Industrialization in Thailand: MNEs and Global Integration

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Declaration

Unless otherwise indicated this
thesis is my own work.

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Abstract

This thesis examines the role of multinational enterprises (MNEs) in industrialization in developing countries through a case study of Thailand. The key hypothesis is that the policy environment of the host country, in particular the trade policy regime, conditions gains from MNE involvement. The involvement of MNEs has been a key feature of the process of industrial transformation in Thailand over the past three decades, but the role of MNEs in determining developmental outcomes of industrialization has not been systematically examined. This study aims to fill this gap.

The introductory chapter spells out the purpose and scope of the study. The remainder of the thesis is structured in nine chapters. Chapter 2 presents the analytical framework for examining how MNE involvement contributes to economic development in host countries and what factors potentially condition gains from MNE involvement. Chapter 3 provides an overview of the investment climate and the incentive structure of Thai manufacturing over the past three decades, and the related key policy shifts, with emphasis on the trade policy regime. Chapter 4 surveys trends and patterns of the presence of MNE participation in Thai manufacturing.

The analytical core of the thesis comprises four chapters. Chapter 5 probes the FDI-growth nexus at the macro level by estimating a growth equation derived in the context of the new growth theory, which provides for capturing the impact of FDI interactively with openness on economic growth, using time series data for the period 1970-2002. In Chapter 6, an inter-industry cross-sectional econometric analysis of FDI technology spillover on domestic manufacturing is undertaken, using the unpublished returns to the Industrial Census 1997. Chapters 7 and 8 provide in-depth firm-level case studies of two key industries —processed foods and automotive— to gain insights into various non-FDI dimensions of MNE involvement. Chapter 7 surveys the development of the processed food and automotive industries over the past three decades. This is to lay down a foundation for probing the mechanisms of MNE involvement and its

contribution in Chapter 8. The analysis in Chapter 8 is based on information gathered by interviewing senior managers of a sample of firms (16 in the processed food industry and 11 firms in the automotive industry) between December 2003 and February 2004, chosen using the purposive sampling technique. The final chapter summaries the key findings, makes policy inferences and presents suggestions for further research.

The findings support the hypothesis that gains from MNE involvement in manufacturing, in terms of the key criteria such as output and export growth, and technology spillover, are greater under a more open trade regime compared to a closed-economy (import-substitution) regime. There is also strong evidence to suggest that the conventional approach of focusing solely on FDI as the main link between MNEs and the domestic manufacturing tends to overlook an important part of the story relating to the role of MNEs in the industrialization process. MNEs contribute significantly to export-led industrialization through various non-FDI channels such as providing marketing channels, improving technological capability, and assisting to overcome export obstacles.

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List of Abbreviations and Acronyms

$	US dollar
2SLS	Two-Stage Least Squares
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ADB	Asian Development Bank
AICO	ASEAN Industrial Cooperation
ANU	Australian National University
APEC	Asia Pacific Economic Cooperation
ASEAN	Association of South East Asian Nations
ASEAN-4	Indonesia, Malaysia, Singapore and the Philippines
ASEAN-5	ASEAN-4 and Thailand
B	Baht
BOI	Board of Investment (Thailand)
BOT	Bank of Thailand
CBU	Completely Built-up
CEPT	Common Effective Preferential Tariff
CES	Constant-elasticity-of-substitution
CKD	Completely Knocked-down
CP	Chareon Pokphand
CPI	Consumer Price Index
CV	Coefficient of Variation
DF	Dickey-Fuller
DUPS	Directly Unproductive Profit Seeking
EG	Engle-Granger
EP	Export Promotion
EPZ	Export Processing Zones
ERE	Effective Rate of Exchange
ERP	Effective Rate of Protection
EU	European Union

FAO	Food and Agriculture Organization
FDA	Food and Drug Administration (the US)
FDI	Foreign Direct Investment
FIML	Full-information Maximum Likelihood
FPO	Fiscal Policy Offices (Thailand)
FTAs	Free Trade Agreements
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GFCF	Gross Fixed Capital Formation
GM	General Motor
GNI	Gross National Income
HS	Harmonized System
IBEC	International Basic Economy Corporation
IEDB	International Economic Data Bank
IMF	International Monetary Fund
IPZs	Investment Promotion Zones
IS	Import Substitution
LCRs	Local-Content Requirements
M&A	Merger and Acquisition
MNEs	Multinational Enterprises
MOF	Ministry of Finance (Thailand)
MSC	MMC Sittipol (Thailand)
NAFTA	North American Free Trade Association
NESDB	National Economic and Social Development Board (Thailand)
NICs	Newly Industrialized Countries
NRP	Nominal Rate of Protection
NSO	National Statistics Office (Thailand)
NTBs	Non-Tariff Barriers
OECD	Organization for Economic Co-operation and Development
OEM	Original Equipment Manufacture
OFCF	Other Forms of Capital Flows

OLS	Ordinary Least Squares
PF4	Canned Pineapple, Canned Tuna, Processed Chicken and Processed Shrimp
PH	Phillips-Hansen
QRs	Quantitative Restrictions
R&D	Research and Development
REM	Replacement Equipment Manufacture
RER	Real Exchange Rate
SITC	Standard International Trade Classification
SPS	Sanitary and Phytosanitary
TFP	Total Factor Productivity
TRIMs	Trade-Related Investment Measures
TSIC	Thai Standard Industry Classification
UNCTAD	United Nations of Conference of Trade and Development
UNIDO	United Nations Industrial Development Organization
USITC	US International Trade Commissions
VAR	Vector Autoregressive
VAT	Value-added Tax
WPI	Wholesale Price Index
WTO	World Trade Organization

Chapter 1: Purpose and Scope

1.1 Significance of Issues

Multinational enterprises (MNEs)[1] are key players in the process of global economic integration. Foreign direct investment (FDI) flows, a widely used measure of MNEs' cross-border activities, have grown much faster than global trade, which in turn has increased faster than world output (Hill and Athukorala, 1998; Craft, 2000; Brooks *et al.* 2004). Most developing countries changed their attitude toward MNEs and their involvement in the growth process. MNEs, which used to be regarded a modern form of economic colonialism and exploitation in the early post-war years, are now widely acknowledged as facilitators of global integration. MNE involvement can facilitate the industrialization process of host countries by bringing in not only capital but also production technology, managerial skills, international marketing channels, etc. to host countries (Sjöholm, 1997; Borensztein *et al.*, 1998; Lipsey, 2000; Vernon, 2000).

Until the 1980s, most developing countries treated MNEs as symbols of colonialism and imposed restrictions on their involvement in their economies. However, the successful experience of some developing countries that opened their doors to MNEs and gained benefit from their involvement has gradually diluted and changed this pessimistic attitude. In addition, the adverse outcome resulting from debt crisis during the 1970s persuaded many countries to reform their foreign investment policies to promote MNE involvement. Rapid technological change and the emergence of globally integrated production and marketing networks, which greatly reduced the ability of the national state to control the activities of MNEs, have also acted as a catalyst for the reform of foreign investment policy. In this context, an increasing number of developing countries have begun to offer lucrative investment incentives and to undertake policy reforms to improve the investment climate with a view to enticing MNE involvement.

[1]A multinational enterprise (MNE) is defined as an enterprise that controls and manages production establishments/plants located in at least two countries.

However, many countries still regulate and limit the economic activities of MNEs operating within their borders in various ways in the hope of maximizing gains from such involvement.

Nevertheless, analysis of the impact of MNE involvement in host countries and factors that prevent MNEs from functioning more effectively in these countries have lagged behind the growing policy emphasis. Four main aspects of this knowledge gap are worth emphasizing. Firstly, many studies examining the impact of MNE involvement have focused solely on FDI e.g. Markusen (2002: p.5). There is, however, ample empirical evidence that MNEs can be involved through non-FDI channels[2], which have a considerable influence on the operation and performance of indigenous firms.[3] Thus, the conventional approach of treating FDI as a synonym for MNEs tends to understate the impact of MNEs on host countries and the industrialization process.

Secondly, previous studies have not properly taken into account the economic and policy environment in host countries that potentially conditions gains from FDI. While FDI has the potential to create a favourable impact on the industrialization process, the economic and policy environment in host countries plays a crucial role in turning the potential into reality. So far, two key factors, trade policy regime and human capital development, have been hypothesized. However, there is a dearth of studies that bring these two factors together in an analytical framework for a systematic analysis of the contribution of MNEs to the industrialization process.

Thirdly, the overwhelming majority of studies have examined the impact of MNE involvement at either the macro- or industry/firm-level analyses without a systematic connection between these two analyses. In macro-level analysis, these studies mainly examine the relationship between output growth and FDI inflows, or the FDI-growth

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[2] Some studies use different terminology. For example, Oman (1984) referred to the non-FDI channel as 'New Forms of Investment'.

[3] For example, Richardson (1972), Hone (1974); Nayyar (1978); Westphal *et al.* (1979); Lall (1980); Keesing (1983); Keesing and Lall (1992); Oman (1984); Dunning (1993).

nexus. This analysis could provide an evaluation of the overall FDI impact on host economies with a presumption that FDI creates technological benefit. However, the favourable impact on locally non-affiliated firms, particularly on technological capability, cannot be explicitly examined. This impact is very important because it is often argued to be the most desired benefit host countries anticipate from FDI. This can be systematically examined only through inter-industry/inter-firm studies of the relationship between the presence of foreign firms and the productivity of local manufacturing firms. While both the macro- and industry/firm-level analyses need to be brought together in order to produce a systematic quantitative analysis in evaluating gains from FDI, so far there has not been a systematic link between the macro- and industry/firm-level studies.

Finally, there is a dearth of systematic analysis of non-FDI channels through which MNEs impact on host countries. Mainly because of data scarcity, research in this subject area has failed to go beyond FDI in examining the impact of MNEs on the host country. However, in reality, MNEs can substantially influence business operations of enterprises in host countries through various non-FDI channels such as technology licensing, international subcontracting, and MNE buyer channels. Most of these non-FDI channels are not quantifiable. Thus, it is important to examine these channels through firm/industry-level case studies in order to provide a complete picture of the contribution of MNE involvement in the industrialization process of host countries.

1.2 Purpose of the Dissertation

This dissertation aims to examine the involvement of MNEs in both FDI and non-FDI forms in the Thai manufacturing sector. It has three main objectives:

(1) To probe and evaluate the impact of MNE involvement in Thai manufacturing.

(2) To gain insight into the principal mechanism MNEs contribute to the industrialization process, and obstacles preventing them from functioning more effectively.

(3) To recommend policies for maximizing the benefits from MNE involvement.

Both quantitative and qualitative analyses are combined in the dissertation to provide a comprehensive scope of MNE involvement in Thai manufacturing as well as to evaluate their contribution to the Thai industrialization process. The quantitative analysis is undertaken at both macro- and inter-industry levels to provide quantitative indicators of the FDI contribution. These analyses are complemented with firm-level case studies in order to provide insights into the mechanism of how MNEs, both FDI and non-FDI, can be involved in and contribute to the Thai industrialization process. Several unquantifiable aspects related to MNE involvement are captured in the firm-level case studies analysis. The key hypothesis is that the policy environment of the host country, in particular the trade policy regime, conditions gains from MNE involvement.

MNEs have been involved in Thai manufacturing since the early 1960s (Tambunlerchai, 1975; Santikarn, 1981; Pongpisanupichit, 1985; Akira, 1989). As measured by FDI inflows, the role of MNE involvements has become increasingly important over the past three decades. The annual average value of FDI inflows to Thai manufacturing increased from $34.6 million during 1971–5 to $700 and $2,486.3 million during 1986–90 and 1996–2000, respectively. Manufacturing FDI inflows accounted for 3.7 per cent of the total manufacturing investment in the 1970s. Its share increased noticeably to 12.7 per cent in the 1980s and to 51.5 per cent in the 1990s.[4]

Despite the significant involvement of MNEs in the Thai economy, their role in the industrialization process has remained a controversial issue for the past two decades. Among the few available studies, Tambunlerchai (1975) and Pongpisanupichit (1985)

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[4]The sharp increase in the figures in the 1990s was mainly due to the dramatic drop of domestic manufacturing investment during the 1997–8 crisis. For the period 1991–6, the share of FDI in total manufacturing investment was 14.7 per cent.

come up with the inference that MNEs played a rather negligible role, if any, in the process of industrial development in Thailand. By contrast, Santikarn (1981), who undertook a qualitative analysis based on personnel interviews and questionnaire surveys, noted significant technology transfer from MNE parents to Thai affiliates but there was no evidence of technology spillover from these affiliates to local firms. Santikarn (1981) provides some useful insight into the technology acquisition process, but the inferences are mostly drawn from the experience of enterprises in textile industries. Quite apart from the mixed inferences and the lopsided nature of the subject coverage, these studies are now very dated. More recent studies have by and large focused mostly, if not solely, on trends and patterns of FDI e.g. Pananond (2004). Moreover, all existing studies have treated 'MNE involvement' and 'FDI' as synonymous. Little attention has been paid to various non-FDI channels of MNE involvement, which have presumably played an important role in some sectors, the export-oriented processed food industry in particular (Jaffee and Gorden, 1993).

The foreign investment policy regime and policies impacting on the overall investment environment (trade policy, in particular) in Thailand have undergone notable changes over the past three decades. By developing-country standards, Thailand's trade policy regime has remained relatively open throughout the post-war period (Sachs and Warner, 1995). Thailand resorted to a high level of tariff protection to promote import-substitution industries during the 1970s and 1980s. From the late 1980s onwards, these trade barriers have been gradually removed. The foreign investment regime has also become increasingly liberal. Foreign ownership restrictions in specific sectors and the domestic procurement requirement imposed on MNE affiliates have been considerably relaxed or completely removed. Thus, Thailand provides an excellent setting for examining the link between gains from MNE involvement and changes in the domestic policy regime.

1.3 Structure

The dissertation is composed of nine chapters. The following chapter provides an analytical framework to examine the role of MNEs in industrialization in host developing countries. The scope of MNE involvement covered in this chapter encompasses both FDI and non-FDI. Relating to the FDI channel, the contribution to technological capability is identified as the major source of gain. Three possible non-FDI channels are identified, namely, technology licensing, international subcontracting, and MNE buyer links that significantly influence local enterprises. A key theme running through the chapter is that the domestic policy context, in particular trade policy, plays a pivotal role in determining the nature and degree of host-country gains from MNE involvement.

Chapter 3 surveys the general investment climate and policy-induced incentive structure in Thai manufacturing over the past three decades from 1970 to the present. Six aspects of the commercial environment are discussed to illustrate the general investment climate in Thai manufacturing. These are the macroeconomic environment, labour markets, the quality of human capital, institutional factors, the role of government, infrastructure availability and policies towards foreign investment. To evaluate the overall investment climate, an international comparison is undertaken with emphasis on the four major Southeast Asian counterparts, Indonesia, Malaysia, the Philippines, and Singapore (henceforth referred to as ASEAN-4). This is followed by discussion on investment and trade policy regimes. Various measures of trade restrictiveness, such as the degree of openness, the trade to goods GDP, the export-output ratio in the manufacturing sector, the incidence of applied tariffs, the nominal rate of protection (NRP) and effective rate of protection (ERP) are used to evaluate changes in the degree of trade restrictiveness over the past three decades.

Chapter 4 provides an overview of industrialization in Thailand and MNE involvement. Growth performance and its structural changes in the Thai economy are discussed in order to highlight the evolution of Thai manufacturing. Patterns and trends of Thai manufacturing during the period since 1970 are examined, followed by trends and patterns of FDI involvement. The final section in this chapter examines manufacturing FDI to shed light on the level of MNE involvement and its characteristics.

The analytical core of the thesis comprises the four following chapters. Chapter 5 probes the FDI-growth nexus for total manufacturing. This is done by estimating a growth equation derived in the context of the new growth theory, which provides for capturing the impact of FDI interactively with openness on manufacturing output growth. The growth equation is estimated by applying the co-integration technique to time series data for the period 1970–2002. The key hypothesis is that the greater the trade openness, the greater the impact of FDI on output growth. Three alternative indices of trade openness, (i.e. trade to goods GDP, the ratio of export-output in the manufacturing sector and the incidence of applied tariff rates in the manufacturing sector), are used in order to test the sensitivity of results on these indices.

In Chapter 6, an inter-industry cross-sectional econometric analysis of FDI technology spillover on domestic manufacturing is undertaken, using unpublished returns to the Industrial Census 1997 (data for 1996). The data relate to 105 industries at the 4-digit disaggregating level, classified according to the Thai Standard Industry Classification (TSIC). The key hypothesis emphasizes the role of the trade policy regime across industries. Two alternative measures, i.e. *NRP* and *ERP*, are used to proxy the nature of trade policy that varies across industries. Both productivity and FDI determinants equations are estimated simultaneously in order to guard against any potential simultaneity problem. By the single-equation estimation, i.e. productivity determinant, the estimated positive relationship between foreign presence and the productivity of domestic manufacturing might simply reflect the fact that foreign investment gravitates towards more productive industries rather than representing any technology spillover from foreign presence. In addition, the productivity determinants equation of the whole manufacturing sector (covering both foreign and local manufacturing) is estimated to shed light on the impact of the foreign presence.

Chapters 7 and 8 provide an in-depth firm-level study of two key industries — processed foods and automotive — to gain insights into the mechanisms of MNE involvement. The two industries are different in terms of the trade policy regime facing them. Thailand is one of the world's major exporters of processed foods. The trade policy regime facing processed food producers has remained highly open over the past four decades. By contrast, the Thai government has long attempted to influence economic incentives for the automotive industry (covering both cars and components manufacture) by providing protection on vehicles as well as imposing local-content requirements (LCRs) to promote local parts manufacture. Since the early 1990s, the incentive regime for the automotive industry has become increasingly neutral. Thus, these two industries provide an excellent opportunity to look at the role of MNE involvement under different policy environments.

Chapter 7 surveys the development of the processed food and automotive industries in order to lay down a foundation for probing into the mechanism of MNE involvement and its contribution in the following chapter. Domestic policy regimes, especially trade and investment policies and several aspects of industrial development such as output growth, employment, market orientation and MNE involvement are discussed and compared to one another. To probe the mechanism of MNE involvement, the analysis in Chapter 8 is based on information gathered by interviewing senior managers of a sample of firms (16 in the processed food industry and 11 firms in the automotive industry) between December 2003 and February 2004. The sample was chosen using the purposive sampling technique.

The final chapter provides key inferences and policy lessons. It also draws policy lessons from Thailand for other developing countries and makes suggestions for further research.

Chapter 2: Analytical Framework

The chapter aims to provide the analytical framework to examine the role of MNEs in industrialization in host countries. The chapter begins with the scope of MNE involvement in host countries in Section 2.1. In this study, there are two broad ways MNEs can link and become involved in host countries: through FDI (equity) and non-FDI (non-equity). This is followed by the role of the general investment climate in enticing MNE involvement in host countries. Section 2.3 provides discussion of potential determinants of gains from FDI. Two potential determinants, trade policy regime and level of human capital development, are proposed. In Section 2.4, the proposition of FDI backward linkage conditioning gains from FDI is addressed and probed for its relevance. Conclusions and key inferences are in Section 2.5.

2.1 Scope of MNE Involvement

MNEs play a crucial role in assisting host countries, especially in developing countries, to access advanced technology, to upgrade their production structure, to penetrate the global market successfully, and to facilitate the industrialization process. This is due to the fact MNEs are now widely regarded as the principle bearers of technology across international borders (Sjöholm, 1997; Borensztein *et al.*, 1998; Lipsey, 2000; Vernon, 2000). When MNEs become involved in host economies, their involvement is likely to be associated with advanced technology that can benefit both their affiliates and other enterprises within host countries.

Since there is no universally accepted definition of technology, this study pursues the most common approaches where 'technology' is referred to as a collection of physical processes that transform inputs into outputs, and knowledge and skills that structure the activities involved in carrying out these transformations (Kim, 1997a: p.4). According to this definition, technology is defined in a broad sense covering production technology, managerial skills, international marketing know-how, etc.

In general, there are two broad ways MNEs can involve themselves in host countries: through FDI and non-FDI channels.

2.2.1 FDI Channel

FDI is the outcome of a firm's decision to diversify all or some operational activities across countries. The key factor that drives a firm to transplant its activities abroad relates to its competencies as well as to business opportunity. This means a firm taking this step is able to use abroad its technology that is proprietary. Hence, investing abroad is a way to maximize benefit from a firm's competitive advantage (Dunning and Rugman, 1985; Teece; 1985).

An alternative way for firms to exploit this benefit is arm's length sale of technology, including the right to use or infringe on patents (Caves, 1996: p.166). The choice between investment abroad and arm's length sale is governed by a host of factors such as the nature of host economies, transaction costs incurred, the nature of technology (codificability and teachability), and the risk of technology leakage into the hands of competitors.[1] Interestingly, FDI seems to be a more efficient way for firms to exploit their latest technology innovation (Teece, 1977, 2000; Mansfield and Romeo, 1980). Generally, the market for technology is imperfect. Technology owners and licensees have asymmetric information so that pricing the value of technology is complicated. Buyers only realize the real value of technology if they actually use it, so they tend to undervalue it. At the same time, technology owners try to sell technology at the highest price possible to maximize the profit from their innovation. This is particularly true of the latest technology where the information gap between technology owners and licensees is even wider. It becomes harder to obtain an optimum price for the latest technological innovations, compared to more mature technology. As a result, the latest

[1] For a succinct discussion of these factors, see Caves (1996: p.168–72).

technology developed by MNEs is not generally available for international licensing. The only effective way for a given country to access such technology is to entice MNEs to set up affiliates (Mansfield and Romeo, 1980; Teece, 2000: p.112). In addition, possessing a technological advantage is essential for firms establishing affiliates abroad in order to successfully compete with existing or potential competing indigenous firms, which have familiarity with local markets.

