has been undertaken between DMEs in the post-war periods, and thus many empirical studies have sought to explain why cross-investment activities have been concentrated among countries with similar incomes and market size. Secondly, the data on FDI are much more systematically recorded in DMEs than in DCs. Of the few micro-studies of DCs, none has examined the effects of 'locational factors' on the incidence as well as the extent of FDI across manufacturing activities. There have been even fewer detailed case studies on the locational determinants of FDI in DCs, and thus there is still scope for further work on this line of research. Chapter IV concluded that the analysis of Japanese FDI in this thesis would make a contribution to the existing literature of FDI determinants in that it would shed more light on the role of locational factors in determining the industry distribution in FDI in non-industrialised countries.

In the light of the theoretical and empirical reviews of FDI determinants, chapter V sought to identify and investigate the determinants of Japanese FDI in Thailand. Based on the locational approach discussed in chapter III, five hypotheses were formulated for empirical testing: the labour intensity of production, home market size, transportation costs, government incentives, and external trade preferences. The empirical analysis was separated into two parts.

The first investigated the influences of locational factors on the incidence of FDI; it addressed the question why some industries received FDI but not others. The second investigated their effects on the extent of FDI; it addressed the question why FDI was concentrated on particular industries. The Heckman two-stage procedure was used for these two stages of empirical estimation. In the first stage, a Probit model was used to estimate the probability of a Thai industry receiving some Japanese FDI. FDI was measured as a dichotomous variable, being assigned a value of 1 if a Thai industry had received some FDI (during the specified periods) and 0 otherwise. In the second stage, an OLS model with selectivity bias adjustments was used to estimate the effects of locational factors on the extent of FDI. In this stage, the extent of FDI was alternatively measured in terms of share capital and count measure of the number of Japanese-owned companies. The latter was used because there was some weaknesses associated with the measure of share capital. Finally, the cross-sectional model was estimated using the samples for 1985 (pre-Japanese Yen appreciation), 1990, and 1995. These cross-sectional results were subsequently compared with the results estimated from a pooled model.

The empirical results were quite robust across the estimated models, in terms of signs and levels of significance. These suggest that the locational factors specified in the empirical model are relevant in explaining both the incidence and the extent of Japanese FDI undertaken across Thai manufacturing industries over recent decades. They indicate that the majority of FDI tends to be of the

vertically integrated type, exploiting the abundance of cheap (unskilled) labour in Thailand in order to export final products back to the Japanese market. Lower costs of transporting these final products back to Japan facilitated the intra-firm trading activities between parent firms in Japan and subsidiary firms in Thailand.

It was also found that the trade policy pursued by the US government (in terms of GSP privileges) toward the manufacturing exports of Thailand indirectly promoted and diversified investment activities in that country (provided that there was a potential for producing and exporting those GSP products). The empirical findings also indicate that the Thai government has been quite successful in promoting and diversifying FDI activities over the past two decades. However, these results do not necessarily imply that the government has also been successful in maximising the benefits gained from FDI in terms of transfers of technology and knowledge. Rather, it has been criticised for concentrating on the quantity rather than the quality of foreign direct investment (Anuroj, 1995).

Previous empirical studies have suggested that manufacturing firms from Japan tend to follow one another overseas to supply and (perhaps source) their key intermediate outputs and inputs there (e.g. Belderbos and Sleuwaegen, 1996). Chapter VI thus investigated whether there was the relationship between the vertical linkages among parent firms in Japan and FDI undertaken by those firms across manufacturing activities in Thailand. The concept of linkages was first elaborated and their effects on FDI were investigated. In the analysis, the input-

output linkages among Japanese firms were classified as intra- or inter-industrial. The former are the input-output linkages among firms within the same industry j while the latter are the input-output linkages between firms in industry j and firms outside industry j.

The empirical analysis indicated that there was evidence of a significant relationship between Japanese (intra- and inter-) industrial linkages and the extent of FDI in Thailand. Three main conclusions were drawn from the analysis. Firstly, Japanese firms undertaking FDI in a given industry in Thailand tended to carry out intermediate transactions with other pre-existing Japanese firms in the same industry (4-digit ISIC level), as well as in related industries which are classified under the same broad sector (2-digit ISIC level). Secondly, those Japanese firms that undertook FDI tended to sell their key intermediate products to other pre-existing Japanese firms in Thailand. Thirdly, even though this linkage story was relevant in explaining the inter-industry distribution of Japanese FDI in Thailand, the linkage effects were relatively small as compared to other locational effects. Thus, the locational factor examined in chapter V, such as labour intensity, appear to play more important role in determining the extent of Japanese FDI in Thailand.

With respect to the empirical findings as a whole, one final point to be made is that although the results obtained tend to support the main hypotheses, caution must be used in interpreting and drawing strong implications from the empirical

findings. This is due to proxying and measurement problems in the measures used for both dependent and independent variables, and of course the dangers of inferring causality from the identified relationships.