As a result, FDI reflects the objective of an entity resident in one country to obtain a long-term relationship between the direct investor and the host country enterprise, in which the former has a significant degree of influence on the management of the latter. To obtain a significant ability to influence enterprises, it does not always mean that MNEs must hold the majority of the voting stock, i.e. 50 per cent or greater. In fact, to some extent, the correspondence between ownership rights and control over the enterprises is complicated. There are cases where MNEs with minority equity ownership can have considerable influence on firms (Oman, 1984: p.19). Hence, owing to the dominant current definition by the International Monetary Fund (IMF) and other institutes such as the Organization for Economic Co-operation and Development (OECD), the US Department of Commence as well as several scholars studying multinational firms,[2] FDI is defined as the inflows of investment necessary to acquire a lasting management interest (10 per cent or more of voting stock) in an enterprise operating in an economy other than that of the investor (IMF, 1993: p.86). Based on this definition, FDI covers both fully-owned MNE affiliates and joint ventures between MNEs and local enterprises.

Through the FDI channel, MNEs have the potential to generate considerable impact on host countries' economies. Similar to other forms of capital flows (OFCF), FDI provides additional capital funds to host economies thereby lowering the cost of

[2] For example, the early Harvard studies under the direction of Raymond Vernon: Vaupel and Curhan, (1969: p.3) and Wilkins (1970), both cited in Lipsey (2001a)

capital, and encouraging domestic production.[3] This is widely regarded as the direct impact (Sjöholm, 1997; Blomström *et al.*, 2000). Nevertheless, with integrated international capital markets as well as possibilities to borrow in the host country's capital market, the direct impact of FDI is becoming less important to some host countries. Besides the direct impact, FDI still has great potential to affect host economies.[4] It is likely to influence the economic structure as well as the conduct and performance of locally owned firms in the host country. Since FDI means there are new entrants in industries, this can affect industry concentration.[5] Their entry can increase domestic market competition and eventually influence the behaviour and performance of incumbent firms. FDI inflows can create linkages to upstream and downstream industries, thereby promoting complementary domestic investment in host economies. In addition, superior technology associated with MNE affiliates can spill over into the rest of the host economy and benefit locally non-affiliated firms and other foreign-invested firms. All of these impacts can be a result of the productivity improvement of locally non-affiliated firms. Such indirect impact is referred to as FDI technology spillover. In other words, spillover is said to take place when the presence of a foreign firm generates productivity or efficiency benefits for the host country's local non-affiliated firms (Blomström and Kokko,1998). Of all the gains from FDI, it is often argued that spillover is the most desirable benefit

There are at least three channels, through which FDI spillovers can occur:

(1) Demonstration Effect

The presence of foreign firms can have a demonstration effect that allows local firms to become familiar with superior technologies, marketing and managerial practices used in foreign affiliates. For instance, local firms might not know about certain technologies and production processes until they become available in the domestic

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[3] See, for example, MacDougall (1960) for the systematic treatment of the impact of capital flows. In this study, there is no difference between FDI and OFCF.

[4] See a full discussion of the difference between FDI and OFCF in Appendix 1.

[5] It is inconclusive as to whether FDI increases or lowers industry concentration. Its impact depends on the nature of industry, competency of indigenous firms, and other policy environments in host countries. See Caves (1996: p.87–8) for a comprehensive discussion.

economy, due to the entry of foreign firms. Thus, spillover can take place in the form of imitating the foreign subsidiaries' technology. Apart from enhancing the demonstration effect, the presence of foreign affiliates can exert pressure on local firms exhibiting technical or allocation inefficiencies to adopt more efficient methods. This allows local firms to survive successfully or even compete with foreign firms. In the short run, local firms respond to the presence of foreign affiliates by improving their X-efficiency, such as enforcing more cost-conscious management, and motivating employees to work harder. In the longer term, local firms seek new technology or innovations to upgrade their existing production. Since both demonstration and competition effects are likely to occur simultaneously, these two effects are regarded in the literature as a single channel of spillover.

To our knowledge, while there are a few studies examining the demonstration effect of FDI on local firms, e.g. Swan (1973); Tilton (1971); Riedel (1975); and Lake (1979), there is so far no direct econometric evidence of spillover through demonstration effect. These studies have simply inferred the presence of FDI spillover through demonstration effect from a estimated positive relationship between the productivity of locally non-affiliated firms/industries and a foreign presence. Indeed, under these studies, spillover can take place either through demonstration effect, labour mobility or both, as seen below.

(2) Linkage Effects

Where foreign investors are linked to upstream and downstream industries in host countries, the linked indigenous firms have the possibility of gaining technological benefits. The former is referred to as backward linkage and the latter as forward linkage. By backward linkage, foreign investors establish an inter-firm relationship with local suppliers and create a demand for inputs from local suppliers in upstream industries. When these local firms are engaged to supply certain raw materials, the high quality, reliability and speed of delivery that MNE affiliates demand, force them to enhance productivity. Moreover, in some cases, local suppliers in upstream industries receive technical and managerial training in the production of the required inputs. This is likely to generate additional economic activity and income, and transfer technological and management skills to the host country.

Similarly, forward linkage effects are created when one industry uses another industry's output as its inputs. Every activity that does not by its nature cater exclusively to final demand will induce attempts to utilize its outputs as inputs in other industries. The sum of the backward and forward linkages gives a total linkage effect, which can be seen as the growth in other new industries induced by establishing an industry.

Many studies have examined the role of backward linkages of MNEs and their contribution to host economies e.g. Schive (1990); Schive and Majumdar (1990); Barry and Bradley (1997); Kelegama and Foley (1999); Smarzynska (2002).[6] Only Smarzynska (2002) explicitly examines the backward linkages channel for FDI spillover by estimating a firm's production function in Lithuanian manufacturing during 1993–2000. Variables of foreign presence (measured by capital share) and backward linkages (measured by the proportion of sales to foreign firms to total sales) are incorporated in the production function to test their relationship. The key findings support the existence of productivity spillovers from FDI taking place through contacts between foreign affiliates and their local suppliers in upstream sectors, but there is no indication of spillovers occurring within the same industry. Nevertheless, as fully discussed in Section 2.4, this study ignores the nature of backward linkages created. They can be policy-induced (i.e. LCRs) linkages rather than linkages that are economically induced.

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[6] For example, Schive (1990) and Schive and Majumdar (1990) measure the magnitude of backward linkages of MNE affiliates across industries, and examine patterns over a period of time, based on Taiwanese manufacturing during the 1970s, with the presumption that the greater the linkages the larger the benefit host economies received from FDI. Meanwhile Barry and Bradley (1997) and Kelegama and Foley (1999) argue that even though insignificant linkages of export-oriented MNE affiliates existed, these affiliates still made a significant contribution to the whole economy in several aspects, such as foreign exchange earning, experiencing new marketing and managerial skills, and promoting employment. Their arguments are based on the cases of Irish manufacturing and garment industry in Sri Lanka, respectively.

(3) Labour Mobility

In addition to demonstration effects and linkages, FDI technology spillover can still take place through labour mobility. Generally, foreign affiliates play a more active role than local firms in educating and training local labour. Through this training and subsequent work experience, workers become familiar with the foreign affiliates' technologies and production methods. Technology spillover through this channel occurs when employees of foreign affiliates move on to local employers or set up their own business, using knowledge learned during their previous employment.

There are a few empirical studies that examine the presence of FDI technology spillover through the labour mobility channel but indicate likelihood of its presence, e.g. Lindsey (1986); Gershenberg (1987); Djankov and Hoekman (2000); and Sousa (2001). Lindsey (1986), Djankov and Hoekman (2000); Sousa (2001), for example, find that MNEs actively provided worker training. Gershenberg (1987) provides evidence of managers moving from MNE affiliates to local firms. Thus, there is possibility that FDI technology spillover would take place through the labour mobility channel. The only published empirical study, which has explicitly tested the role of the labour mobility channel, is by Görg and Strobl (2002), using firm level data in Ghana. The productivity determinants equation of locally owned firms was estimated, and they introduced a zero-one dummy of working experience with MNE affiliates (1 for owners that have such experience; and 0 otherwise) to test whether these working experience variables are positively related to a firm's productivity. The key finding supports spillover through labour mobility only within the same industry.

Besides empirical works that examined certain channels of FDI spillover, there are numerous studies examining gains from FDI in a wider context. They can be grouped into two broad categories: macro- and firm/industry-level analyses. In macro-level analysis, empirical studies focus the relationship between output growth and FDI inflows (henceforth referred to FDI-growth nexus).[7] Growth equations are estimated in this analysis. FDI affects economic growth as a channel of technology spillover according to endogenous growth theory.[8] On the other hand, there are a number of studies that concentrate on firm/industry-level analysis and examine the presence of FDI spillover as summarized in Table 2.1. The productivity determinant equations are estimated across industries within a given country. The statistical relationship between performance of locally non-affiliated firms/industries and the presence of MNE affiliates is examined to test the presence of technology spillover.[9]

Results from both macro-level and firm/industry-level analyses are far from conclusive. Some countries make large gains whereas others gain only marginally. Moreover, in some countries, FDI can even generate an adverse effect on the host country.[10] The key inference of these studies is that the economic and policy environment in the host country conditions gains from FDI. This is fully discussed in Section 2.3.

2.1.2 Non-FDI Channel

MNEs can be involved in and have considerable influence on enterprises in host countries, even without equity participation. Such involvement is referred to as non-FDI channel, and has been increasingly important as a mode of MNE involvement in host countries in the global economy (Oman, 1984, 1989; Dunning, 1993: p.91–4; Hobday,

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[7] For example Balasubramanyam *et al.* (1996); Borensztein *et al.*(1998); De Mello (1999); Lipsey (2000); Nair-Reichert and Weinhold (2001).

[8] The other channels of international technology spillover are international trade, and geography. See Keller (2002) and works cited therein.

[9] Görg and Strobl (2002) argue that these studies treated the channels, through which these spillover effects work as a black block.

[10] There are several possible instances where FDI inflows can retard economic growth. FDI inflows may crowd out domestic investment. The entry of MNE affiliates generates a fierce competition effect so that existing local firms may be forced out of business. MNE affiliates are more reliant on imported raw materials and/or intermediates rather than locally produced ones. The linkages to the rest of economy can be limited. In certain circumstances, where FDI inflows are directed into protected sectors, the associated adverse impact from resource misallocation is enlarged, leading to immiserizing growth in host countries. Recently, Brooks and Hill (2004: p.6–7) provide a fruitful summary of the possibilities of the negative impact of FDI.

1995, 2000; Nabeshima, 2004). In the context of the manufacturing sector, MNEs can be involved in host countries through three modes of non-FDI channel.[11]

Table 2.1

Summary of Empirical Studies Testing the Competition Effect from FDI in Developing Countries

Empirical studies	Country	Analysis	Aggregation	Study period
Positive Spillover				
Blomström and Persson (1983)	Mexico	CS	Industry	1970
Blomström (1986)	Mexico	CS	Industry	1970/75
Blomström and Wolff (1994)	Mexico	CS	Industry	1970/75
Kokko (1994)	Mexico	CS	Industry	1970
Kokko (1996)	Mexico	CS	Industry	1970
Blomström and Sjöholm (1999)	Indonesia	CS	Firm	1991
Chuang and Lin (1999)	Taiwan	CS	Firm	1991
Sjöholm (1999a)	Indonesia	CS	Firm	1980–91
Sjöholm (1999b)	Indonesia	CS	Firm	1980–91
Kokko *et al.* (2001)	Uruguay	CS	Firm	1988
Negative Spillover				
Aitken and Harrison (1999)	Venezuela	P	Firm	1976–89
Djankov and Hoekman (2000)	Czech Republic	P	Firm	1993–6
Kathuria (2000)	India	P	Firm	1976–89
Ambiguous				
Haddad and Harrison (1993)	Morocco	P	Firm/Industry	1985–89
Kokko *et al.* (1996)	Uruguay	CS	Firm	1990
Bosco (2001)	Hungary	P	Firm	1993–7

Notes: CS denotes cross-sectional analysis.
P denotes panel analysis.

[11]Oman (1984) lists additional non-FDI channels such as management contracts, product-in-hand, production sharing contracts, risk service contracts. However, these channels are mainly involved in the non-manufacturing sector, especially the petroleum and mining sectors.

(1) Technology Licensing Channel

Technology licensing refers to a circumstance where a host country enterprise (licensee) directly contacts technology owners who are likely to be MNEs,[12] in order to gain rights of access to one or a set of technologies or know-how in return for value. The value may take a variety of forms: an initial lump-sum fee, a percentage of sales, royalties etc. On the other hand, the licensee gains access either to 'know-how' that is secret unpatented technology, trademarks, copyrights or patents, or a combination of these for a specified or unspecified duration. Sometimes, under the licensing contract, the licensee receives training from the technology owner. While it seems that technology sale and licensing are very similar, the major difference between these two channels is that, under the former, the technology owner sells technology *per se* to the buyer and there is no constraint on its use. By contrast, licensing usually gives carefully defined rights of access to technology and to its use by the owner so that MNEs as technology owners to some extent have influence on the operation of host country enterprises.

Technology licensing in practice can take several forms, such as technological assistance agreements, franchising, management contracts, or patent licensing. All of these vary according to the degree of inter-firm participation. For the purpose of this study, they are treated as a single channel to illustrate a broad picture of the ways indigenous firms can access advanced technology.

Empirical evidence suggests that among developing countries, there are few countries successfully benefiting through the technology licensing channel. In particular, in the context of East Asian economies, there are many success stories, found mainly in the cases of Korea and Taiwan.[13] This is due to the fact that, through the technology licensing channel, the licensee requires more technical capability than through other channels. The licensee needs to understand the underlying technology in order to use it

[12] MNEs conduct a large proportion of the world's total research and development (R&D) and own most of the world's advanced technology (Sjöholm, 1997; Borensztein *et al.* 1998; Lipsey, 2000).

[13] Nabeshima (2004) provides a recent survey of cases where technology licensing was successfully used in East Asian countries.

efficiently (Hobday, 1995). Nevertheless, the bulk of international payments for technology licensing are between MNE parents and their foreign affiliates, rather than independent firms.

(2). International Subcontracting Channel

According to Oman (1984), the international subcontracting channel normally involves a 'principal' contractor based in an industrialized country — often a MNE or trading company, occasionally an importer or wholesaler — that places orders with sub-contractors in a developing country to produce components or assemble finished products with the inputs it provides. The principal normally sells the final product, sometimes in its home market, sometimes in a third-country market. Based on this definition, the international subcontracting channel is in line with the so called Original Equipment Manufacture (OEM) channel as proposed by Hobday (1995: p.35).

One crucial aspect of the international subcontracting channel is that the finished product is made to the precise specification of particular buyers. Thus, to obtain a finished product, intensive inter-firm cooperation is needed (Hobday, 1995, 2000). In this way, MNEs can considerably influence the business operations and technological capabilities of host country subcontractors. In general, MNEs (the principal contractors) provide technical know-how and service to ensure that subcontracting firms can produce quality components to meet specifications. Nevertheless, host country subcontractors need to show their potential to deliver the final goods. This requires firms to posses a certain level of production skill and technological capability. Usually, MNEs take part in the selection of capital equipment and the training of managers, engineers, and technicians as well as in giving advice on production, financing and management (Hobday, 1995: p.37). This eventually raises the technological capability of host country subcontractors.

Empirically, the role of the international subcontracting channel is highlighted in previous studies as one of the key factors contributing to the export success of North East Asian newly industrialized countries (NICs), i.e. Korea, Taiwan, and Hong Kong in the electronics industry (Hobday, 1995; Nabeshima, 2004). Note that experience of Malaysia and Thailand in the electronics industry is different from these NICs. FDI instead of the international subcontracting channel plays a dominant role.

(3) MNE Buyer Channel

A MNE buyer channel can be classified as another specific form of subcontracting. There are foreign investors, mostly MNEs, large trading companies (either retailing or wholesaling), and large supermarkets from developed countries,[14] that travel the world in search of potential suppliers in developing countries to manufacture tailor-made goods. These companies operate in many countries and have considerable influence on local suppliers (Hone, 1974: p.149; Keesing, 1983: p.339; Rhee *et al.*, 1984: p.54). Based on the definition of MNEs used in this study, these companies are regarded as such and are henceforth referred to as MNE buyers.

The relationship between MNEs and local suppliers resembles general arm's length transactions in that these buyers and local suppliers contact each other to negotiate their commercial contracts (e.g. price, quantity, quality, delivery, payments, etc.). The feature that distinguishes MNE buyers from other foreign buyers is that they form a long-term relationship with local suppliers (Richardson, 1972; Keesing 1983). Their relationship goes far beyond the negotiation and fulfillment of orders. In fact, MNE buyers not only bring in commercial orders but also help local suppliers to penetrate international markets successfully, especially developed country markets where final goods must fulfill several quality aspects required by final consumers. There is a wide range of these required quality aspects, including input specifications and quality, product design, and labeling and packaging (Keesing 1983: p.339; Rhee *et al.* 1984: p.61). While some of these aspects may not even be of interest in developing countries, consumers in developed countries are highly sensitive to them and therefore are vital to market success.

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[14]Samples of these MNE buyers are Mitsubishi, Mitsui, Marubeui-Ida, Nichimen, J.C. Penny, Macy's, Bloomingdales, Marcor, Sears Roebuck, Wall Mart, Marks and Spencers, C&A Modes and Kaufhof (Hone, 1974: p.149).

Richardson (1972: p.885) provides an example of Marks and Spencer and their suppliers to exemplify the MNE buyer channel.

> 'Not only do Marks and Spencer tell their suppliers how much they wish to buy from them, and thus promote a quantitative adjustment of supply to demand, they concern themselves equally with the specification and development of both processes and products. They decide, for example, the design of a garment, specify the cloth to be used and control the process even to laying down the types of needles to be used in knitting and sewing.'

Where a wide range of quality is concerned, the manufacturing process is far beyond the simple manufacturing process, and the final product is the result of several activities, comprising research and development (R&D), product design, marketing, and manufacturing. MNE buyers are extensively involved with R&D activities, product design, and the control process, as well as a strong marketing network that tend to specialize in such related activities. Nevertheless, MNEs might not necessarily be superior to local suppliers in the manufacturing process, especially in industries where the production process needs to be involved with intensive local labour and access to local raw materials. On the other hand, even though indigenous suppliers are capable in the manufacturing process, they lack knowledge of all quality aspects required, making it unlikely they would export successfully without assistance from MNE buyers. Empirical studies point out that the first few shipments from developing countries to developed ones received substantial assistance from these MNE buyers.[15]

Before placing orders, MNE buyers visit local suppliers to check their production process in order to conduct their own assessment of their capability. After finding potential suppliers, the buyers provide technical information for improving existing facilities. Based on Korean manufacturing experience, Rhee *et al.* (1984) illustrates a wide spectrum of the technical information provided, ranging from production techniques, product specification, product design, styling to market requirement, quality control technique, etc. Host country suppliers receive considerable benefits from these

[15] See Keesing (1983) for the general experience of developing countries and Rhee *et al.* (1984) for Korean manufacturing.

buyers' factory visits (Keesing, 1983; Rhee *et al.*, 1984). To become integrated into the MNEs global chain, local enterprises must comply with all requirements and apply the technical information. In many cases, manufacturers are required to install additional facilities. Furthermore, buyers will continue to conduct periodic visits to local suppliers in order to check quality control and introduce the development of new products and new product varieties. The relevant role of the MNE buyer channel in the manufacturing sector has been cited in sizable studies.[16] In particular, Hone (1974) clearly spells out the MNE buyer channel is on a par with the MNE affiliates in the export success of East Asian countries in the 1960s and early 1970s in consumable manufactured goods.

There are two specific features of MNE buyer channels. Firstly, even though it seems that international subcontracting and MNE buyer channels are similar, a key difference is that, the latter do not necessarily rely on explicit contracts as does the former. Secondly, the relative importance of MNE buyers as opposed to other foreign buyers depends on the export destination and types of products. As suggested by previous studies, the MNE buyer channel is likely to be more important for developed country destinations than for developing countries. In addition, it is more likely that the MNE buyer channel occurs in the area of consumable finished products e.g. clothing, footwear, processed foods, rather than in other manufacturing industries such as automotive industries or electronics (Richardson, 1972; Hone, 1974: p.148–9; Rhee *et al.*, 1984: p.59–63). In consumable finished products, production technology *per se* is likely to be widely known rather than being proprietary to any specific firms. It is also not subject to frequent change. Thus, it is less likely that MNEs would internalize all the production processes within the firm to prevent leakage of a technology.

Table 2.2 provides a summary of channels, through which MNEs can be involved in host economies. The degree of involvement in host economies varies across channels. Technology licensing seems to feature the least degree of MNE involvement in host economies whereas FDI seems to be the highest. International subcontracting and MNE

[16] For example, Richardson (1972); Hone (1974); Nayyar (1978); Westphal *et al.* (1979); Lall (1980); Keesing (1983); Keesing and Lall (1992).

buyers are in the middle. However, the degree of involvement does not necessarily reflect gains from MNE involvement. Gains from MNE involvement through FDI linkage might be fewer than those made through international subcontracting or MNE buyer channels. As seen in the fuller discussion in Section 2.3, FDI could even have an adverse impact on host economies.

Table 2.2
Channels of MNE Involvement

FDI Channel
1. Demonstration effect
2. Labour mobility
3. Backward linkages
4. Forward linkages
Non-FDI Channels
1. Technology licensing
2. International subcontracting
3. MNE buyer

Source: See text.

2.2 Role of the General Investment Climate and the Likelihood of MNE Involvement

Discussion in this section aims to highlight the role the general investment climate of the host country plays in successfully enticing MNE involvement. Since there is no consensus as to the definition of general investment climate, in this study (for example, see Dollar *et al.* 2004), it is a catch-all term for various considerations impinging on investment decisions, such as macroeconomic stability, political stability, policy uncertainty, civil liberties, the attitudes of the host country towards foreign enterprise participation, the rule of law, and the clarity of rules governing foreign investment.

The general investment climate is significant because a decision of MNE involvement in host economies, especially FDI, involves risk and uncertainty. Some of these risks and uncertainties can be resolved when firms begin operating but often it takes time to reveal relevant information and eventually resolve them (Rivoli and Salorio, 1996). For example, political instability cannot be resolved just because MNEs establish their affiliates. In addition, FDI involves sizable sunk costs, so that a large proportion of the fixed investment cannot be recovered, i.e. this is a case of irreversibility. The only way to recover the initial investment is to operate for a longer period. The role of the general investment climate is to reduce this risk and uncertainty involved in direct investment. Promoting a FDI-friendly environment affects the success of business operations at the micro level and creates a foundation of competitiveness and growth at the macro level. Similarly, the entry of MNE buyers occurs when the conditions in host countries are right. The right conditions include the general business environment that fosters trade rather than impedes it (Rhee *et al.*, 1984: p.51; Keesing and Lall, 1992).

There is a consensus among economists that the general investment climate is much more important than investment incentives and the like to influence MNE entry decisions (Wells, 1986; Brooks et al. 2004; Dollar et al. 2004). Investment incentives might matter only when host countries create certain levels of a conducive investment climate that allows foreign investors to make profits from their investment. While their governments offer investment incentive schemes such as tax holidays, tariff exemptions, etc to entice MNE involvement, especially FDI, the effectiveness of investment incentive schemes is still inconclusive.[17] On the one hand, these investment incentives could create distortions and inefficiencies such as bias against small and medium enterprises, and lack of transparency and accountability (Brooks *et al.*, 2004). In addition, as countries compete to attract investment, the incentives offered by a given country are generally counter-balanced by similar moves by other competing countries. Hence, investment incentives may matter only when other conditions are roughly similar in alternative host countries. On the other hand, with the harmonization of many other policy differences

[17] See the comprehensive discussion of FDI incentives in Blomström and Kokko (2003).

between countries as a part of meeting reform commitments under the World Trade Organization (WTO) and several regional integration agreements, investment incentives appear to take on a stronger role. For example, Easson (2001: p72) argues that while MNE executives used to downplay the role of incentives, they now readily admit their increasing importance for investment decisions. Moreover, Taylor (2000) provides econometric evidence in supporting the increased importance of investment incentives on international direct investment flows.

A wide range of economic and social factors, such as macroeconomic stability, the general business environment, and institutional context combine to build and sustain a favourable general investment climate. Macroeconomic stability plays a central role in providing an economic environment conducive for a country to maintain long-term economic growth (e.g. Fischer, 1993; Hobday, 1995; Yusuf *et al.,* 2003; Hill, 2004). Macroeconomic stability allows private sectors to forecast investment returns more precisely, based on the underlying economic fundamentals. In addition, the general business environment, as well as several institutional factors, are as relevant as macroeconomic stability in forming a favourable investment climate. This involves consideration of a wide range of non-economic factors such as: basic rights for foreign investors, civil liberties, rule of law, clarity of rules of governing foreign investors, labour market environment (e.g. labour strike, labour unionization), political stability, and infrastructure availability.[18]

2.3 Determinants of Gain from FDI

While FDI has high potential to generate favourable impacts on the host country, as suggested by empirical evidence (see above), gains from FDI are not automatic but depend on the economic environment and domestic policies in host countries. So far

[18] For example, Kravis and Lipsey (1982) , Mascarenhas (1982); Chase *et al.* (1988); and Rivoli and Salorio (1996) for institutional framework and political stability; Kravis and Lipsey (1982) for infrastructure quality; Wei (1997 and 2000) and Smarzynska and Wei (2000) for corruption and recently Stein and Daude (2001) testing for a wide range of institutional indicators.

there are two determinants that are generally recognized as conditioning gains from FDI: the trade policy regime and human capital.

2.3.1 Trade Policy Regime

Starting with the pioneering paper by Bhagwati (1973), a sizable theoretical literature has sought to explain how the restrictiveness (openness) of the host country's trade regime conditions gains from FDI (Bhagwati, 1978, 1985, 1994, 2003; Brecher and Diaz-Alejandro 1977; Brecher and Findlay 1983). The theory of the effect of the trade policy regime on gains from FDI in a given host country was conceived as an extension to the theory of immiserizing growth (Johnson, 1953; Bhagwati, 1958).[19] A key hypothesis arising from this literature (which is now referred to as the 'Bhagwati hypothesis') is that gains from FDI are likely to be far less or even negative under an import substitution (IS) regime compared with a policy regime geared to export promotion (EP). As postulated by Bhagwati (1978), the criterion to classify a trade policy regime is based on the effective rate of exchange (ERE). The ERE for a certain activity simply reflects the net economic return from that activity so that the criterion to distinguish between IS versus EP regimes is reliance on the degree of policy neutrality toward economic activities, i.e. import-competing versus export-oriented. Hence, an EP regime is defined as one, which equates the average ERE for exports (ERE_X) with the average effective rate of exchange for imports (ERE_M). In short, under an EP regime there is no difference in economic return between import-competing and export-oriented activities, i.e. a trade-neutral or bias-free regime (Bhagwati, 1985). In contrast, an IS regime is referred to as one where ERE_M is greater than ERE_X. Hence, an IS regime provides uneven economic return in favour of import-competing activities.

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[19] Bhagwati (1958: p.201) argues that, "economic expansion may harm the growing country itself. Under certain economic circumstances, economic expansion may harm the growing country. Economic expansion increases output which, however, might lead to a sufficient deterioration in terms of trade to offset the beneficial effect of expansion and reduce the real income of the growing country". In general, immiserizing growth occurs in the case of a large country. Johnson (1967) argues that a small country growing from the tariff-induced-FDI inflows could experience immiserizing growth in particular circumstances.

The trade policy regime conditions gains from FDI because it can influence economic incentives confronting enterprises, which operate in host countries (including MNE affiliates). Meanwhile FDI inflows are not homogenous (Dunning, 1993) and each of them could generate different benefits to host countries. Hence, with different trade policy regimes, host countries could entice different types of FDI.

Under an IS regime, government policies create artificial economic incentives in favour of domestic markets as opposed to exports. The highly-protected domestic market is the key motivation for FDI inflows. Thus, MNE affiliates are established mainly to capture economic rents induced by government policies in host countries. On the other hand, under an EP regime, FDI inflows are dictated by market mechanisms. The main incentive is the comparative advantage of the host country. In the context of developing countries, the main incentives would be the relatively low labour costs and/or availability of raw materials. MNE affiliates rely on the comparative advantage of host countries in order to enhance production efficiency and gain international competitiveness.[20] Hence, the nature of the trade policy regime could alter gains from FDI.

Gains from FDI tend to be lower under an IS regime, compared to an EP regime, in the following three ways:

(1) Direct Impact

As mentioned, direct impact refers to the impact of FDI as additional capital to host economies (see above). The dollar amount of FDI inflows under an IS regime seems to be less than under an EP regime. Since the highly-protected domestic market is the motivation for FDI inflows under an IS regime, the dollar amount is mainly determined by the size of domestic demand. In contrast, the main incentives for FDI inflows under an EP regime is the comparative advantage of host countries that MNEs can use to strengthen their international competitiveness. The dollar amount of FDI inflows under an EP regime are not likely to be constrained by limited domestic demand but by export opportunity. Balasubramanyam and Salisu (1991) empirically support this, based on

[20] According to Dunning (1993), an IS regime is likely to entice rent (market)-seeking FDI whereas efficiency seeking FDI is likely to gravitate to host countries pursuing an EP regime.

inter-country cross-sectional data analysis. While other factors such as market size of the host country (measured by GDP per capita and its growth), macroeconomic stability (measured by the wholesale price index), and attitudes toward foreign investors are taken into consideration, the magnitude of FDI inflows tends be lower for countries pursuing an IS regime. Thus, the direct impact tends to be less under an IS regime, compared with an EP regime.

(2) Impact on Resource Allocation and Immiserizing Growth

FDI inflows under an IS regime are likely to generate immiserizing growth in host countries. Generally, countries pursuing an IS regime impose protection on capital-intensive sectors where they are less internationally competitive. Thus, FDI inflows under an IS regime would be directed into the capital-intensive sector. This causes expansion in the protected capital-intensive sector and enlarges the existing distortion effect. According to the Rybczynski Theorem,[21] this leads to contraction of the protection-free labour-intensive sector. Thus, the impact of FDI could possibly reduce social welfare and real income.

A two-factor, two-good Hecksher-Ohlin-Samuelson (HOS) model can illustrate this. Suppose there are only two input factors, capital (K) and labour (L). There are two goods, X (export-oriented) and Y (import-competing) goods. Assume that Y is capital intensive. The general equilibrium model setting is as follows;

$$X = g^x(L_x, K_x) \tag{2.1}$$

$$Y = g^y(L_y, K_y) \tag{2.2}$$

$$\overline{L} = L_x + L_y \tag{2.3}$$

$$\overline{K} = K_x + K_y \tag{2.4}$$

[21] According to the Rybczynski Theorem, the endowment of one of the factors of production increases, the endowment of the other being constant, the output of the good using the accumulating factor intensively will increase and the output of the other good will decrease in absolute terms, provided that commodity and factor prices are kept constant (Södersten and Reed,1994: p.125).

where $g^i(L_i, K_i)$ = production function of i^{th} good,

$i = X$ and Y

Assume the production function is linear homogenous, i.e. exhibits constant returns to scale. With this assumption, the production function can be considered in terms of the input-output coefficients. Thus, equations (2.1) and (2.2) can be transformed into equations (2.5) and (2.6), respectively. That is, equation (2.1) is divided by X and rearranged to obtain equation (2.5). Equation (2.5) states that 1 unit of good X can be produced by a_{LX} units of labour and a_{KX} units of capital.

$$\frac{X}{X} = \frac{1}{X} g^x(L_x, K_x)$$

$$1 = g^x\left(\frac{L_x}{X}, \frac{K_x}{X}\right)$$

$$1 = g^x(a_{LX}, a_{KX}) \tag{2.5}$$

where $a_{LX} = \dfrac{L_x}{X}$ and $a_{KX} = \dfrac{K_x}{X}$

Similarly, equation (2.6) is expressed as the production function of 1 unit of good Y.

$$1 = g^y(a_{LY}, a_{KY}) \tag{2.6}$$

where $a_{LY} = \dfrac{L_y}{Y}$ $a_{KY} = \dfrac{K_y}{Y}$

Rearrange equations (2.2) and (2.3) to be a function of a_{Li} and a_{Ki} as in equations (2.7) and (2.8), respectively.

$$\overline{L} = a_{LX}X + a_{LY}Y \tag{2.7}$$

$$\overline{K} = a_{KX}X + a_{KY}Y \tag{2.8}$$

FDI inflows enlarge the capital in host countries. Differentiating equations (2.7) and (2.8) with respect to *FDI,* it obtains as in equation (2.9) and (2.10), respectively.

$$\frac{\partial \overline{L}}{\partial FDI} = a_{LX}\frac{\partial X}{\partial K}\frac{\partial K}{\partial FDI} + a_{LY}\frac{\partial Y}{\partial K}\frac{\partial K}{\partial FDI} \tag{2.9}$$

$$\frac{\partial K}{\partial FDI} = a_{KX}\frac{\partial X}{\partial K}\frac{\partial K}{\partial FDI} + a_{KY}\frac{\partial Y}{\partial K}\frac{\partial K}{\partial FDI} \tag{2.10}$$

FDI inflows do not have any impact on the labour force so that $\frac{\partial \overline{L}}{\partial FDI} = 0$. Therefore, a matrix of linear equation system is obtained as in Equation (2.11).

$$C_{2\times1} = A_{2\times2}X_{2\times1} \tag{2.11}$$

where $C_{2\times1} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$; $A_{2\times2} = \begin{bmatrix} a_{LX} & a_{LY} \\ a_{KX} & a_{KY} \end{bmatrix}$; and $X_{2\times1} = \begin{bmatrix} \frac{\partial X}{\partial K} \\ \frac{\partial Y}{\partial K} \end{bmatrix}$

Thus, $X = A^{-1}C$

$$\begin{bmatrix} \frac{\partial X}{\partial K} \\ \frac{\partial Y}{\partial K} \end{bmatrix} = \begin{bmatrix} \frac{-a_{LY}}{a_{LX}a_{KY} - a_{KX}a_{LY}} \\ \frac{a_{LX}}{a_{LX}a_{KY} - a_{KX}a_{LY}} \end{bmatrix} \tag{2.12}$$

With the assumption that Y is capital intensive, $\frac{a_{LX}}{a_{KX}} > \frac{a_{LY}}{a_{KY}}$ and thus $a_{LX}a_{KY} - a_{KX}a_{LY} > 0$. FDI inflows cause the expansion of goods *Y* on the cost of goods *X.*

To draw an inference on social welfare, the prices of goods *X* and *Y* as well as consumer's utility must be incorporated into the general equilibrium framework. For simplicity, assume that X as numeraire and p is the price of goods Y relative to X, depending on world price, (p^*) and tariff (t).

$$p = (1+t)p^* \tag{2.13}$$

Hence, the total value of output is as follows:

$$\begin{aligned} R(p,L,K) &= pg^y(L_y,K_y) + g^x(L_x,K_x) \\ &= pg^y(L_y,K_y) + g^x(L-L_y,K-K_y) \end{aligned} \tag{2.14}$$

where $R(p,L,K)$= value of output in terms of goods X.

This setting is in line with the theoretical model developed by Edwards and Wijnbergen (1986). Consumer behaviour, on the other hand, is summarized by the concave expenditure function $E(p, U)$ as in equation (2.15).

$$\begin{aligned} E(p,U) &= X(p,U) + pY(p,U) \\ &= X(p,U) + pY(p,U) \end{aligned} \tag{2.15}$$

where $X(p,U)$= Hicksian demand for goods X

$Y(p,U)$= Hicksian demand for goods Y

Assume that $R\ (p,K,L)$ and $E(p,\ U)$ are twice differentiable. At the equilibrium,

$$R\ (p,K,\ L) + t\overline{Y} = E(p,\ U) \tag{2.16}$$

Note that the second term of the left-hand side is the tariff revenue, the product of tariff rate and equilibrium quantity of Y ($\overline{Y}$). The equilibrium quantity of Y is jointly determined by both demand for and supply of goods Y so that it is a function of both utility and capital stock. The presence of tariff on goods Y entices the FDI inflows, thereby increasing the level of domestic capital stocks. Take total differential to equation

(2.16) and assume other variables except dU and dK are equal to zero. Hence, the welfare impact of the FDI inflows is as follows:

$$p\frac{\partial Y}{\partial K}dK+\frac{\partial X}{\partial K}dK+t\left(\frac{\partial Y(U,p)}{\partial U}dU-\frac{\partial Y(p,K)}{\partial K}dK\right)=\frac{\partial X}{\partial U}dU+p\frac{\partial Y}{\partial U}dU$$

$$\frac{\partial U}{\partial K}=\frac{\left(p\frac{\partial Y}{\partial K}+\frac{\partial X}{\partial K}\right)-t\frac{\partial Y}{\partial K}}{\left(\frac{\partial X}{\partial U}+p\frac{\partial Y}{\partial U}\right)-t\frac{\partial Y}{\partial U}} \tag{2.17}$$

According to the duality theory,

$$Y^M(p,I)=Y^M[p,E(p,U)]=Y(p,U)=E_P(p,U)=\frac{\partial E(p,U)}{\partial p} \tag{2.18}$$

where $Y^M(p,I)$ = Marshallian demand function of goods Y.

I = Money income

Differentiating equation (2.18) with respect to U, it obtains

$$\begin{aligned}\frac{\partial Y(p,U)}{\partial U}&=\left(\frac{\partial Y^M}{\partial I}\right)\left(\frac{\partial E(p,U)}{\partial U}\right)\\&=\left(\frac{\partial Y^M}{\partial I}\right)\left(\frac{\partial X}{\partial U}+p\frac{\partial Y}{\partial U}\right)\end{aligned} \tag{2.19}$$

Substitute $\frac{\partial Y(p,U)}{\partial U}$ from equation (2.19) into equation (2.17);

$$\frac{\partial U}{\partial K}=\frac{\left(p\frac{\partial Y}{\partial K}+\frac{\partial X}{\partial K}\right)-t\frac{\partial Y}{\partial K}}{\left(\frac{\partial X}{\partial U}+p\frac{\partial Y}{\partial U}\right)(1-\alpha t)} \tag{2.20}$$

where $\alpha=\frac{\partial Y^M}{\partial I}$, income effect

The first term of nominator of equation (2.20), $\left(p\frac{\partial Y}{\partial K}+\frac{\partial X}{\partial K}\right)$, is the marginal productivity of capital that is always positive. The second term $t\frac{\partial Y}{\partial K}$ is positive because according to equation (2.12), $\frac{\partial Y}{\partial K}$ is positive.[22] Thus the sign is ambiguous. On the other hand, the sign of the denominator depends on the last bracket $(1-\alpha t)$. With the assumption that Y is normal goods $\alpha \in (0,1)$. Hence with $t \in (0,1)$, $\alpha t \in (0,1)$. The denominator is always positive. At the positive tariff rate, $t > 0$, FDI inflows could result in immiserizing growth and lower income in host countries. In other words, under an IS regime, MNE affiliates that are motivated by high tariff protection could generate an adverse impact on host economies. Such an adverse effect is unlikely to occur under an EP regime.

It becomes clearer when remittances are taken into consideration. Under the assumption that the capital market is perfectly competitive, direct investors earn interest return on foreign capital equal to the marginal product of capital. In the extreme case where these investors fully remit this return to home countries, the nominator in equation (2.20) will be only $-t\frac{\partial Y}{\partial K}$ as in equation (2.21). Thus, FDI inflows under an IS regime always result in immiserizing growth.

$$\frac{\partial U}{\partial K} = \frac{-t\frac{\partial Y}{\partial K}}{\left(\frac{\partial X}{\partial U}+p\frac{\partial Y^H}{\partial U}\right)(1-\alpha t)} \tag{2.21}$$

In a case where foreign affiliates remit this return partly, the general version of equation (2.20) is

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[22] Edwards and Wijnbergen (1986) refer to the term as Rybczyncki term.

$$\frac{\partial U}{\partial K}=\frac{\gamma\left(p\frac{\partial Y}{\partial K}+\frac{\partial X}{\partial K}\right)-t\frac{\partial Y}{\partial K}}{\left(\frac{\partial X}{\partial U}+p\frac{\partial Y^{H}}{\partial U}\right)(1-\alpha t)} \tag{2.22}$$

where $\gamma \in (0,1)$ = the fraction of interest return remaining in host countries

3. Technology Spillover

While FDI inflows can create technology spillover to indigenous non-affiliated firms, which result in enhancing productivity and long-term economic growth in host countries, technology spillover seems to occur far less under an IS regime, compared with an EP regime. Some countries might even experience negative FDI technology spillover on the productivity of locally non-affiliated firms.

To illustrate the impact of FDI inflows on technological capability in the host country, total factor productivity (A) is introduced into the revenue function. The greater the value of A, the greater the productivity gained by firms in host countries, i.e. $\frac{\partial R}{\partial A}>0$. Assume FDI technology spillover affects A in general (Hicks-neutral technological progress), not in particular goods, so there is no need to disaggregate into goods X and Y. The economy is represented by revenue and expenditure functions. Thus, in the revenue function A is incorporated.

$$R(p,K,L,A)=E(p,U)$$

Following the mathematical procedures from equations (2.16) to (2.22), the effect of FDI inflows to utility in host countries is as in equation (2.23):

$$\frac{dU}{dK}=\frac{\left[\gamma\frac{\partial R(p,K,L,A)}{\partial K}+\frac{\partial R}{\partial A}\frac{\partial A}{\partial FDI}-t\frac{\partial R_{P}(p,K,L)}{\partial K}\right]}{\frac{\partial E(p,U)}{\partial U}[1-t\alpha]} \tag{2.23}$$

While $\frac{\partial R}{\partial A} > 0$, the sign of $\frac{\partial A}{\partial FDI}$ is ambiguous as suggested by a number of empirical studies (see above). It can be positive or negative, depending on how MNE affiliates and locally non-affiliated firms interact with each other. In circumstances where local firms actively respond to the presence of MNE affiliates and try to maximize the advanced benefits, $\frac{\partial A}{\partial FDI}$ tends to be positive. In contrast, where local firms fail to respond to the presence of MNE affiliates, it is likely the latter will bring in with them advanced technology in a once-and-for-all manner at the time of establishment. $\frac{\partial A}{\partial FDI}$ tends to far lower in these circumstances. How locally non-affiliated firms react to the entry of MNE affiliates depends on the trade policy regime.