7.3 Implications

Although the focus of this research is on the determinants rather than the welfare impact of FDI, some broad welfare implications may be drawn. While recognising that foreign direct investment create jobs as well as promote exports of developing countries, this study is sceptical about the effects of FDI on the transfers of technical knowledge and skills to indigenous labour and / or firms. Primarily, it is evident that the main motive of Japanese FDI is to exploit cheaper unskilled labour in Thailand. The form of FDI tends to be vertically integrated with high-technology machinery and equipment being imported from Japan to Thailand, and subsequently the processed products being exported back to service Japanese and other industrialised markets. Therefore, one may anticipate that the transfers of technical knowledge and core skills to indigenous Thai labour were not substantial. This was because most of capital- and technology-intensive components were imported from Japan, and Thai labour was simply used for assembling those components (Ministry of Foreign Affairs, 1996; Krongkaew, 1997; Jomo et al., 1997). Furthermore, due to the fact that Japanese firms in Thailand either imported components from Japan or purchased their key components directly from other-pre existing Japanese suppliers in Thailand, it

was (is) unlikely that there were (are) any strong input-output links between Japanese and local indigenous firms. A similar view is expressed by Anuroj (1995) and IDE (1998). As indicated by IDE (1998, p. 57), on comparing the manufacturing structure of Thailand and Japan using the constructed bilateral Thai-Japanese Input-Output table,

> "Dependence on goods and services from Japan has deepened in most Thai industries since 1985. Local industry was not able to accommodate the demand generated by the sudden increase in investment from Japan. Thai industries seem to have fallen into chronic dependency on Japanese goods and services".

Lastly, it was evident that the labour intensity and the US GSP factors tended to have relatively strong effects on the amount of Japanese investment undertaken across Thai manufacturing industries. Potentially, this raises concerns for the future prospects of investment in Thailand, since the (real) wages of Thai labourers are steadily rising. Furthermore, Thailand is gradually being excluded from the lists of GSP beneficiary countries due to limits imposed by the US government on the value / amount of Thai GSP exports[1]. Therefore, this type of FDI will become less significant for Thailand in the long run. With the recent move towards more free, marker-based, economies by countries such as Vietnam and China, together with other cheaper locations in South Asia, Japanese

[1] If an import of a particular Thai manufacturing product account for more than 50% of the value of total US import of that product or exceed certain $ amount, then such product will be excluded from the GSP beneficiary lists (see USTR, 1999, for more details).

vertically integrated firms may find those locations more attractive as locations for their assembly activities[2].

Urgently, Thailand must transform herself so as to become one of those locations that are attractive for higher value-added production, with relatively more capital and technology-intensive components being manufactured in Thailand and subsequently exported to relatively low cost locations for manufacturing assembly. However, this will not be possible without sufficient skilled human resources, implying substantial training and development, together with the educational development of supporting industries, services, and facilities.

Recently, the Thai and other ASEAN governments have attempted to make use of the ASEAN free trade area (AFTA) to promote intra-firm trading activities among multinational companies (mostly Japanese) in the region. It is argued that lower trade costs and more harmonised investment policies within ASEAN countries will induce foreign affiliates in one country to specialise in particular production processes according to local comparative advantages, and to rely on imports of intermediate products supplied by affiliates in other countries. For instance, large Japanese companies like Toyota can become specialised in producing gas engines in Thailand, diesel engines in Indonesia, steering parts in Malaysia, and transmission parts in the Philippines (see Hatch and Yamamura, 1996, p.26).

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[2] Unless the agglomeration benefits gained from the manufacturing concentration in Thailand compensate for the rising costs of labour there.

In order for the ASEAN governments to launch an effective investment promotion scheme (ASEAN Investment Areas), they should know clearly what the patterns of investment activities across those countries are, i.e. whether FDI undertaken tends to be concentrated in the same or different manufacturing activities. If the former is the case, intra-industry specialisation of manufacturing production within the region should be promoted. Furthermore, it would be very informative to know whether the determinants of Japanese direct investment identified by the present study could in fact be generalised to explain the manufacturing distribution of investment across those ASEAN countries as a whole.

7.4 Future Research

The present analysis is for a single country but it could be readily extended to a multi-country setting. As noted above, it is desirable that the empirical models (specified in chapter V and VI) are further tested in the context of Japanese FDI in other ASEAN developing countries. Certainly, further work on FDI in ASEAN countries would provide deeper insights into the nature and determinants of FDI across manufacturing activities in the South East Asian region as a whole. Although comprehensive information on both the geographical and industrial distributions of Japanese FDI may not be easily accessible, one may adopt the data-compiling technique used in the present research.

Alternatively, since the present models have been examined in the context of Japanese FDI in developing Asia, one might also seek to modify and test them in the context of non-Japanese FDI in other developing countries. Further work on this line of research would strongly enhance our understanding of the industry-level determinants of FDI outside industrialised countries.

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