The theoretical model developed by Wang and Blomström (1992) is employed to illustrate the sign of $\frac{\partial A}{\partial FDI}$. The model is based on a dynamic game theory framework. Assume two firms in the manufacturing sector: an affiliate of an MNE and a locally non-affiliated firm (henceforth referred to as the 'foreign' and 'local' firms, respectively), producing differentiated but substitutable products for the host country market. This assumption of serving the domestic market can be generalized to a situation where both types of firms produce for a third country market without affecting the key result. The market success of each firm depends on the level of technology employed. The more advanced the level of technology, the greater the consumer demand and expected profits. On the one hand, the entry of a foreign firm is associated with some amount of proprietary technology from the parent company so as to offset the potential disadvantage against the local firms possessing superior knowledge of the availability of factor inputs, business practices and/or consumer preferences. Beyond that there is still an incentive for the foreign firm to put extra effort into undertaking technology transfer activities to increase market share.[23]

[23] See the fuller discussion of the model's dynamic optimization setting in Appendix 2.

It is assumed the effort to undertake technology transfer activity is observable and represented by I_f. However, transferring technology activities is costly. The effort to transfer technology I_f is associated with dollar costs, C_f where C_f is an increasing function of I_f, i.e. $\frac{\partial C_f}{\partial I_f} > 0$, with decreasing rate, i.e. $\frac{\partial^2 C_f}{\partial I_f^2} < 0$. Because of the presence of cost and benefit, the foreign firm has to decide the amount of I_f undertaking such activities to maximize its net benefit. In addition, the amount of I_f will depend on the local firm's response to the presence of the foreign firm. In a situation where the local firm actively puts in the effort to learn the advanced technology associated with the foreign firm, the technology superiority of the latter will not last long. As the result, it will need to keep undertaking technology transfer activities in the following period in order to maintain the advantage or even just to survive in the host country environment. In contrast, a situation where local firms are less responsive in attempting to learn the associated technology provides relatively less incentive for foreign firms to continue to actively undertake technology transfers from their parent company.

On the other hand, the local firm can observe, learn, and adapt technological superiority associated with the MNE affiliate (so called 'learning effort') to enhance its own technological capability. This is because the technology accompanying with the foreign firm has certain public good qualities, which cannot be fully internalized, thus the localization of the foreign firm could potentially generate positive externality in terms of technological benefit to the local firm.

As mentioned earlier, the market success of each firm depends on the level of technology it employs. This encourages local firms to learn the associated superior technology. However, the learning effort of the local firm is associated with the dollar amount of cost. The effort that the local firm devotes to the learning process is observed by I_d and its associated dollar costs, C_d, which increases with the level of effort, I_d, but at a decreasing rate (that is $\frac{\partial C_d}{\partial I_d} > 0$ and $\frac{\partial^2 C_d}{\partial I_d^2} < 0$). Similar to the foreign firm, I_d also depends on I_f and the local firm has to decide on its level of effort (I_d).

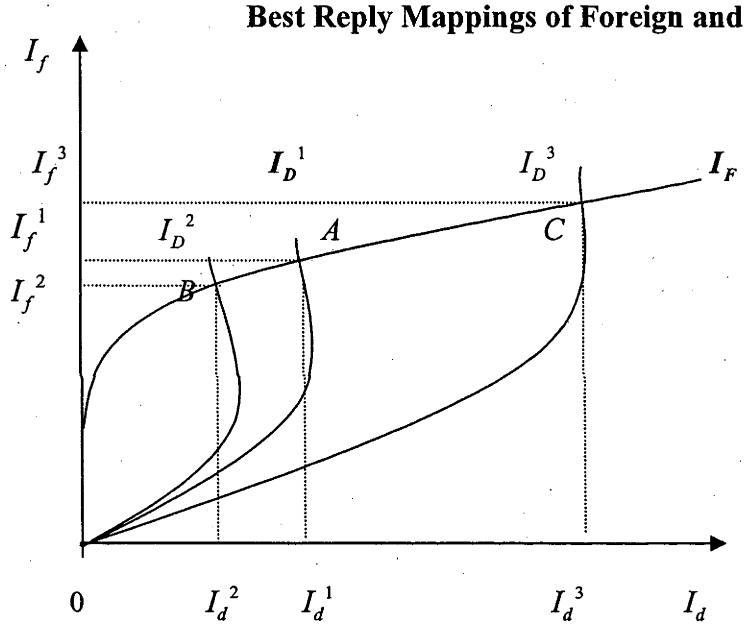
Each firm chooses its own optimal level of effort, given the other's effort over the period. The optimal path of effort level each firm decides on could be represented by the so-called 'best reply' mapping. That is, $\boldsymbol{I_F}$, the best reply mapping of a foreign firm, is a function that illustrates the optimum level of I_f with a given level of I_d as well as other factors, such as capital costs and age of technology transferred. Similarly, the best reply mapping of local firm, $\boldsymbol{I_D}$, is a level of effort where the local firm maximizes its return at the certain level of I_f as well as other related factors such as policy environment in the host country and domestic opportunity cost.

Figure 2.1 illustrates both $\boldsymbol{I_F}$ and $\boldsymbol{I_D^1}$ mappings. Both are positively sloped.[24] Intuitively, the upward slope of the $\boldsymbol{I_F}$ curve implies the foreign firm positively responds to I_d in order to keep technological superiority and secure market share in the host country. The concavity of $\boldsymbol{I_F}$ reflects the learning-by-doing feature of technology enhancing activities. That is, as a foreign firm becomes more involved with technology transfer activities, the additional effort to advance its technological capability is less. The positive y-axis intercept on $\boldsymbol{I_F}$ represents the prerequisite the foreign firm needs to accompany the advanced technology to offset its initial disadvantage in local market conditions. As a mirror image of $\boldsymbol{I_F}$, the $\boldsymbol{I_D^1}$ function exhibits a positive relationship between I_d and I_f with the convexity. Unlike the foreign firm, the local firm possesses superior knowledge of the local market condition so the best reply mapping of local firm, $\boldsymbol{I_D^1}$, starts from the origin.

[24] The positive slope of $\boldsymbol{I_F}$ needs a certain but not counter-intuitive assumption over the parameter. See details in the Appendix 2.

Both firms will attain the equilibrium levels of I_f^1 and I_d^1 at the intersection between $\boldsymbol{I_F}$ and $\boldsymbol{I_D}$ functions at point A in Figure 2.1. Given the steeper slope of $\boldsymbol{I_D}$, the equilibrium is locally stable and steady-state Nash equilibrium. There is no incentive for either of these firms diverting from this equilibrium level. Both $I_f^{\,1}$ and $I_d^{\,1}$ levels jointly determine the magnitude of technology spillover the host country can expect from FDI. Given the equilibrium level of I_f, the higher the equilibrium level of I_d, the higher the level of technology spillover. All other things being equal, the higher level of I_f at the equilibrium implies the higher technology spillover the host country expects to gain.

Figure 2.1
Best Reply Mappings of Foreign and Local Firms



To demonstrate the role of the trade policy regime, the model discussed here is modified by hypothesizing that trade policy influences the cost effectiveness of the technology enhancing activities for the local firm. That is, every effort to enhance the technological capability of the local firm is more costly in any industry where the trade regime is more restrictive. This is because much of the FDI flowing to a sector with high trade restrictions often enters relatively capital- and skill- intensive products where output is mainly supplied for a highly protected domestic market. Although the production technology associated with FDI is typically older and less advanced than used in the MNE's home country (Moran, 2001), it is often relatively capital and skill intensive, compared to that employed by the local firm. Technology gap in this circumstance is likely to be wide. This is also far from the host country's comparative advantage. Thus, it is difficult for local firms to use the advanced technology.

In addition, the nature of the capital intensity and the requirement for huge fixed and sunk costs in the early stages limit the number of local enterprises able to become involved. Learning and adapting such technology does not automatically take place (Bell *et al.*, 1984; Eveson and Westphal, 1995). In order to effectively benefit from technology, the acquisition process requires successive effort and incurs sizable dollar costs. An IS regime does not provide the economic incentive for local enterprises to commit to such long-term investment. Instead, the highly-protected domestic market encourages local firms to produce products not directly competitive with those being produced by foreign affiliates and to enjoy economic rents induced by the regime. Kokko (1994) refers to this as a situation where the foreign affiliate in certain industries may operate in 'enclaves' in isolation from local firms. Thus, an increase in the level of trade restrictiveness raises the dollar cost of learning effort for the local firm, C_d. This results in shifting $\boldsymbol{I_D}$ left from I_D^1 to I_D^2 in Figure 2.1. That is, at any level of I_f, the effort of the local firm to learn technology becomes less. Thus at point B, the equilibrium levels of I_f^2 and I_d^2 are lower than those at point A, thereby lowering the expected magnitude of technology spillover from FDI.

In contrast, in the context of a liberal trade regime, technology spillover is likely to generate a more productivity enhancing effect. This is because the main incentives for FDI in a given host country are the relatively low-labour costs and/or availability of raw materials. FDI inflows under an EP regime can be expected to employ technologies more in line with the host country's comparative advantage. A higher level of policy neutrality creates a higher likelihood for MNEs to become involved with the host country's production to serve their strategy for maintaining a competitive position in international markets. With this motivation, the associated advanced technology will be cutting edge and making use of existing resource endowments in the host country (Moran, 2001). Under these circumstances, it is easier for the demonstration effect of foreign involvement in the host country to operate. Global competition makes all economic agents actively seek technological innovation to improve efficiency.

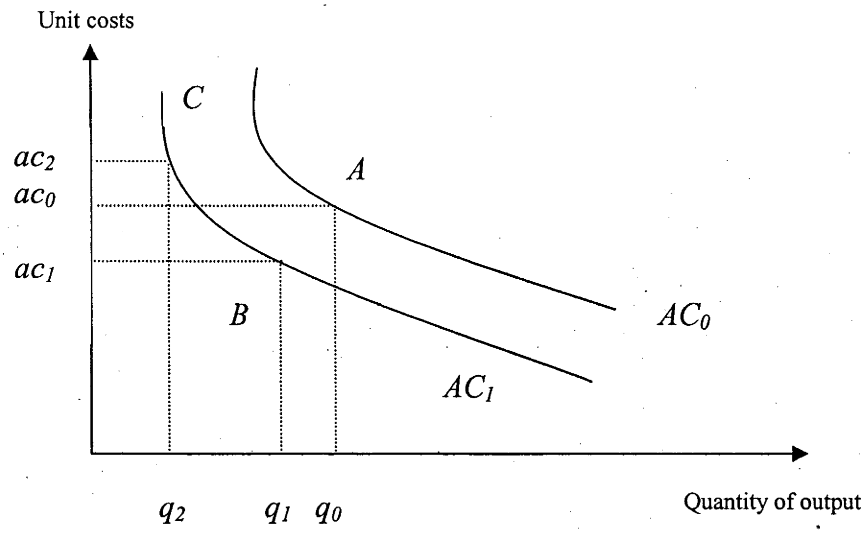
It is arguable that the technology gap between foreign MNEs and local firms in EP industries can be expected to be smaller. This encourages local firms to learn the advanced technology associated with the foreign presence. In such an industry, the advanced technology might be related to special skills in management, distribution, product design, marketing and other links in the value chain, or be made up of internationally recognized brand names and trade marks. Lowering trade restrictiveness reduces the cost of learning effort at any level of I_d. This results in an outward shift of I_D^1 to I_D^3. The new equilibrium level is attained at point C in Figure 2.1 where the equilibrium levels of I_f^3 and I_d^3 are both higher than points A and B. Technology spillover could have a more growth conducive effect in the EP industry.

Nevertheless, the main shortcoming of this proposed theoretical framework is that FDI cannot adversely affect productivity of local firms. However, there is empirical evidence that FDI can result in a negative outcome, e.g. Aitken and Harrison (1999) for Venezuela, Djankov and Hoekman (2000) for Czech. Republic, and Kathuria (2000) for India. It is unlikely that a spillover effect *per se* could be negative. Rather it would be either zero or positive. Nevertheless, there is a possibility that the entry of MNE affiliates could create an indirect effect that would have an adverse impact on the production level and productivity of local firms as argued by Aitken and Harrison (1999). In particular, even with positive technology spillover the foreign presence could steal market share, reducing the local firm's output level. In a highly capital-intensive industry where fixed costs are significant, lower production levels are likely to result in higher average costs and lower production efficiency. Aitken and Harrison (1999) refer to this adverse effect as the so-called 'market-stealing effect'. As a result, the net effect on local firms' productivity is ambiguous, and could be either positive or negative.

The market-stealing effect can be illustrated in Figure 2.2. The presence of fixed costs makes the average cost function downward sloping. AC_0 represents the average cost curve before the entry of MNE affiliates. In an oligopolistic market environment, the entry of MNE affiliates can affect indigenous firms in two ways. Firstly, the entry of MNE affiliates creates a positive effect on the productivity of indigenous firms thereby shifting down the average cost curve from AC_0 to AC_1. At any output level, indigenous firms can produce their products with lower average costs. However, when MNE affiliates sell their product domestically, the new entrant causes the fraction of market demand for each individual firm to become smaller so that the fixed cost per unit is raised and the net effect on average cost is ambiguous. The larger the amount of output reduction, the less the net benefit indigenous firms can anticipate from the entry of MNE affiliates. Suppose the entry of MNE affiliates causes the total sales of i^{th} firm to slightly drop from q_0 to q_1, but the average costs of i^{th} firm are still lower after the entry of MNE affiliates. Thus, the net impact is still positive. However, if the total sales of i^{th} firm dramatically drop to q_2, the average costs of i^{th} firm increase. In the latter example, the entry of MNE affiliates adversely affects the productivity of indigenous firms.

In the context of trade policy regimes, this market-stealing effect is more likely to operate under an IS regime than an EP regime. As the promoted industry under an IS regime is generally characterized as highly capital-intensive and domestic-market oriented, a foreign presence is likely to share the domestic market, thereby generating an adverse impact on the local firm's productivity. Combining this market-stealing effect with favourable technology spillover means the net impact of a foreign presence could be either positive or negative. In contrast, the market-stealing effect is unlikely to take place in an EP industry because production is not limited by the size of the domestic market.

Figure 2.2
Output Response of Indigenous Firms to Entry of MNE Affiliates



Source: Aitken and Harrison (1999)

Therefore,

$$\frac{\partial A}{\partial FDI} = \alpha + \beta TP \tag{2.24}$$

where TP= proxy for the trade policy regime, i.e. an increase in TP implies the trade policy regime is geared toward an EP regime.

$\frac{\partial A}{\partial FDI}$ in equation (2.24) can be either positive or negative. Parameter α captures the direct effect of the entry of MNE affiliates (adding more productive firms into the economy) as well as the partial effect of technology spillover to local firms. βTP is the remaining effect of FDI technology spillover that is conditioned by the trade policy regime. According to the 'Bhagwati hypothesis', β must be negative.

All in all, under an IS regime, the impact of gains from FDI, either direct or indirect, seems to be less or even negative, compared to a policy regime geared toward an EP regime. Despite its immense policy relevance, empirical studies to examine the role of a trade policy regime conditioning gains from FDI (the 'Bhagwati hypothesis') are sparse. So far there are only four studies, i.e. Balasubramanyam *et al.* (1996), Athukorala and Chand (2000), Kokko *et al.* (2001) and Kohpaiboon (2003). These studies provide support for the 'Bhagwati hypothesis'.

2.3.2 Human Capital

Human capital in host countries is another factor that plays a crucial role in conditioning the gains from FDI. The role of human capital is derived from the concept of absorptive capability, proposed by Nelson and Phelps (1966), Abramovitz (1986) and Benhabib and Spiegel (1994). The entry of MNE affiliates is associated with advanced technology, so the level of human capital development in host countries is needed to turn the opportunities into reality and enhance technological capability.

Borensztein *et al.* (1998) propose a theoretical model to illustrate how FDI and human capital affect gains from FDI measured in terms of output growth, and empirically test the model across developing countries. This model is based on endogenous growth theory. FDI inflows in the model affect economic growth in host countries because they are usually associated with the introduction of advanced technology. Hence, this generates technological progress.

$$Y_t = A_t H_t^{\theta} K_t^{1-\theta} \tag{2.25}$$

$$K_t = \int_0^N \left[X_j^{1-\alpha} d_j \right]^{\frac{1}{(1-\alpha)}} \tag{2.26}$$

where Y = output

A = the exogenous state of environment

H = human capital

K = physical capital

X_j = j th capital goods

θ , α = parameters and $\in (0,1)$

In this model, the physical capital in equation (2.26) is defined as a composite of a continuum of varieties of capital goods, X_j. The number of capital goods available, N, plays a crucial role in determining economic growth in the host countries. The larger the value of N, the higher the economic growth. This is analogous to expanding the variety of intermediate products, as in Romer (1990), Grossman and Helpman (1991); Barro and Sala-i-Martin (1995). In the model, FDI inflows play two important roles in determining economic growth. Firstly, FDI inflows enhance the variety of capital stocks that favourably affect economic growth. That is, N is positively related to the presence of FDI in this model. Secondly, as applying new capital goods into the production process incurs fixed costs from learning how to use the goods efficiently as well as how to adjust them to the local environment, the presence of FDI saves such fixed costs. This is because it is likely to be cheaper to imitate products and/or processes already in existence than those that are at the frontier of innovation.

This does not mean acquiring such technology is costless. To absorb and utilize the technological benefits effectively, host countries must first surpass a certain threshold level of human capital development. Beyond this threshold level, the higher the absorptive capability, the lower the cost to apply the new capital goods. In other words, the relationship between FDI and economic growth is not linear but is conditional on the level of human capital development in the host country.

Empirical studies examining the role of human capital have emphasized macro-level analysis. Nevertheless, there is a puzzle about the role of human capital in conditioning gains from FDI inflows. Except for Borensztein *et al.* (1998), the level of human capital development seems unsatisfactory to explain the various outcomes of the FDI-growth nexus. For example, Nair-Reichert and Weinhold (2001) examine the relationship between FDI and economic growth in 24 developing countries over the period 1970–95, and introduce both human capital and trade policy regime to condition the growth-enhancing effect of FDI. The coefficient corresponding to the trade policy regime is the only one found statistically significant. Carkovic and Levine (2002) and

Ram and Zhang (2002) find the same outcome as Nair-Reichert and Weinhold (2001), based on experience from both developed and developing countries.

One explanation for this unsatisfactory outcome could be the measurement problem of how to quantify the level of human capital development. All of these studies measure the level of human capital development based on education indicators because of data availability. In fact, Abramovitz (1986) and Blomström *et al.* (1994) argue that human capital measured by the level of attainable education is one of several ways to build a country's absorptive capability. Indeed, absorptive capability widely covers the level of education, political stability, openness to competition, and the freedom to operate business, etc. (Abramovitz, 1986: p.389). Similarly, it is argued by Parente and Prescott (2000: p.66) that evidence that a certain industry performs better in one country than in another, and vice versa, points out the limitations in solely focusing on human capital as the key factor in determining gains from FDI.

Besides trade policy and human capital, a recent study by Alfaro *et al.* (2004) proposes that local financial markets play a role in determining gains from FDI. The key proposition is countries with better financial systems can exploit FDI more efficiently. While the econometric results support the role of local financial markets, it seems more reasonable that the level of financial development seems to have an impact on FDI gains only at a certain level, i.e. a threshold level. In countries whose financial development levels pass this threshold level, the financial system would no longer condition FDI gains. For example, it does not seem reasonable that levels of financial systems among developed countries could condition FDI gains. In addition, their study examined the relationship between economic growth and FDI rather than FDI technology spillover, in which the impact on locally non-affiliated firms is emphasized. It is unlikely that MNEs are constrained by the financial system in host countries. For these reasons, financial intermediation is not included in the analytical framework of determinants of gains from FDI.

2.4 Gains from FDI and the Role of FDI Linkages

Recent theoretical studies, i.e. Rodŕigueze-Clare (1996); Markusen and Venables (1999), highlight FDI linkages as the other key determinant of gains from FDI. Their general proposition is that the greater the magnitude of FDI linkages, particularly backward linkages[25], the greater the gains from FDI. Backward linkages are not included in the previous section because FDI linkages are indeed a performance indicator of FDI, rather than the economic and policy environment in host countries. Nevertheless, it is important to spell out this proposition clearly, because it is still an issue in the foreign investment policy debate. Many governments in developing countries regard LCRs as a complementary measure that must go hand in hand with liberalizing foreign investment policy (Battat *et al.*, 1996). LCR measures are always pursued, based on the belief that it is required to develop 'specific' industries in order to provide a transition period and to allow them to compete in an open trading environment. There is evidence that these countries have been reluctant to call off such measures, although the General Agreement on Tariffs and Trade (GATT)/ World Trade Organization (WTO) stipulated certain rules to eliminate LCR measures by 1 January 2000 (Belderbos *et al.* 2001; Bora, 2001 cited in Brooks *et al.* 2004).[26]

While both Rodŕigueze-Clare (1996), and Markusen and Venables (1999) point to the relative importance of FDI linkages with local indigenous firms as a key factor in determining gains from FDI, these two studies have a different focus. Rodŕigueze-Clare (1996), on the one hand, proposes a theoretically sound measurement of the size of

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[25] The significance of linkages to overall economic development is first developed by Hirschman (1958).

[26] Even though in the industrialized and more advanced developing countries the use of local content has officially been banned after the conclusion of the Uruguay Round of the GATT, in practice local content rules for foreign investors are present in several guises. For example, in the United States, local content rules are embedded in the rule of origin regulated with the establishment of the North American Free Trade Association (NAFTA). As another example, the European Union (EU) embedded a local content requirement in the anti-dumping law. This affects foreign investors whose exports to the EU have previously been targeted by EU anti-dumping actions (Belderbos *et al.,* 2001).

backward linkage.[27] On the other hand, Markusen and Venables (1999) directly address the necessary role of backward linkages in the context of FDI-growth nexus. Thus the following discussion concentrates on the latter.

Gains from FDI through backward linkages in Markusen and Venables (1999) are referred to as gains in terms of output expansion rather than as a favourable impact on the technological capability of local suppliers. In the circumstance where MNEs establish affiliates for the domestic market, they directly compete with locally non-affiliated firms within the same industry (henceforth referred to as the competition effect). The competition effect can eventually crowd local firms out of the market and create an adverse effect on the host country's economic growth.[28] Backward linkages are needed because their positive impact on economic growth in upstream industries will mitigate any potential adverse effect from direct competition in downstream industries. Hence a substantial amount of backward linkages could result in a net gain from FDI.

The model proposed by Markusen and Venables (1999) is partial equilibrium analysis consisting of two types of goods; final and intermediate goods, and three types of firms; domestic, MNE affiliated, and foreign. While all three types of firms compete in final goods, only the first two types of firms produce locally. As intermediate goods are assumed to be nontradable, the entry of MNE affiliates automatically generates demand for intermediate goods in the host country. As a result, MNE affiliates lead to expansion of intermediate input production in the host countries, widening their availability and deepening the industrial development level. In addition, a well-developed domestic upstream industry could induce the development of a domestic downstream industry, i.e. the presence of forward linkages.

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27 Rodŕigueze-Clare (1996) proposes the number of workers employed in the upstream industry could be a good proxy for the level of backward linkages generated.

28 The competition effect is somewhat similar to the 'market-stealing' effect proposed by Aitken and Harrison (1999), as discussed above.

Even though the model comes up with a strong theoretical outcome for the role of FDI linkages on economic growth, the implications for policy and for appraisal of FDI projects must be interpreted with caution. In particular, Markusen and Venables (1999: p.352–3) argue that

> 'While the research in this paper provides a framework for identifying some of the characteristics of FDI projects most likely to have a positive impact on host country development, we caution against drawing policy conclusions from such a simple model. Further work is needed to broaden the scope of project appraisal techniques to encompass the sort of linkages analysed in this paper and to address the more difficult policy issues raised by cumulative causation.'

This point is highly important in the policy design context because it is easy to mislead by overemphasizing the role of backward linkages from FDI, and to favour LCRs-induced linkages as a result. In the Markusen and Venables' model, the necessity of linkages, especially backward ones, derives from the circumstance that FDI inflows aim only to substitute trade and directly compete with local final product suppliers (Markusen and Venables, 1999: p.344). Indeed, ample studies of FDI, e.g. Hill and Athukorala (1998); Athukorala (2003a) point to sizable export-oriented FDI inflows. For these export-oriented FDI inflows, there is no threat of a competition effect and even FDI with low linkages is unlikely to retard economic growth. This is supported by a number of empirical studies e.g. Barry and Bradley (1997) in the case of Irish manufacturing; Kelegama and Foley (1999) in the case of Sri Lanka; and Athukorala and Santosa (1997) in the case of Indonesia.

In addition, linkages in the theoretical work are referred to as 'natural' linkages. That is, the linkages take place according to underlying economic conditions, i.e. product quality, price competitiveness, and transportation costs. In particular, with the assumption of non-traded intermediate products in the model, the entry of MNE affiliates is naturally associated with the demand for intermediates and such linkages promote the host country's economic growth. This would be different from another type of linkage induced by governments in host countries, so called 'policy-induced' linkages henceforth.[29] The following question arises — do 'policy-induced' linkages still benefit host countries in the same way as 'natural' ones?

Indeed, policy-induced linkages seem to be less beneficial to the technological improvement of indigenous firms than 'natural' linkages. Imposing policy-induced linkages distorts the mechanism where FDI generates technology spillover through backward linkages. To some extent, LCRs would be regarded as protection for intermediate producers in host countries. To maintain their operation in host countries, MNEs in downstream industries are obligated to use locally produced intermediates regardless of price and quality, so that the presence of LCR measures increases the operating costs of MNE affiliates. In this situation, MNEs must isolate their affiliates from the rest of the organization. In the context of small developing countries, MNEs will seek protection of final goods in return for keeping their operation in the host country.[30] As a result, host countries must offer protection to downstream industries to compensate for the presence of LCR measures.

Since policy-induced linkages do not rely on a country's comparative advantage, complying with LCR measures requires a greater effort. At the same time, the protection of final outputs offered provides MNE affiliates (as well as local producers) shelter from world competition. To comply with the LCR measures, MNE affiliates will procure locally manufactured inputs that just meet minimum requirements. In addition, the quality of intermediate inputs is of less concern to MNEs. What is of concern is that FDI backward linkages create healthy competition and put pressure on these intermediate suppliers to improve their production efficiency. MNEs only expect an acceptable quality of intermediate goods at acceptable prices. The word 'acceptable' refers to a situation where MNEs still receive a net gain from the net economic rents created by the

[29]The policy-induced linkages equate with LCRs although of course in practice they are broader than this.

[30] This might not be true for extremely large developing countries like China and India. Their enormous domestic markets could compensate for the addition operating costs resulting from the LCR measures. See the discussion based on the automotive industry in Doner *et al.* (2004)

protection of final output and the costs related to the presence of LCRs (i.e. higher input costs and other costs incurred to assist local suppliers). Thus, they would expect less benefit from 'policy-induced' linkages, compared to 'natural' linkages.

One sensible basis for support of the LCR measures in the context of gains from FDI is the well-known 'infant industry' argument.[31] The key element in this argument is the presence of dynamic economies. The dynamic economies cannot be achieved overnight but need a certain amount of time. The presence of LCR measures provides time for these indigenous firms to learn and mature with the expectation that they will eventually enable a country to complete the industrialization process. However, empirical evidence suggests the opposite.[32] To gain dynamic economies is not costless (Bell *et al.*, 1984; Eveson and Westphal, 1995). It requires long-term commitment and real resources. When these suppliers receive protection from LCR measures, they tend to be 'unresponsive' to improved technological capability as well as requests for improvement in the quality and price of what they offer. This in turn results in a general deterioration of technological and management skills (Moran, 2001). The LCRs and 'policy-induced' linkages retard rather than promote growth and efficiency.

2.5 Conclusions

The chapter combines previous theoretical and empirical studies in order to form the analytical framework of MNE involvement and their contribution to the industrialization process in host countries. There are four key findings drawn from previous studies. Firstly, MNEs can become involved and generate a favourable impact on host economies in two broad ways: FDI and non-FDI channels. Through the FDI channel, MNE involvement can generate both a direct and indirect impact on the host economy. Nevertheless, indirect impact, i.e. technology spillover, seems to be far more important because it is unlikely to be associated with OFCF and is at the centre of current

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[31] See the excellent treatment of the 'infant industry' argument in Corden (1997: Chapters 8 and 9).

[32] See Moran (2001), Belderbos *et al.* (2001) and works cited therein.

policy debate. On the other hand, non-FDI channels are another important way MNEs can be involved in host countries. Three channels are classified under non-FDI: technology licensing, international subcontracting, and MNE buyers. Empirical evidence suggests that there has been substantial technology transfer to host countries through these channels. Ignoring non-FDI channels vastly understate the contribution of MNE involvement.

Secondly, the general investment climate plays a crucial role in enticing MNE involvement in host countries. Investment incentives, which are widely used by many host developing countries to entice MNE involvement, do not necessarily have much bearing on the entry decision of MNEs.

Thirdly, FDI technology spillover is not automatic but depends on the economic and policy environment in the host country. So far, there are two key determinants: trade policy regime and human capital. In addition, the former seems to be more promising in examining various outcomes of gains from FDI found in previous empirical studies.

Finally, FDI linkages are heterogeneous in terms of potential to generate benefit to host countries. In this study, the linkages are separated into 'natural' and 'policy-induced' linkages. The former seem to be more beneficial to host countries than the latter. Hence, these two types of linkages need to be separated in the analysis.

Appendix 1
Difference between FDI and OFCF

FDI inflows are not only simply a transfer of capital but are associated with advanced technology. These forms of capital flow are distinctly different from OFCF (Ito and Krueger, 2000: p.3) Thus, it is necessary to treat FDI separately from OFCF in analyzing its determinants and impact.

Traditionally, an explanation of the direction, motivation and impact of capital inflows is based on the neo-classical theory of international capital investment, namely the interest arbitrage theory (for example MacDougall, 1960). Capital funds will flow from a country where the expected rate of return is low to one which provides a higher return. However, as described above, the motivation for establishing MNE affiliates is far more complicated than the difference in the nominal rate of return, as postulated by the arbitrage theory. This is first pointed out by Hymer (1960), based on the US experience during the 1950s. The US experienced simultaneously net FDI outflows and net inflows of OFCF. Based on the interest arbitrage theory, the US should have experienced either net outflows or net inflows in both FDI and OFCF. Net OFCF inflows imply that the US interest rate must be higher than somewhere else. Thus, if the movement of FDI flows were fully explained by the interest arbitrage theory, the US would experience net FDI inflows. Hymer's breakthrough became a starting point for other researchers to seek and develop new theories to explain FDI determinants, such as Vernon's product-cycle theory (1966), Dunning's eclectic theory (1977), and Rugman's internalization theory (1980).

There are four major differences between FDI and OFCF.

(1) Investors and Conduits to Transfer Capital Funds

MNEs are the world's major direct investors. In 2002, foreign assets of the 100 largest MNEs (less than two per cent of the total number of MNEs worldwide) accounted for around 12 per cent of the world's total stock of FDI (UNCTAD, 2004). Many studies use MNEs and FDI in an interchangeable manner. More importantly, over four-fifths of the stock of FDI originates from half a dozen countries — the US, United Kingdom, Japan, Germany, Switzerland, and the Netherlands — which are also the major producers of the most advanced technology (Blomström *et al.*, 2000). On the other hand, OFCF investors are far broader in scope, ranging from individuals to institutional investors and banks. In addition, the main conduit for FDI to inject capital funds is through a subsidiary. In contrast, capital funds from OFCF can either go directly to the recipient or to financial brokers.

(2) Investment Motivation

Inflows of FDI and OFCF are motivated by different factors. As mentioned earlier, FDI inflows are the result of a firm's decision to transplant across countries so they are mainly motivated by business opportunity, competitive advantage, and global strategy, all related to long-term underlying economic fundamentals. In contrast, OFCF is a capital fund allocation across countries to benefit from differences in financial rates of return, e.g. interest rates, exchange rates, etc. These financial returns are related to short-term fluctuations in key macroeconomic indicators such as interest rates, exchange rates, and stock prices. Even though there are some common factors and/or external shocks that can have considerable impact on the returns from FDI and OFCF, such as overall economic performance, political stability, and policy uncertainty, it is still far from conclusive to group both kinds of international capital flows together. The observed evidence during the recent economic crisis in East Asian economies that started in mid 1997, provides a strong case for treatment of these two different capital flows. During the onset of the crisis, OFCF in the five-crisis hit countries experienced huge net outflows while there were still FDI inflows into these same countries, cushioning the large shift of capital flows (Athukorala, 2003a).

(3) Volatility

By their nature, OFCF seem more volatile than FDI (Frankel and Rose, 1996; Radelet and Sachs, 1998; Kim and Hwang, 2000; Lipsey, 2001b; Athukorala, 2003a). OFCF are attracted by financial return and are highly sensitive to any external shock. In addition, a rapid movement of OFCF from one country to another could generate a considerable amount of profit for investors. With its higher volatility, Frankel and Rose (1996) point out that a country with a high ratio of OFCF to total capital flows is more likely to experience a currency crisis. In contrast, FDI is likely to exhibit a greater sunk cost of investment, i.e. once the investment has been made none of it can be recovered (Rivoli and Salorio, 1996). Thus, the FDI decision on entry/exit takes longer, compared with OFCF. Quick movement (entry-exit) is unlikely to generate a net return to direct investors.

(4) Impact on Economic Development in Host Countries

FDI and OFCF generate different impacts on a host country. Apart from providing additional capital funds, FDI is likely to influence the economic structure as well as the conduct and performance of locally owned firms in the host country. Since FDI means there are new entrants in industries, this can affect industry concentration (Caves, 1996: p.87–8). Their entry can increase domestic market competition and eventually influence the behaviour and performance of incumbent firms. More importantly, the entry of MNEs with their extensive involvement with world R&D activities can provide opportunities for local firms to access advanced technology. Such opportunity is not limited to a subsidiary but other local firms can also gain these benefits. Nevertheless, the net impact of FDI is not necessarily always positive but is conditioned by several economic factors in host countries, as discussed in Section 2.3. In contrast, OFCF obviously provides additional capital funds to the host country and allow the market mechanism to allocate them. The efficiency of the market mechanism in allocating funds depends on the stage of development in the capital and financial markets as well as policy-induced incentives (e.g. tariff protection) in host countries.

Table A. 1.1 provides a summary of key distinct characteristics between FDI and OFCF. While it seems clear the common contribution of FDI and OFCF to host countries is to achieve investment levels beyond their own domestic saving, there are strong reasons to believe FDI inflows are considerably different from OFCF as mentioned above. Hence, it is necessary to treat FDI differently from OFCF to evaluate its impact on host countries' economies.

Table A.1.1
Distinct Characteristics between FDI and OFCF

Feature	FDI	OFCF
Investors	MNEs	Individuals, institutional investors, etc.
Conduit to transfer	Establish affiliates	Contact recipient directly or indirectly through financial intermediates
Investment Motivations	Underlying economic fundamentals	Short terms fluctuations of several macroeconomic variables such as exchange rates, interest rates, share prices
Volatility	More stable	More volatile
Impact on host countries' economies	- Capital funds - Opportunity to access advanced technology - Structure-conduct-performance (S-C-P) of incumbent firms	- Capital funds only - Funds are allocated according to market mechanisms.

Appendix 2

Theoretical Model of Technology Spillover

This appendix elaborates on the theoretical model proposed by Wang and Blomström (1992). A foreign affiliated and local firms are both producing differentiated but partly substitutable products for the host country's consumers. There is an incentive for firms to use resources to enhance their technology capability, as this makes their product more attractive to consumers (i.e. for the foreign affiliate to transfer advanced technology from its parent company and for the local firm to learn the new technology that accompanies the foreign presence). Even though technology can influence both demand and supply aspects, for analytical tractability, it is assumed to impact solely on the demand side. Assuming consumer preferences can be represented by the following aggregate utility function:

$$U(Y) = U(\sum_i GiYi) \tag{A.2.1}$$

where G_i represents the attractiveness of the i^{th} firm's product that is an increasing function of the level of technology the firm i^{th} employed, K_i. Technology here covers the product's quality and/or other favorable characteristics embodied in the product. That is,

$$G_i = G_i(K_i) \text{ and } \frac{\partial G_i}{\partial K_i} > 0 \tag{A.2.2}$$

Assuming logarithmic utility function and that $G_i = G_i(K_i) = K_i^{\alpha}$ where $\alpha > 0$, the utility function can be written as follows:

$$U(Y) = \ln(K_d{}^{\alpha} Y_d + K_f{}^{\alpha} Y_f)$$

$$U(Y) = \ln\left[K_d{}^{\alpha}(Y_d + kY_f)\right] = \alpha \ln K_d + \ln(Y_d + kY_f) \tag{A.2.3}$$

where k = the technology gap between the foreign affiliate and local firm

$$= \frac{K_f}{K_d}$$

Following the traditional maximization of consumer utility, i.e. the equality of marginal utility and price, demand schedules for products produced by the foreign affiliate and local firm are in (A.2.4) and (A.2.5), respectively.

$$P_f = k(Y_d + kY_f)^{-1} \qquad \text{with } \frac{\partial P_d}{\partial k} < 0 \tag{A.2.4}$$

$$P_d = (Y_d + kY_f)^{-1} \qquad \text{with } \frac{\partial P_f}{\partial k} > 0 \tag{A.2.5}$$

Analytically, each firm's decision can be decomposed into two steps. Each firm chooses its output to maximize its monetary profit, given the status quo of both firms' technology levels and its competitor's current output. On the second step, each firm chooses a level of effort to undertake technology enhancing activities. With the feature that technology level influences demand for goods, the continuously and differentiable quasi-rent function, $R_i(k)$ can be constructed as a function of k.

$$R_i(k) = Max\{P_i(k, Y_{i,} Y_j^*)Y_i - \overline{c}_i Y_i \text{ if } Y_i \text{ is feasible}\} \tag{A.2.6}$$

where $P_i(k, Y_{i,} Y_j^*)$ = demand for its own product the firm i^{th} faces

Y_i = level of output of the firm i^{th}

Y_j^* = Cournot-Nash equilibrium output of the other firm.

$\overline{c_i}$ = per unit cost of production assumed here constant.

i = d and f for local and foreign firms

As shown in equations (A.2.4) and (A.2.5), the partial derivative of quasi-rent function with respect to k can be attained as in equation (A.2.7)

$$R_d' = \frac{\partial R_d}{\partial k} < 0 \text{ and } R_f' = \frac{\partial R_f}{\partial k} > 0 \tag{A.2.7}$$

Assuming $R_d'' = \dfrac{\partial^2 R_d}{\partial k^2} < 0$ and $R_f'' = \dfrac{\partial^2 R_f}{\partial k^2} < 0$ is to ensure the existence of solutions to the firm's maximization problem. Importantly, (A.2.6) is similar to the firm's profit function except that the key variable is the technology gap, thereby called the quasi-rent function.

So far, the analysis suggests both firms can earn quasi-rent from upgrading technological capability. Thus, they need to choose their own optimum levels of effort to undertake technology enhancing activities, which is observable by assumption. I_f and I_d are the levels of effort undertaken by the foreign and local firms, respectively. The growth rates of technology level of the foreign and local firms are expressed in equations (A.2.8) and (A.2.9), respectively. Where the foreign firm is concerned, the marginal productivity of effort to generate technological progress is assumed to be 1. However, for the local firm, the marginal productivity of effort is instead equal to the product of ϕ and k. ϕ as a function of I_d is introduced in order to reflect diminishing return of the learning effort, i.e. $\phi' > 0$ and $\phi'' < 0$. Moreover, as postulated by Findlay (1978) that the rate of technological progress in a relatively 'backward' country is an increasing function of the gap between its own level of technology and that of the 'advanced' country, the model adds technology gap variable, k, as in equation (A.2.9).

$$\dot{K}_f = I_f K_f \tag{A.2.8}$$

$$\dot{K}_d = \phi(I_d) k K_d \tag{A.2.9}$$

Equations (A.2.8) and (A.2.9) can be combined together as a function of k as in equation (A.2.10).

$$\dot{k} = k[I_f - \phi(I_d)k] \qquad (A.2.10)$$

However, transferring advanced technology for the foreign firm and learning associated superior technology for the local firm are not cost-free activities. A certain level of I_f is associated with dollar costs, C_f. Assuming C_f is an increasing function of I_f, i.e. $C_f' > 0$, with decreasing rate, i.e. $C_f'' < 0$. The decreasing rate reflects the concept of 'learning-by-doing'. Similar to the foreign firm, the total dollar cost associated with the learning effort of local firm is the product of θ and C_d where θ is the shifting parameter. Introducing θ allows policy environment and/or other specific factors in host countries that potentially alter the total cost of learning effort and eventually the level of effort. The smaller the θ, the more cost effective the domestic firm in its learning activities is.

As postulated by the 'Bhagwati hypothesis' that the trade policy regime can alter the magnitude of FDI technology spillover, this study departs from the original model by hypothesizing this parameter as an increasing function of trade policy regime (*TP*), i.e. $\frac{\partial \theta}{\partial TP} > 0$. That is, the higher the degree of trade restrictiveness, the larger the cost effectiveness and the larger the cost in learning effort.

Thus, deciding the levels of I_f and I_d is a dynamic optimization problem of the foreign and local firms respectively. The objective functions of the optimization problem are as in equations (A.2.11) and (A.2.12) for foreign and local firms respectively. In the optimization problem, k is state variable and its growth rate follows equation (A.2.10).

$$\underset{I_f \in R_+}{Max} \quad V_f = \int_0^\infty e^{-rt}\left[R_f(k) - C_f(I_f)\right]dt \qquad (A.2.11)$$

$$\underset{I_d \in R_+}{Max} \quad V_d = \int_0^\infty e^{-\rho t}\left[R_d(k) - \theta(TP)C_d(I_d)\right]dt \qquad (A.2.12)$$

where r = the world interest rate

ρ = the world interest rate

At the steady-state equilibrium, we attain the following two implicit functions

$$T_f(\overline{I_f},\overline{I_d};r)=\frac{R_f'(\overline{k})}{\left[r+\overline{I_f}\right]}-C_f'(\overline{k})=0 \qquad \text{(A.2.13)}$$

$$T_d(\overline{I_f},\overline{I_d};r)=\frac{(\overline{I_f})^2\phi'(\overline{I_d})R_d'(\overline{k})}{\left[\phi(\overline{I_d})\right]^2\left[\rho+\overline{I_f}\right]}-\theta(TP)C_d'(\overline{k})=0 \qquad \text{(A.2.14)}$$

where $\overline{k}=\dfrac{I_f}{\phi(I_d)}$ = level of technology gap at the steady-state equilibrium

Equation (A.2.13) represents a best reply mapping of foreign firm. That is I_f is a function of I_d with the positive relationship. Similarly, (A.2.14) illustrates the best reply mapping of the local firm that is affected by both I_f and TP. The condition $\phi(I_d=0)>\dfrac{\theta C_d'(I_d=0)(\rho+I_f)}{-R_d'(I_f/v)}\left[\dfrac{v}{I_f}\right]^2$ is needed to ensure the existence of I_d>0. Intuitively, this condition suggests the domestic firm will not invest in learning effort unless the marginal benefit of its first unit of resource spent on such activities exceeds the cost of learning with v representing the costless benefit of technology the local firm could acquire from the foreign presence.

Solving equations (A.2.13) and (A.2.14) simultaneously yields the equilibrium levels of $\overline{I_f}$ and $\overline{I_d}$. Importantly, to attain a unique locally stable steady-state Nash equilibrium with positive values of $\overline{I_f}$ and $\overline{I_d}$, $\left(\dfrac{\partial T_f}{\partial I_f}*\dfrac{\partial T_d}{\partial I_d}\right)>\left(\dfrac{\partial T_f}{\partial I_d}*\dfrac{\partial T_d}{\partial I_f}\right)$ is required. This implies the slope of best reply mapping of the foreign affiliate is less than that of the local firm. The equilibrium levels of $\overline{I_f}$ and $\overline{I_d}$ show potential technology spillover from FDI. The larger the levels of $\overline{I_f}$ and $\overline{I_d}$, the greater expected technology spillover would take place.

To demonstrate the 'Bhagwati hypothesis', we take total differential to the two implicit functions as in equation (A.2.13) and (A.2.14) with respect to *TP* as in equations (A.2.15).

$$\begin{bmatrix} \frac{\partial T_f}{\partial I_f} & \frac{\partial T_f}{\partial I_d} \\ \frac{\partial T_d}{\partial I_f} & \frac{\partial T_d}{\partial I_d} \end{bmatrix} \begin{bmatrix} \frac{\partial \bar{I}_f}{\partial TP} \\ \frac{\partial \bar{I}_d}{\partial TP} \end{bmatrix} = \begin{bmatrix} -\frac{\partial T_f}{\partial TP} \\ -\frac{\partial T_d}{\partial TP} \end{bmatrix} \quad \text{(A.2.15)}$$

By Cramer's rule, the impact of *TP* on the equilibrium values of $\overline{I_f}$ and $\overline{I_d}$ can be illustrated as in equations (A.2.16) and (A.2.17), respectively.

$$\frac{\partial \bar{I}_f}{\partial TP} = \frac{\begin{vmatrix} -\frac{\partial T_f}{\partial TP} & \frac{\partial T_f}{\partial I_d} \\ -\frac{\partial T_d}{\partial TP} & \frac{\partial T_d}{\partial I_d} \end{vmatrix}}{\begin{vmatrix} \frac{\partial T_f}{\partial I_f} & \frac{\partial T_f}{\partial I_d} \\ \frac{\partial T_d}{\partial I_f} & \frac{\partial T_d}{\partial I_d} \end{vmatrix}} = \frac{\begin{vmatrix} 0 & \frac{\partial T_f}{\partial I_d}(+) \\ \theta(TP)(+) & \frac{\partial T_d}{\partial I_d}(-) \end{vmatrix}}{|J|} < 0 \quad \text{(A.2.16)}$$

$$\frac{\partial \bar{I}_d}{\partial TP} = \frac{\begin{vmatrix} \frac{\partial T_f}{\partial I_f} & -\frac{\partial T_f}{\partial TP} \\ \frac{\partial T_d}{\partial I_f} & -\frac{\partial T_d}{\partial TP} \end{vmatrix}}{\begin{vmatrix} \frac{\partial T_f}{\partial I_f} & \frac{\partial T_f}{\partial I_d} \\ \frac{\partial T_d}{\partial I_f} & \frac{\partial T_d}{\partial I_d} \end{vmatrix}} = \frac{\begin{vmatrix} \frac{\partial T_f}{\partial I_f}(-) & 0 \\ \frac{\partial T_d}{\partial I_f}(+) & \theta(TP)(+) \end{vmatrix}}{|J|} < 0 \quad \text{(A.2.17)}$$

where $|J| = \left(\frac{\partial T_f}{\partial I_f} * \frac{\partial T_d}{\partial I_d}\right) - \left(\frac{\partial T_f}{\partial I_d} * \frac{\partial T_d}{\partial I_f}\right) > 0$

Chapter 3: Thai Manufacturing: The General Investment Climate and Incentive Structure

This chapter aims to survey the general investment climate and incentive structure in Thai manufacturing from 1970 to the present. Both the general investment climate and policy-induced incentives can influence the involvement and developmental implication of MNEs in host countries. In making an entry decision, MNEs first take into consideration the overall investment climate and then the incentive structure.

The chapter begins with a discussion of the general investment climate. In this section, six aspects of the Thai commercial environment are discussed. These are the macroeconomic environment, labour markets and the quality of human capital, institutional factors, the role of government, infrastructure availability and the attitude toward foreign business. In addition, to evaluate the commercial environment, an international comparison is undertaken with emphasis on ASEAN-4 countries. Investment and trade policy regimes are discussed in Section 3.2 and Section 3.3. Section 3.2 provides a discussion of the investment regime in the Thai manufacturing sector. In Section 3.3, various indices of trade restrictiveness are constructed and used to demonstrate changes in the degree of trade restrictiveness over the past three decades. The chapter ends with a summary of the key elements of the policy environment in Thailand during the past three decades.

3.1 The Overall Investment Climate in Thailand

3.1.1 The Macroeconomic Environment

Thailand has had an impressive record of domestic price stability for most of the past half century. Inflation on average was around 5.7 per cent between 1970 and 2003. This was far lower than the average figure for developing countries (Figure 3.1.A). Despite the onset of the economic crisis and the drastic currency depreciation in 1997, Thailand has maintained price stability well during the ensuing years. Inflation increased from 5.8 per cent in 1996 to 8.1 per cent in 1998, despite a more than 60 per cent depreciation of the exchange rate. Thailand's inflation rate is about average that of ASEAN-4 countries. From 1970 to 2003, inflation in Thailand was higher than that of Singapore (3.2 per cent) and Malaysia (3.9 per cent) but lower than that of the Philippines (11.7 per cent) and Indonesia (13.1 per cent) (Figure 3.1.B)

Thailand's success in maintaining price stability has been attributed to the combination of conservative fiscal and monetary policies, and a stable nominal exchange rate. Even though Thailand experienced 12 consecutive years of fiscal deficits between 1975 and 1987, the expansionary fiscal policy was mainly used to compensate for the slowdown of private investment and maintain short-term economic growth, except between 1975 and 1979 (Figure 3.2). In addition, the size of the budget deficit was limited to around 3.2 per cent of GDP between 1975 and 1985. This level was relatively low, compared with the average level for developing countries. The budget deficit from 1975 to 1979 was the result of expansion in the area of administration and defense. Whatever fiscal expansion there was during this period was to ensure political stability and social harmony.[1] The purpose of the deficit between 1980 and 1987 was to cushion the adverse impact of the slowdown of the overall economy and the shortfall in government revenue (Warr and Nidhiprabha, 1996). Similarly, the government relied on deficit financing from 1997 to 2002 following the onset of the financial crisis (Figure 3.2).

Throughout the period under study, government expenditure was mostly financed by public revenue and domestic borrowing, rather than through inflationary means, i.e. borrowing from the Thai central bank, the Bank of Thailand (BOT) (Warr and Nidhiprabha, 1996: p.165; Warr, 1999). As observed in Figure 3.2, the increase in public

[1]Patmasiriwat (1995: p.145) argues that the increase of public administration expenditure was a result of the government adopting several socially oriented policies such as rural public-works programme, free buses and hospital care for the needy, after the student-led uprising in 1973. The increase in defense expenditure was introduced by the new military-supported government against the communist insurgency.

revenue in the current period was likely to be associated with the increase in public expenditure in the following period.

Figure 3.1

Inflation (per cent) in Thailand and Selected Countries, 1970–2003

Figure 3.1.A: Thailand and developing countries

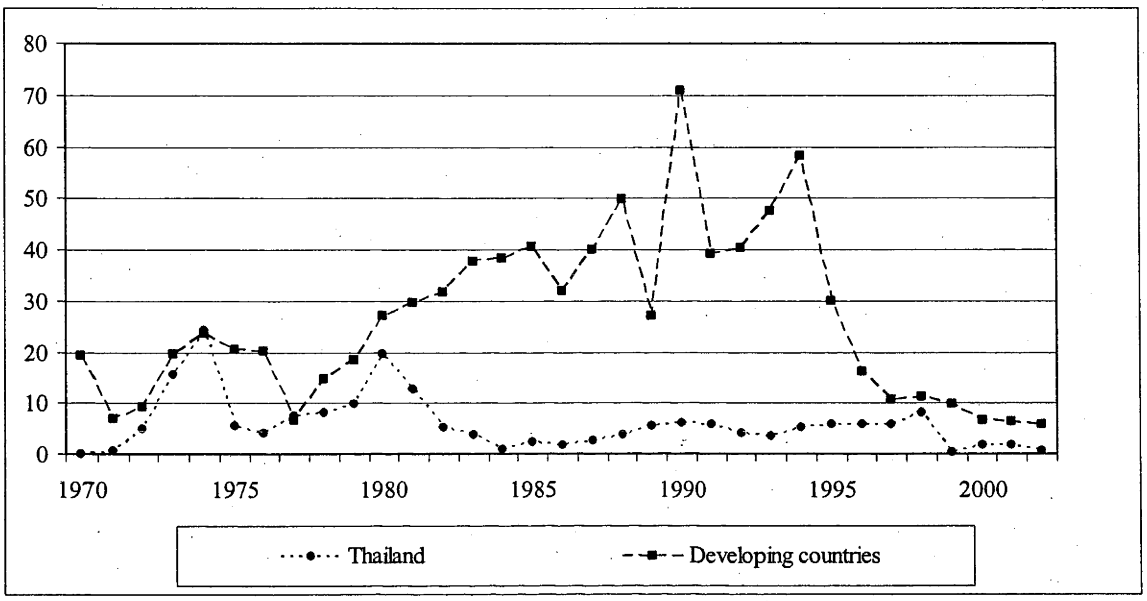
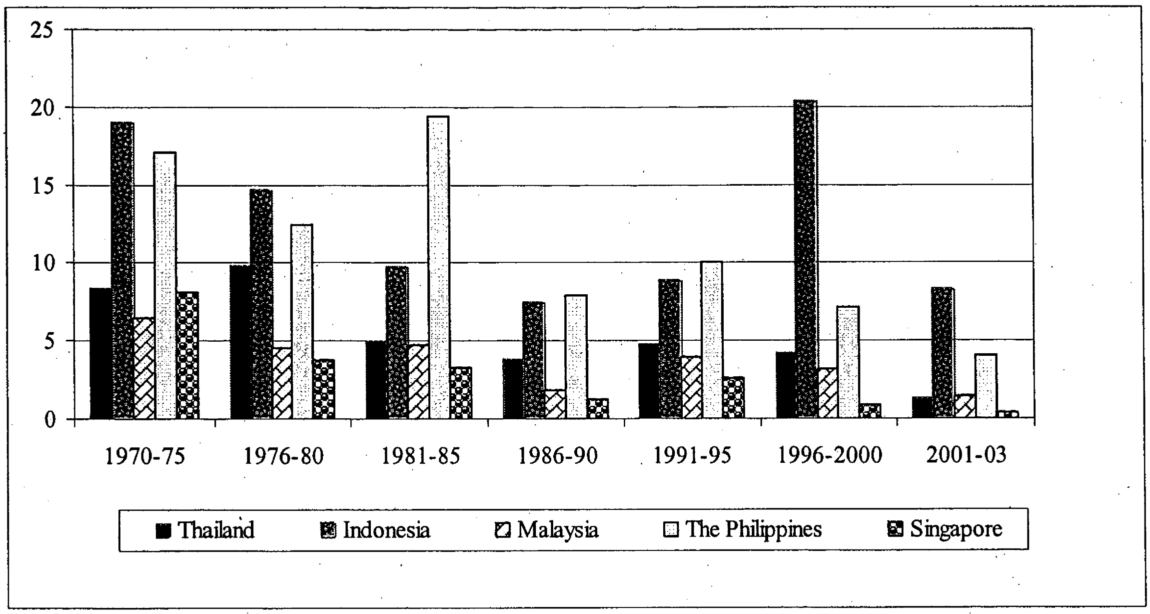
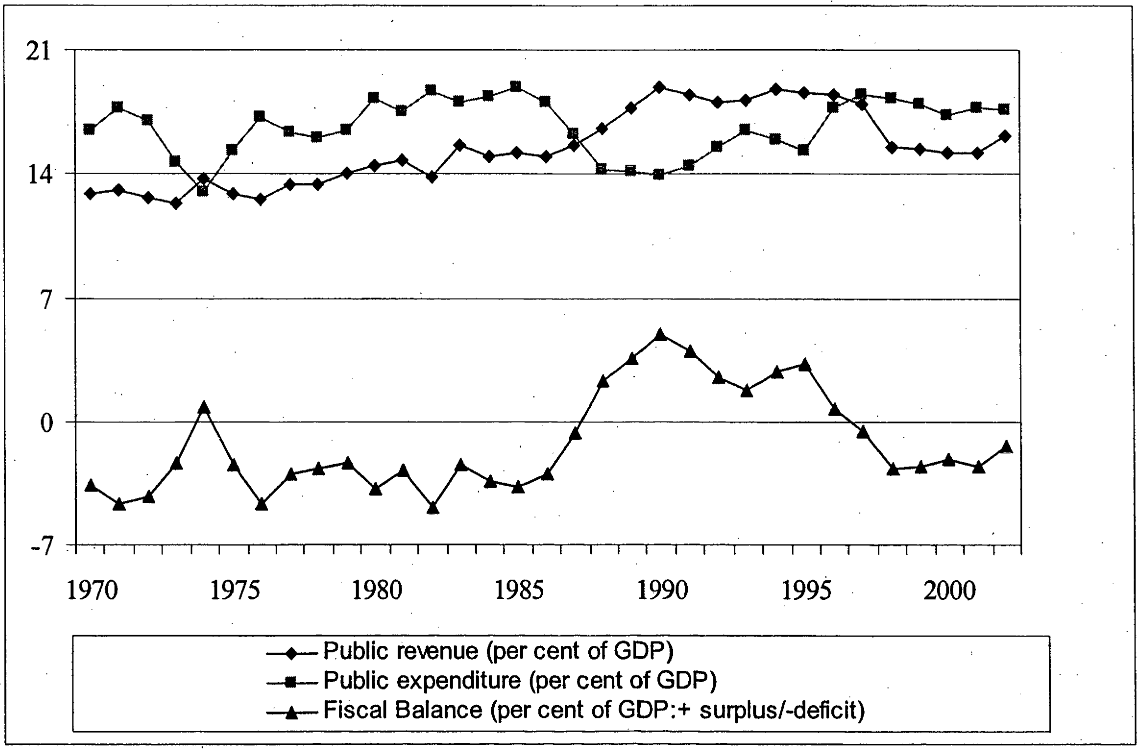


Figure 3.1.B: Thailand and ASEAN-4 Countries.



Source: IMF, *International Financial Statistics* (CD ROM).

Figure 3.2
Public Revenue and Expenditure, and Fiscal Balance in Thailand, 1970–2002



Source: IMF, *International Financial Statistics*, (CD ROM).

Changes in public revenue in general are positively related to overall economic performance.[2] This limited the growth rate of fiscal deficits. Public foreign borrowing, on the other hand, was disciplined by the legally imposed ceiling on the debt-service ratio. The ceiling significantly restrained public sector foreign debt during the early 1980s.

With a considerable degree of policy independence, the BOT effectively pursued a conservative monetary policy. Monetary policies appear to have been countercyclical and stabilized domestic price levels from World War II onward. Inflationary monetary policy, which was strong in the early 1970s, has been remarkably reduced since 1980. A

[2] Warr and Nidhiprabha (1996: p.143) point out that the correlation between public revenue as a proportion of GDP and GDP growth from 1970 to 1990 was almost 0.7.

conservative monetary policy has been associated with stabilizing the nominal exchange rate and with short-term capital control measures. The nominal exchange rate in practice has been stable, closely related to the value of the US dollar, although the exchange rate regime was officially described as a managed floating regime and a floating regime in 1984 and 1997, respectively. The nominal exchange rate was 20 baht/$ from 1961 to 1980 and devalued to 27 baht/$ at the end of 1984. Between 1985 and 1996, the nominal exchange rate appreciated slightly to 25.6 baht/$.

Following the onset of the crisis in July 1997, there was a short period of massive fluctuations in the nominal exchange rate under the new official floating exchange rate regime. The nominal exchange rate rapidly depreciated from around 25 baht/$ in June 1997 to almost 50 baht/$ in January and returned to around 37–38 baht/$ in July 1998. However, the crisis-driven freely floating exchange rate regime in Thailand did not last long. There is convincing evidence that the Thai authorities have gradually resurrected the dollar peg that existed during the pre-crisis era (McKinnon, 2001; Calvo and Reinhart, 2002; Hernandez and Montiel, 2003). After about mid–1998, the nominal exchange rate tended to stabilize at around 42–43 baht/$.

To be able to pursue an independent monetary policy under the fixed exchange rate regime, targeting the stability of the nominal exchange rate, the government imposed regulations that restricted free capital movements until 1990. As a general rule, all matters involving foreign currency were regulated and required the permission of the BOT, through The Exchange Control Act, B.E. 2485 (A.D. 1942). Hence, the BOT acquired some degree of monetary independence. This was evident from significant divergences between domestic and foreign interest rates in the short run (Warr and Nidhiprabha, 1996: p.169). After May 22, 1990, the BOT considerably relaxed foreign exchange controls. At present, certain transactions in Thai baht or foreign currency can be performed virtually without restriction, and only a few require approval from the BOT. Given the fixed exchange rate regime, therefore, this lessens the degree of monetary independence.

In order to shed light on the cumulative effect of macroeconomic policy on economic incentives, a real exchange rate (RER) index is constructed and presented in Figure 3.3. The RER index is generally defined as the ratio of the domestic price of traded (P_T) to non-traded goods (P_N). An increase in the RER index implies an increase in the price of traded goods relative to that of non-traded ones, and vice versa. Thus, an increase (decrease) in the RER signifies depreciation (appreciation). With the indices of both traded and non-traded prices unavailable, the RER has to be proxied by available domestic and world price indices and the nominal exchange rate. In this study, traded and non-traded price indices are represented by the wholesale price index (WPI) and consumer price index (CPI), respectively. By construction, the WPI is dominated by the price of traded goods whereas the CPI is a weighted-average of the prices of tradables and nontradables. Besides, the export share is employed here because of its superiority in representing the country's competitiveness rather than other possible weights such as total trade or import shares (Athukorala and Warr, 2002).

The time pattern of the RER index is a good reflection of the macroeconomic development in Thailand over the past three decades. There were RER appreciations from 1980 to 1984 and from 1990 to 1996. The 1980 to 1984 RER appreciation was a result of successive expansion of public expenditure and government deficit during the late 1970s and early 1980s. The RER appreciation harmed international competitiveness of export sectors. Such appreciation was rectified by the moderate currency depreciation at the end of 1984 and the favourable world price of agricultural products. Between 1985 and 1988, the RER index moved back to the level it was at before the late 1970s. RER appreciation emerged again from 1990 to 1996 and persisted longer than in the first period. This controversy is far beyond the scope of this study.[3] Clearly, the persistent appreciation of the RER would hurt the country's international competitiveness. Since 1996, the relative profitability of tradables production has improved, mainly due to nominal exchange rate depreciation from mid 1997 to 1998.

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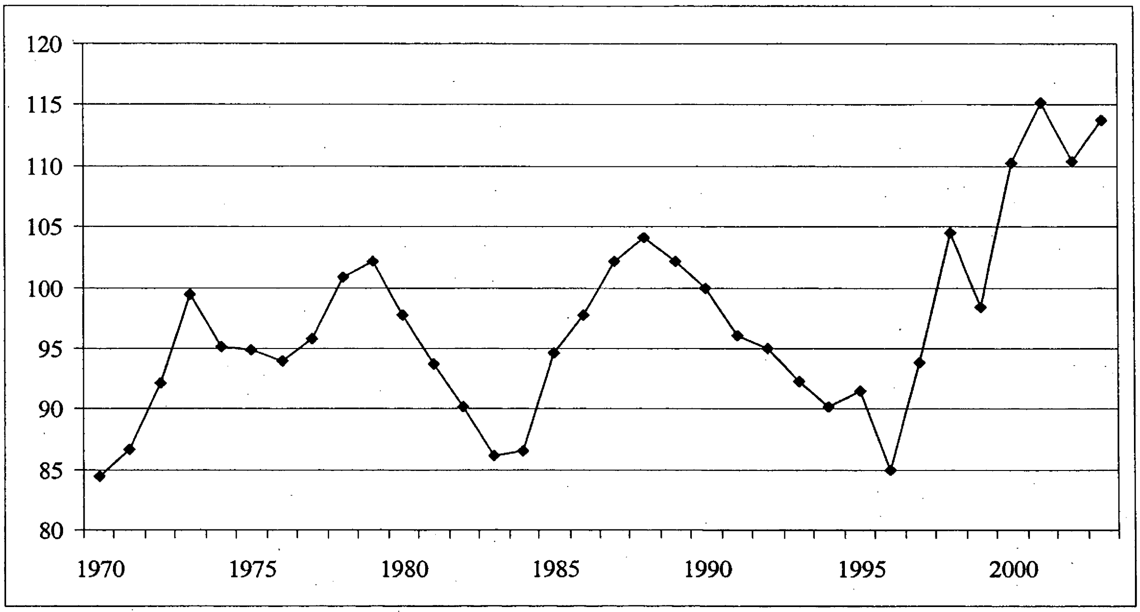
[3]Causes of the RER appreciation between 1990 and 1996 are still subject to an ongoing debate in the recent economic crisis literature. The focus is on the relative importance of the pursued exchange rate regime and capital account liberalization. See Obstfeld and Rogoff (1995); Summers (1998); Fischer (2001); Bhagwati, (1998); Stiglitz (2001); Corden (2002).

Figure 3.3

Real Exchange Rate (RER) Index in Thailand, 1970–2003 (1990=100)



Notes: The RER index is defined as the ratio of the domestic price of traded (P_T) to non-traded goods (P_N). An increase (decrease) in RER index means depreciation (appreciation).

Source: Author's calculation using data from IMF, *International Financial Statistics*, (CD ROM)

3.1.2 The Political Environment and Policy Certainty

The policy environment in Thailand has been stable over the past three decades. Even though Thailand's political history since World War II has been punctuated by a succession of military coups and attempted coups, as well as subject to frequent changes in government administration, these have not had a marked impact on the key political and economic ideology. Thai policy makers continued to follow a similar basic political and economic ideology with main differences emerging in distributional matters. Thailand's bureaucracies have played a particularly important role in maintaining the continuity of economic policy along these lines (Warr and Nidhiprabha, 1996: p.7). Hence between 1970 and 2003, there has not been a drastic change in the general economic policy regime in Thailand. This has created a reputation for policy certainty.

For international comparison, Table 3.1 reports the index of the political environment from the World Survey conducted by the Freedom House Organization.

The index is the result of a worldwide survey in two aspects: political rights and civil liberties. The lower the number, the greater the degree of political freedom. The general pattern occurring in Table 3.1 suggests that since 1981, Thailand has ranked very favourably, compared to other developing countries, including many of its neighbours in Southeast Asia.

3.1.3 The Labour Market Environment and the Quality of Human Capital

The Thai labour force is largely non-unionized. Domestic and foreign investors have been able to carry on their business activities without any fear of labour problems. This is a result of the abolition of the Labour Act of 1956. Establishing labour unions, as well as any form of labour movement, was prohibited until 1978, when the Labour Act was amended to allow firms to set up labour unions under the auspices of the Labour Relations Law. Nevertheless, there has not been any threat of labour unions in Thai manufacturing. In addition, despite the presence of minimum wage regulations since 1973, their impact on actual wage behaviour has been low in Thailand (Warr and Nidhiprabha, 1996).

Placing the record in comparative international perspective highlights the fact that wage levels in Thailand have always been relatively low, not only by the average developing-country standards, but also compared to other high-performing economies in the region. To provide a broad comparison of wages, especially in the manufacturing sector across countries, this study uses the wage compensation per worker in the manufacturing sector of majority-owned US affiliates from 1983 to 2002 (Table 3.2). The wage rate, proxied by the manufacturing wage compensation per worker, reflects the actual payment, in which other relevant aspects such as standard of living, labour skill and minimum wage regulation, etc. are taken into consideration. The clear pattern shown in Table 3.2 is that increases in wage rates in Thailand have fluctuated widely, but were lower than the average for developing countries between 1983 and 2002. However, the changes have been at a comparable level with three other Southeast Asian neighbours (Malaysia, Indonesia and the Philippines). While China and India were much lower throughout the period 1983–2000, the gap between these two countries and other Southeast Asian countries, especially Thailand and Indonesia, narrowed between 1997

Table 3.1

State of Freedom of Selected Developing Countries, 1972–2003

	1972–80		1981–90		1991–2003	
	Political rights	Civil Liberties	Political rights	Civil Liberties	Political rights	Civil Liberties
Latin America and Caribbean						
Argentina	4.9	4.3	2.6	2.3	3.9	3.8
Brazil	4.1	4.5	2.6	2.5	2.1	2.8
Chile	5.7	4.6	5.6	4.6	2.5	3.5
Colombia	2.0	2.6	2.1	3.1	3.2	3.4
Mexico	3.9	3.4	3.5	3.9	2.0	1.8
Peru	5.3	4.5	2.0	3.1	3.5	4.4
Uruguay	5.1	5.4	3.0	2.9	1.0	1.8
Venezuela	1.4	2.0	1.0	2.1	3.2	3.4
East Asia						
China	6.4	6.6	6.1	6.1	7.0	6.7
Indonesia	5.0	5.0	5.0	5.4	7.0	6.5
Korea, South	4.7	5.5	3.9	4.8	2.8	3.5
Malaysia	2.9	3.6	3.4	4.5	2.0	2.2
The Philippines	4.9	5.1	3.6	3.5	5.3	4.8
Singapore	5.0	5.0	4.1	4.9	4.6	4.8
Taiwan	5.4	4.8	4.9	4.5	4.8	4.8
Thailand	4.6	4.1	2.9	3.5	2.3	3.2
Vietnam	7.0	7.0	6.8	6.8	1.2	1.7
South Asia						
Bangladesh	4.1	4.0	4.5	4.8	2.6	3.5
India	2.0	3.1	2.0	3.0	3.9	3.8
Pakistan	5.1	4.9	4.9	4.5	2.6	3.8
Sri Lanka	2.0	3.0	3.0	4.0	4.6	5.0
Sub-Saharan Africa						
Ghana	5.3	5.0	5.9	5.3	6.5	5.5
Kenya	5.0	4.4	5.6	5.3	3.5	3.6
Madagascar	5.4	4.8	5.1	5.4	5.5	5.2
Nigeria	4.6	3.9	4.6	4.3	2.5	3.9
Senegal	5.0	4.4	3.5	3.9	5.5	4.8
Developing Countries	**5.0**	**4.7**	**4.6**	**4.7**	**5.4**	**5.1**

Note: The lower the score, the greater the freedom

Source: Freedom House available at http://www.freedomhouse.org/ratings/index.htm and 2000. This is likely to be as a result of the economic crisis and the currency depreciation in these four Southeast Asian countries that began in 1997.

Table3.2

Wages paid by Majority-owned US Multinational Enterprises, 1983–2002

(annual $ wage per worker)

	1983–5	1986–90	1991–6	1997–2002
Developing countries	6,599	8,170	11,904	13,096
Latin America	7,531	8,844	13,577	15,344
Argentina	10,463	11,464	25,867	30,173
Brazil	8,096	11,578	20,210	21,910
Chile	12,304	11,358	17,563	19,459
Colombia	11,899	10,058	15,621	19,401
Mexico	4,993	5,624	9,040	11,212
Panama	7,413	8,678	11,780	16,298
Ecuador	5,878	5,164	7,098	7,234
Venezuela	11,491	8,966	11,044	19,482
ASIA (excluding Japan)	4,427	6,464	9,857	10,942
South Korea	5,316	9,321	21,473	28,587
Taiwan	5,179	10,074	20,010	24,181
Hong Kong	4,606	7,719	11,380	14,446
Singapore	7,208	8,942	16,566	23,906
Malaysia	4,083	4,682	6,473	8,557
Thailand	4,107	4,319	6,371	5,925
Indonesia	4,384	5,872	5,886	4,561
The Philippines	2,675	3,575	6,105	7,636
China	n.a.	1,813*	3,334	6,661
India	3,105	3,895	3,887	6,072
Africa	7,017	7,396	10,674	12,012
Egypt	3,973	3,882	5,858	7,862
Nigeria	9,849	5,440	4,759	6,667
South Africa	8,333	10,627	16,997	16,699
Middle East	15,919	22,415	26,446	27,606

Notes: n.a. = not available and * denotes the average of 1989–90.
Source: Calculated from US Bureau of Statistics, *US Investment Abroad*, various issues.

In terms of worker quality, Thailand was average, compared with other middle-income developing countries. Table 3.3 presents six indices measuring the quality of human capital for Thailand compared with selected developing countries from 1990 to 2000. The first three indices basically represent levels of human capital quality whereas the other three indices reflect the effort of government to improve human capital. In general, the quality of human capital in Thailand was close to the average of middle-income developing countries. Thai workers were better than the average middle-income countries as measured by the illiteracy rate and tertiary school enrolment, but far behind in terms of secondary school enrolment. In comparison with ASEAN-4 countries, the quality of human capital in Thailand is about average, slightly better than Indonesia and the Philippines except in secondary enrolment, but behind Malaysia and Singapore. On the other hand, in terms of government effort to improve human capital, Thailand is comparable to middle-income developing countries and ASEAN-4 (Table 3.3).

3.1.4 The Role of the Government and Infrastructure Availability

From 1960 onwards, the Thai government has maintained a firm commitment to the ideology of private-sector led industrialization combined with prudent public investment in infrastructure. Influenced by The World Bank mission in the late 1950s, government involvement shifted from direct production via state enterprises toward investment in public infrastructure required for economic development such as electricity and water supply, and transportation facilities. The government virtually prohibited state participation in those commercial and industrial activities, which might be expected to compete directly with private capital (Akira, 1989: p.180).

However, there has been underinvestment in basic infrastructure thereby creating excess demand for public infrastructure, especially in the late 1980s and early 1990s. From 1970 to 1975, the amount of public investment in basic infrastructure exhibited moderate expansion and then declined from 1976 to 1985. This decline was displaced by the increase in public expenditure on administration and military defense for political stability and social harmony (see footnote 1 above). In addition, the economic slowdown during the late 1970s and the early 1980s resulted in a shortage of public revenue. All of

Table 3.3
Selected Indicators of Human Capital Quality in Selected Developing Countries, 1990–2000

	Illiteracy rate	Secondary school enrolment	Tertiary school enrolment	Expenditure per student at secondary education level	Expenditure per student at tertiary education level	Public spending on education
Middle income	5.7	63.2	13.8	n.a.	n.a.	4.3
Upper middle income	4.3	66.4	20.6	15.2	41.3	4.5
Thailand	1.4	49.2	23.3	12.7	29.4	4.3
Indonesia	3.4	49.2	10.9	8.7	11.3	1.3
Malaysia	3.6	61.6	13.3	18.4	86.4	5.0
The Philippines	1.9	76.4	29.5	10.0	19.0	3.1
Singapore	0.5	70.0	29.3	13.5	43.7	3.3

Notes: (1) Illiteracy rate is the percentage of people aged 15–24 who cannot, with understanding, read and write a short, simple statement on their everyday life.

(2) Secondary school enrolment is the ratio of total enrolment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. Secondary school completes the provision of basic education that began at the primary level, and aims at laying the foundations of lifelong learning and human development, by offering more subject- or skill-oriented instruction using more specialized teachers.

(3) Tertiary school enrolment is the ratio of total enrolment, regardless of age, to the population of the age group that officially corresponds to the level of education shown. Tertiary education, whether or not to an advanced research qualification, normally requires, as a minimum condition of admission, the successful completion of education at the secondary level.

(4) Expenditure per student on secondary (tertiary) education is the public current spending on education divided by the total number of students by level, as a percentage of GDP per capita.

(5) Public spending on education is the sum of public spending on public education and subsidies to private education at the primary, secondary and tertiary levels. This is measured as a percentage of GDP.

Source: World Bank, *World Development Indicators*, (CDROM).

these constrained public expenditure to building basic infrastructure. This situation eased between 1986 and 1996 when the economy exhibited rapid growth, thereby expanding the tax base and increasing public revenue. Despite the persistence of excess demand for public infrastructure, the rapid expansion of public revenue allowed the government to increase public expenditure rapidly to build basic infrastructure.

Table 3.4 provides a broad comparison of infrastructure availability in Thailand and other middle-income developing countries. There are four indicators, i.e. electricity production per head of population, telephone mainlines per 1,000 people, improved water source, and percentage share of R&D expenditure to GDP for the 1990s. The first three indicators reflect the availability of physical infrastructure, i.e. electricity, telephone services, and water supply, whereas the fourth one is another key infrastructure that has become increasingly important in promoting long-term economic growth. Private investments in R&D activities like technology are likely to be subject to the problem of free-riders (i.e. public goods problem). Private agents who conduct R&D investment are unable to charge all people who receive benefit from R&D activities. Without government intervention, this could lead to underinvestment. Underinvestment is even more severe in the context of developing countries where there is a relatively weak legal system to protect property rights (Hill. 2004: p.358).

In terms of physical infrastructure availability, Thailand performed poorly compared with middle-income developing countries between 1990 and 2001. In all indicators except improved water supply, Thailand was below the average of the middle-income developing countries. There is minor improvement in infrastructure availability between 1990–5 and 1996–2001. The level of electricity production per head of population in Thailand is closer to, but still below, the average of middle-income developing countries. In comparison with ASEAN-4 neighbours, Thailand is behind Singapore and Malaysia in these three respects, especially electricity and telephone services. However, the availability of infrastructure services in Thailand is better than in Indonesia and the Philippines, especially as far as the electricity supply is concerned. In terms of public R&D expenditure to GDP, Thailand is also below the average of other middle-income developing countries. This is even true when compared with ASEAN-4.

Table 3.4
Selected Indicators of Infrastructure Availability of Selected Developing Countries, 1990–2001

	Electricity production (kwh per capita)	Telephone mainlines (per 1,000 people)	Improved water source (per cent of population with access)	R&D expenditure (per cent of GDP)
1990–95				
Middle-income	1514.8	53.5	75.7	n.a.
Indonesia	249.7	10.2	71.0	0.07
Malaysia	1,702.8	122.7	n.a.	0.36
Singapore	5,710.4	377.2	100.0	1.13
Thailand	1,064.5	38.7	80.0	0.13
The Philippines	432.1	13.5	87.0	0.21
1996–2001				
Middle-income	1,696.4	112.8	81.6	0.57
Indonesia	393.8	28.1	78.0	n.a.
Malaysia	2,709.7	195.4	n.a.	0.31
Singapore	7,160.6	463.5	100.0	1.70
Thailand	1,521.2	86.0	84.0	0.11
The Philippines	552.7	34.9	86.0	n.a.

Notes: Data above are the annual average with data missing in some years.
kwh = kilo-watt hour
Source: World Bank, *World Development Indicators* (CD ROM)

3.1.5 The Policies Governing Foreign Investment

From about the early 1960s, Thailand has always pursued a 'market-friendly' approach towards foreign investors in manufacturing. There have not been major discriminatory policies and foreign investors have been able to be involved in almost any business. There are legal restrictions on foreign ownership of commercial banks, insurance companies, commercial fishing, aviation businesses, commercial transportation, commodity exports, mining and other enterprises. But these restrictions are not generally applied to foreign investors alone. Even local investors frequently require permission from government authorities to pursue these activities.

Under the Foreign Business Act of 1999 (better known as the 'Alien Business Law') which replaced the 1972 National Executive Council Announcement 281, the government restricted certain types of business for Thai enterprises only. Nevertheless, most of the listed activities are related to non-manufacturing, such as newspaper undertakings and radio and television station undertakings, lowland farming, upland farming, or horticulture, and raising animals.

Foreign investors are usually guaranteed the same rights as domestic investors. There are guarantees against expropriation and nationalization. The government permits freedom to export and freedom to remit investment capital, profits and other payments in foreign currency. Despite the presence of capital control measures during the pre–1990 period, in practice repatriation of foreign capital related to direct investment (e.g. investment capital, profit or dividends, interest and principal of foreign loans, royalties and payments on other obligations) has not been restricted (Akira, 1989: p.179).

There have been restrictions on land ownership and hiring of foreign migrants by foreign investors. In general, according to the Land Code (1954), foreign-owned firms are generally not allowed to own land.[4] According to the Alien Occupation Law, passed in 1973 and amended in 1978, foreigners require a work permit. Such restrictions have not been prohibitive. They have not applied to foreign investors who received investment privileges from the Thai Board of Investment (BOI). Hence, this implicitly encouraged foreign investors to apply for BOI promotion privileges, which are discussed in the following section.

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[4]Under the Thai-US Treaty of Amity and Economic Relations signed in 1966, US companies in Thailand are granted equal treatment to Thai companies. This permits 100 per cent US-owned companies to operate in sectors where other foreign companies are generally allowed a maximum ownership level of 49 per cent. In addition, US companies are allowed to own land up to 10 rai or 0.16 hectares with an approval from the Ministry of Interior. The Land Code (1954) was amended in 1999 to relax this restriction. Since 1999, foreign investors regardless nationality have been able to own up to 4 rai of land for residential purposes.

3.2 The Investment Promotion Regime

3.2.1 A Historical Overview (before 1970)

From 1960 onwards, the government pursued an open investment promotion regime to encourage private sector involvement in local manufacturing activities. Investment incentive policies were introduced in order to reinforce the IS strategy, and the BOI was established in 1959 as an independent office that would decide which firms would receive promotion privileges under the Investment Promotion Act (1960). Investment promotion measures included tax concessions on imported machinery, equipment, raw materials, and intermediate inputs needed directly for production. It was this set of privileges, which could be considered an encouragement to import capital goods and intermediate products including components for local assembly.

The tax concessions involved varied across diverse groups of the promoted industries, and the privileges granted differed according to the activity. In general, promoted industry activities were classified into three groups, i.e. A, B and C. Group A received a full exemption from tariff and business tax for 5 years, groups B and C received a one half and one third exemption, respectively. Group A consisted of 38 types, including agricultural machinery, metal products, and basic chemicals, all of which are capital intensive. Auto-assembling and electrical appliance manufacturing were classified in Group B. Group C covered as many as 66 industries, mostly concentrated in the labour-intensive industries, and those such as the weaving industry, which used widely prevailing technology (Akira, 1988: p.181).

It is clear that the pattern of privileges granted promoted activities was complementary to the effect of the restrictive trade policy regime for promoting import-substituting industries. As a result, MNE involvement in Thailand commenced to respond to the economic rents created from these trade and investment promotion regimes. As described in Chapter 4, FDI inflows during the late 1960s and 1970s were directed to the consumer import-substituting industries. The Investment Promotion Act

(1960) was amended several times in the 1960s and early 1970s (i.e. 1965, 1968, and 1972), but there were minor changes in the promotion privileges.

3.2.2 The Development of the Investment Promotion Regime from 1970–present

Since 1970, the investment promotion regime has changed from promoting import-substituting industries to encouraging export-oriented industries. Until the mid 1980s, the role of investment promotion schemes remained complementary to the escalating tariff structure to promote import-substituting industries. Amendments to the Investment Promotion Act in 1972 and 1977 vested the BOI with even more power in determining the length and magnitude of fiscal incentives that promoted firms could receive. For instance, the BOI can grant a corporate income tax exemption for 3–8 years compared with 5 years in the 1962 Act. The list of promoted activities remained more or less the same.[5]

Attempts to promote investment in import-substituting industries became more aggressive in the late 1970s. According to the 1977 Investment Promotion Act, the BOI could impose an import surcharge over and above a tariff in order to protect particular promoted industries. This was designed to allow the BOI to be able to act promptly to solve problems facing promoted industries. In the 1970s and early 1980s, the BOI actively used import surcharges to protect promoted firms producing a variety of products. This protection was normally renewed for periods longer than a year, over and above import tariff measures. In 1980, there were about 20 products and product groups subject to import surcharges ranging from 10 to 40 per cent of c.i.f. prices (Akrasanee and Ajanant, 1986: p.89). At the end of 1985, import surcharges applied to about 30 products and the rates varied from 5 to 50 per cent, with most being between 20 and 30 per cent (World Bank, 1988: p.58–9). These changes strengthened the restrictive impact derived from the trade policy regime in favour of import-substituting industries, as opposed to export-oriented industries.

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[5] Groups A and B, which began in the 1960s, were merged together.

The 1977 Act also stipulated majority Thai ownership for projects serving the domestic market and those in agriculture, mining, and services industries. It had an implication for equity ownership by foreign businesses. While not all foreign firms were required to be BOI-promoted, some of the BOI privileges, such as special rights to own land, and foreign worker permits, implicitly forced foreign businesses to apply for the investment incentives. Hence, the restriction on foreign ownership remained implicitly. Nevertheless, these conditions did not apply to projects where at least 50 per cent of output was exported. In practice, the BOI still had considerable discretion to apply the restriction of foreign ownership to promoted projects. For example, projects associated with advanced technology and/or creating sizable employment were likely to be exempt from foreign ownership restrictions (World Bank, 1988).

In the mid–1980s, changes took place to at least three aspects of BOI privileges: enhancing transparency, promoting industrial decentralization and promoting export-oriented activities. The BOI scheme became more transparent. The first public announcement of the BOI's promotion criteria was made in 1983. The level of policy discretion regarding the length and magnitude of fiscal incentives was reduced. For example, according to the 1983 investment promotion criteria, the BOI was able to determine corporate income tax exemptions for 3 to 5 years, extendable to 8 years, depending on the investment scale or the number of employees. From 1987, the criteria were clearly spelled out. Corporate income tax exemption was granted to projects located in industrial estates in Bangkok and Samut Pakarn for 3 years, extendable to 5 years only.

To promote industrial decentralization, investment privileges were granted to activities located in remote areas outside Bangkok and its surroundings. This shift corresponded to overall planning goals set out in the Fifth and Sixth National Economic and Social Plans, the long-term economic plan of Thailand. In 1987, more privileges were granted to remote areas than for Bangkok and its surroundings, with the rationale that privileges would compensate for the inadequate infrastructure in remote areas. Under the 1987 investment promotion criteria, the promoted zones were clearly classified into 3 zones; Bangkok and Samut Pakarn, the four neighbouring provinces to Bangkok (i.e. Nakhom Pathona, Nonta Buri, Pathum Thani and Samut Sakhon) and another 67 provinces referred to as Investment Promotion Zones (IPZs). Firms located in Bangkok and Samut Pakarn received the fewest privileges compared to those located in the 4 other neighbouring provinces and the IPZs. For example, domestic-oriented promoted firms located in Bangkok did not receive exemption from import duty and business tax on machinery, whereas this exemption was granted to projects located in IPZs. Promoted firms located in 4 other neighbouring provinces received a 50 per cent reduction on duty and tax (Appendix 3 for additional information).

In order to strengthen the objective to promote manufacturing activities in remote areas, the zones were reclassified in 1989. There were now three investment promotion zones, i.e. zones 1, 2 and 3. Zone 1 has 6 provinces, including Bangkok and its neighbouring areas, whereas Zone 2 covers 10 provinces in central and eastern parts of Thailand.[6] All other provinces are in Zone 3. The fewest investment incentives are granted for projects in Zone 1 and the most for Zone 3. This new classification widens the difference in privileges granted between Bangkok, the central areas and the remote zones. Furthermore, in 1993 and 2000, the BOI introduced additional incentives to encourage firms to move from zone 1 to zones 2 and 3. In particular, in 2000, further groups were identified within zone 3 and granted additional privileges to strengthen industrial decentralization.

From the early 1980s, there has been a clear shift in emphasis from import-substituting activities to export promotion. The key importance of this change is the introduction in 1983 of tariff exemptions by the BOI on imported raw materials as an additional privilege for export-oriented promoted firms (i.e. for an export-sale ratio of greater than 30 per cent). This was supplemented by another two tariff exemptions: tariff exemptions/drawbacks (Section 19 of the Custom Laws) given by the Department of

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[6] Five areas surrounding Bangkok are Samut Prakarn, Samut Sakorn, Nakorn Pathom, Nonta Buri and Pathum Thani. Zone 2 covers Samut Songkhram, Ratchburi, Suphan Buri, Ang Thong, Ayutthaya, Saraburi, Nakhon Nayok, Chachoengsao, Chon Buri, and Map Ta Phut Industrial Estate.

Customs, and tax rebate schemes given by Fiscal Policy Offices (FPO).[7] The timing of such a change was more or less in line with changes in the global environment when many East Asian manufacturers started losing their international competitiveness in labour-intensive products. This was instrumental in making Thailand an attractive location for export-oriented labour-intensive FDI for East Asian investors.

It is worth clarifying the difference between tariff exemptions granted by the BOI and the alternative schemes. While tariff exemptions and tax rebate schemes are administered by the Department of Customs, the BOI scheme offers a prior exemption scheme that is less cumbersome than the two existing schemes. After receiving approval from the BOI, export-oriented promoted firms are automatically allowed to access their imports without a delay to calculate and pay levies. This reduces custom procedures that before 1997 were considered unusually cumbersome and imposed costs on importers (European Commission, 1999; and United States Trade Representative, 1999, cited in Warr, 2000: p.1233).

The data on the value of foregone revenues from each scheme are available for some years only.[8] Nevertheless, nesting such data together sheds light on transactions taking place in each scheme and their relative importance. For example, between 1983 and 1987, the annual average revenue loss from the BOI-tariff exemption on imported inputs was B6,086 million. This accounted for around 57 per cent of the total forgone revenues from all tariff exemption schemes (World Bank 1988: p.60–1). The 1998 revenue losses from the tariff exemption of imported inputs amounted to B60 billion (WTO, 1999: p42), as opposed to B14.8 billion of revenue losses from the duty

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[7] From 1990, there have been another three alternatives, i.e.(i) duty relief for goods placed under the Custom Bonded Warehouse scheme; (ii) duty exemption for goods taken into the Free zones established by Customs; (iii) duty exemption for goods taken into the Export Processing Zones (EPZ). Except for (ii) these measures are directly under the administrative responsibility of the Thai Customs Department to grant duty drawback, and duty exemption. Measure (ii) is under the control of the Industrial Estate Authority of Thailand.

[8] The 'Trade Policy Review 1995' by the WTO contains this specific criticism that "..Thailand has made much progress in the creation of a more neutral incentive structure yet a substantial degree of non-transparency still remains; examples include the lack of a published tariff schedule since 1992, and the unavailability of details concerning the usage of tariff concessions and investment incentives." (WTO, 1995: p.32)

exemption scheme administered by the Custom Department in the fiscal year 2002 (June 2001–May 2002) (WTO, 2003: p.42). Since data on the value of imported inputs to which these exemptions refer are not available, it is not possible to make any inferences on the efficiency of any one scheme. The figures shown above indicate the relative significance of the BOI scheme compared with the alternative ones.

After the onset of the financial crisis in 1997, the BOI made slight adjustments to the promotion criteria. First, privileges granted to promote export-oriented activities were abolished according to the WTO commitment on trade-related investment measures (TRIMs) agreement. Secondly, the BOI lifted the restriction on foreign ownership to 49 per cent for promoted activities in Zones 1 and 2. This abolition was in response to the need to attract foreign capital inflows, especially FDI, during the onset of the 1997 crisis (WTO, 1999: p.30).

3.2.3 Evaluation of the Investment Policy Regime

It seems clear that the investment promotion regime in Thailand generally treats domestic and foreign investors equally. Investment promotion privileges, except import surcharges and input tariffs exemption, are used in order to influence decisions to allocate resources to promoted targets. However, effectiveness is still unclear. Most firms intending to invest for the long term do not become profitable for some time, making the five year tax holiday less useful than it might seem. Obviously, the tariff exemption privilege for machinery becomes less significant when applied tariff rates drop to around five per cent or less. Evidence from the automotive industry also raises questions regarding its effectiveness. Although the BOI dropped automotive assembly activities from the promotion lists in the late 1960s, more entrepreneurs were attracted to operate without these BOI privileges in the 1970s (Nawadhinsukh, 1983). The same evidence was also found for some cases in textile industries during the late 1970s (Suphachalasai, 1992; Kohpaiboon, 1995).

The imposition of import surcharges over and above tariffs in order to protect particular promoted industries distorts the incentive structure. However, in recent years, use of this measure has been limited, and has been applied on a temporary basis since the late 1980s. For example, at the end of 1987 it affected only nine products, mainly chemicals and pharmaceuticals. In 2002, for example, there was only one case where the BOI imposed an import surcharge on steel imports. It lasted for seven months (January–July 2002). The other exception was an exemption from input tariffs. This measure is probably more significant for exported-oriented enterprises. While the presence of input tariffs could distort international competitiveness, becoming a BOI promoted firm is a way to bypass the burden of input tariffs, as well as customs procedures.

3.3 The Trade Policy Regime

3.3.1 The Situation before 1970.

Ever since the Bowring Treaty with Great Britain in the 1850s, Thailand has remained a relatively open trading economy. Under the Bowring treaty, Thailand could not impose import or export tariffs of more than 3 per cent. In addition, British merchants were allowed to buy and sell goods directly, without any of the interference that had taken place when the King controlled trade. Fourteen other countries, mostly European countries, the United States and Japan, were included in the Bowring Treaty. As a result, Thailand pursued broadly free trade policies and concentrated on exporting primary goods such as rice, tin, and teak and imported manufactured products (Ingram, 1971).

After the abolition of the Bowring Treaty in 1926, Thailand began raising its tariff rates. The aim was to increase government revenue rather than to protect local industry. The average level of tariff rates increased to around 20 per cent in the 1960s, from about 3–4 per cent between 1855 and 1927 (Akrasanee and Ajanant, 1987: p.80). To some extent the high tariff could provide protection to local production as opposed to imports, but the response from private investment in manufacturing continued to be low. Hence, the government began to make public sector investment, in both infrastructure and manufacturing (Isarangkun, 1969). Several public enterprises in areas such as textiles, paper, glass, and gunny bags were established between 1947 and 1957.[9]

However, Thailand's trade policy regime continued to remain remarkably free compared to other developing countries. According to Sachs and Warner (1995), Thailand is one of only seven developing countries that have always been relatively open. Thailand embarked on an IS industrialization strategy in the early 1960s. The government introduced an escalating tariff structure to encourage local manufacturing, as well as pursuing private-sector-led industrialization. The government at that time (i.e. the Sarit government) also attempted to restructure drastically the existing tariff system of selected products. Unlike the system adopted from 1927 to 1959, which had primarily been aimed at increasing central government revenue, the changes in the tariff system under the Sarit government were designed to protect domestic manufacturers, including foreign investors, and to pursue IS industrialization. Nevertheless, the degree of tariff escalating structure in the mid–1960s was negligible. Tariff rates were scattered around 20–30 per cent, i.e. 25–30 per cent for durable and non-durable consumer goods; 20–30 per cent for intermediate products; and 20 per cent for machinery and equipment. To some extent this escalating tariff structure began then, in spite of the small difference in tariffs across sectors.

[9]This was partly due to the result of nationalistic policies, but it also reflected discrimination against the Chinese business community and fear of foreign investment. Akrasanee and Ajanant (1986) point out that Chinese business diverted their investments into high liquidity businesses such as retailing and mining (Muscat, 1966; Akira, 1989) and remitted a sizable amount of return to China. Hence, import tariffs and export taxes (especially on rice exports) were raised partly in response to the high remittance in spite of the government revenues (Ingram 1971).

3.3.2 The Development of the Trade Policy Regime since 1970[10]

As in other developing countries, Thailand implements both tariff and quantitative restrictions (QRs) as trade policy instruments. However, historically, there has been greater reliance on tariffs rather than QRs (World Bank, 1988). This is especially true for the manufacturing sector where tariffs were the main trade policy instrument to influence the country's resource allocation, with a few exceptions. One exception was the automotive industry where the government has used both tariff and non-tariff measures i.e. LCRs, to encourage auto parts localization (see details in Chapter 7). In general, the tariff and QRs are mainly confined to agricultural trade (World Bank 1988, p.57–8).

For the past three decades, Thailand has maintained an escalating tariff structure where tariff rates for raw materials and intermediates have usually been lower than those on finished products. The escalating tariff structure, which began in 1964 in order to promote an IS strategy, has been pursued since then. Between 1970 and 1987, such a tariff structure was associated with high effective tariff rates. The government maintained tariff rates on output but reduced those on inputs. In 1971, tariff rates for durable and nondurable consumer goods were raised to around 30–55 per cent while remaining unchanged for intermediate goods, machinery and equipment at the 1964 level of 20–30 per cent. As a result, the gap in tariffs between the former and the latter was widened, thereby enhancing incentives for local manufacturing in finished goods. In 1974, tariff rates for machinery and equipment for both agricultural and industrial use were reduced to 10 per cent. The purpose of reduction of tariffs on inputs was not purely motivated by industry protection. Averting inflationary pressure resulting from the world oil price hike was a dominant concern.

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[10]The tariff discussed in this section is based on 'applied' not 'statutory' or 'scheduled' tariff rates. The statutory tariff rate is referred to as the tariff rate given by the Customs Decree B.E. 2500. Changes to statutory rates require legislative approval. The applied rate refers to the actually implemented one. The Minister of Finance (MOF) may modify the applied tariff rates without requiring approval by the legislative body. Consequently, applied tariffs for several products differ from statutory tariffs. Though the MOF has the power to raise or reduce tariff rates, the change in applied tariffs has generally worked to reduce the rate in recent years (WTO, 1990: p.74-8).

The key implication of an escalating tariff structure is to provide an incentive for local enterprises to produce finished goods as opposed to intermediate goods. The presence of input tariffs is compensated for by tariffs on outputs at a higher level. The fact that the value of outputs is generally greater than the total value of intermediate inputs, i.e. positive value added, means that the escalating tariff structure could generate net protection greater than the level of nominal protection on outputs. This encourages local enterprises to enter into the production of highly-protected finished goods, regardless of the existing comparative advantage of the country. Hence, it is likely to cause inefficiency in domestic resource allocation.

While government officials were aware of the adverse impact from the escalating tariff structure, as well as the great variation in tariff rates across industries, tariff restructuring could not be implemented until the late 1980s. This was due mainly to the poor fiscal situation. The awareness of the adverse impact was even explicitly addressed and incorporated in the Fifth National Economic and Social Development Plan. However, in the early 1980s, this attempt was constrained by the consecutive budget balance deficit and high level of public debt, as well as inflationary pressures from the oil price crisis of the late 1970s (see above). For instance, tariff changes announced in October 1982 were intended to initiate reform and reduce the sectoral variation in protection impacts by lowering nominal rates to a maximum of 60 per cent.[11] The consecutive fiscal deficits from 1975 to 1984 caused increases in tariffs on intermediate chemical products and machinery in order to narrow the tariff gap between intermediate inputs and finished products. However, fears about their impact on production costs caused an almost immediate reversal of most of these tariff increases. Eventually, a special surcharge on imports was temporarily imposed between 1982 and 1984. This was replaced with an increase in nominal tariff rates in 1985. Tariffs on raw materials and intermediate goods were raised by 5 per cent, while those on finished goods except for

[11] In 1982, the Thai government decided to apply an upper limit of 60 per cent in general. The few chapters of the Harmonized System (HS), for which this upper limit on ad valorem tariffs has not been imposed are certain leather products, fur, hats, umbrellas, as well as certain ceramic products. For products with specific tariffs, it is not possible to ensure that such an upper limit always applies in terms of an ad valorem equivalent tariff. In 1989, for example, imports of several items faced applied tariffs of more than 100 per cent.

certain textile and machinery items were raised by 10 per cent. Thus, the escalating tariff structure associated with the higher level of nominal protection remained in place.

During the late 1980s to the mid–1990s, the Thai government undertook a considerable tariff reduction in the context of the economic boom and the improvement in the fiscal position. During this period Thailand experienced rapid economic growth with price stability. From 1986 to 1995, the annual average growth of real GDP was 9.2 per cent. The rapid growth of domestic income meant a rapid expansion of the tax base, thereby improving the government's fiscal position. The budget balance recovered from 12 years of consecutive deficit between 1975 and 1987 to surplus in 1988 and remained in surplus until 1997 (Figure 3.2).

Tariff reduction commenced with electrical and electronic goods in Chapter 85 of the Harmonized System (HS) as well as with various industrial inputs, totaling 115 items in 1988 (See details in Annex 3, World Bank, 1988). In September 1990, tariffs on several machinery and equipment imports were reduced to 5 per cent (WTO, 1990: p.84). A comprehensive plan for tariff reduction was proposed in 1990 and implemented in 1995 and 1997. It involved tariff reduction and rationalization. Maximum tariffs were reduced from 100 per cent to 30 per cent. Tariffs were significantly lowered on some 4,000 items (at the 6–digit HS level) or 75 per cent of total tariff lines. By the end of the 1990s, the tariff bands were reduced from 39 to six (0, 1, 5, 10, 20 and 30 per cent). The two low rates (0 and 1 per cent) were for raw materials and the two top rates (20 and 30 per cent) for finished products, with the two middle rates for intermediate goods. As a result of these tariff cuts, the average applied tariff rates dropped from more than 30 per cent in 1990 to 17 per cent by 1997 (Table 3.5)

In mid–1997, the reform process was temporarily interrupted by the financial crisis. Tariffs on completely built-up (CBU) passenger cars and a number of other luxury imports were temporarily raised in 1997.[12] Tariffs on these items were raised to

[12] In October 1997, the government raised tariffs on completely built-up (CBU) passenger cars (from 42-69 per cent to 80 per cent), perfumes, cosmetics, clothing, leather products,

discourage demand for imported goods, increase tax revenues, and as a response to pressure from domestic industry. At the same time, a surcharge of 10 per cent was introduced with the exception of goods subject to less than 5 per cent tariff rates. This was a temporary measure to increase tax revenue in order to meet the budget surplus of 1 per cent of GDP agreed to with the International Monetary Fund (IMF) in late 1997. The surcharge was abolished in August 1999 as part of the Government's package of measures to encourage investment, which also included autonomous reductions on over 600 tariff lines, covering inputs used by Thailand's main industries (WTO, 1999: p.37). Hence, the financial crisis interruption caused a reverse trend of tariff rates. Applied tariff rates increased slightly to 20.1 per cent in 1998 and returned to 17.1 per cent in September 1999 after the temporary tariff measures were removed (Table 3.5).

Over the past two years, tariff restructuring has received renewed emphasis as an essential part of the overall economic reforms aimed at strengthening efficiency and competitiveness (Warr 2000; WTO 1990, 1995, 1999). The Thai government introduced another effort to lower tariff rates, commencing in June 2003 (implemented in October 2003), followed by a four-year period of tariff reduction from 2004 to 2008. There are around 900 items involved in the second round of tariff reductions, covering a wide range of manufacturing products. Table 3.6 provides a summary of selected items scheduled to have tariff rates cut between 2002 and 2005 according to the magnitude of the cuts. Changes in tariff rates between 2006 and 2008 are minor, compared to the 2005 tariff structure. The clear evidence from Table 3.6 is that the tariff reduction in this round is mainly on intermediate products, thereby maintaining the escalating tariff structure. The top 10 items subject to tariff reduction consist of rubber and articles thereof (HS40), glass and glassware (HS70), knitted fabrics (HS60), other base metals (HS81), woven fabrics (HS58), articles of stone (HS68), man-made staple fibre (HS55), wadding yarns (HS56), cotton (HS52), and miscellaneous vegetable preparations (HS21). The magnitude of tariff reduction is moderate, within the range of 0 to 8.9 per cent.

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glassware and crystal products, certain shoes and jewelry (from 20 to 30 per cent), and lenses, eyeglasses, cameras, watches, pens and lighters (from 5 to 30 per cent).

Table 3.5

Average Tariff Rates in Selected Asian Countries, 1985–2001 (unweighted, per cent)

	China	Indonesia	Korea	Malaysia	Philippines	Taiwan	Thailand	Vietnam
1985	n.a.	27.0	n.a.	n.a.	27.6	26.5	41.2	n.a.
1986	38.1	31.5	n.a.	15.8	27.9	22.8	n.a.	n.a.
1987	39.5	n.a.	22.9	13.6	27.9	19.4	n.a.	n.a.
1988	n.a.	n.a.	18.9	13	27.9	12.6	n.a.	n.a.
1989	n.a.	25.2	14.9	17	27.6	9.7	40.8	n.a.
1990	40.3	20.6	13.3	n.a.	27.8	9.7	39.8	n.a.
1991	n.a.	20.3	11.4	16.9	26	n.a.	38.7	n.a.
1992	42.9	20.0	10.1	12.8	24.3	n.a.	n.a.	n.a.
1993	39.9	19.4	8.9	14.3	22.6	n.a.	45.6	n.a.
1994	36.3	n.a.	n.a.	13	21.7	n.a.	23.3	n.a.
1995	n.a.	n.a.	n.a.	n.a.	20	11.2	23.1	12.8
1996	23.6	13.2	13.4	8.7	14.3	9.7	n.a.	n.a.
1997	17.6	n.a.	13.3	9.1	13.4	n.a.	17	13.4
1998	16.8	9.5	11.1	7.1	10.7	n.a.	20.1	n.a.
1999	n.a.	10.9	8.7	9.7	10.1	8.8	17.1	n.a.
2000	17.5	8.4	n.a.	n.a.	7.5	n.a.	18.4	16.5
2001	17.5	8.4	n.a.	10.2	7.6	n.a.	18.5	15.7

Notes: n.a. = not available.
Source: Athukorala, Jongwanich and Kohpaiboon (2004), based on Hoekman *et al.* (2002, Table A–1) for the period 1985–89; WTO, Trade Policy Review – Country Report (various) and individual country tariff schedules available from the Asia Pacific Economic Cooperation (APEC) Secretariat online data base, www.apec.org for other years.

Table 3.6
Average Tariff (per cent) of Top 30 Items under Tariff Restructuring in Thailand, 2002–5

HS		Average Tariff Rates				Tariff Difference
		2002	2003	2004	2005	2002–05
		(1)	(2)	(3)	(4)	(1)–(4)
40	Rubber and articles thereof	23.3	23.3	15.0	8.6	8.3
70	Glass and glasswear	18.0	10.1	10.1	10.1	7.9
60	Knitted fabrics	20.0	20.0	12.5	5.0	7.5
81	Other base metals	9.4	3.2	2.5	2.5	7.0
58	Woven fabrics, lace etc.	20.0	20.0	13.2	6.1	6.8
68	Articles of stone	18.3	11.6	11.6	11.6	6.6
55	Man-made staple fibre	15.9	15.9	9.4	4.8	6.5
56	Wadding yarns	17.7	17.7	11.4	6.1	6.3
52	Cotton	15.5	15.5	9.2	4.8	6.3
21	Miscellaneous vegetable preparations	30.3	24.1	24.1	24.1	6.2
54	Man-made filaments	15.0	15.0	8.9	5.0	6.1
13	Lacs, gums and other vege.slabs	16.1	10.0	10.0	10.0	6.1
50	Silk	14.9	14.9	8.9	5.1	6.1
48	Paper and paperboards	17.7	12.2	12.2	6.8	5.5
83	Misc. articles of base metals	19.1	13.6	13.6	13.6	5.5
79	Zinc and articles thereof	9.0	5.9	4.1	4.1	4.9
87	Vehicles (other than railway)	38.2	38.2	33.5	32.2	4.8
78	Lead and articles thereof	9.2	4.9	4.5	4.5	4.7
69	Ceramic products	22.7	18.0	18.0	18.0	4.7
11	Products of the milling industry	30.1	26.2	25.5	25.5	4.5
82	Tools, implements. Cutlery etc	20.6	16.2	16.2	16.2	4.4
74	Articles of iron and steal	10.6	6.3	6.3	6.3	4.3
34	Soap and washing preparations	12.0	8.1	8.1	7.3	3.9
32	Tanning or dyeing extracts	9.6	6.0	6.0	6.0	3.6
76	Aluminium etc.	11.6	8.3	8.1	8.1	3.5
7	Edible vegetables , roots and tubers	38.7	35.4	35.4	35.4	3.3
53	Other vegetable textile fibres	9.8	9.8	6.8	5.0	3.0
35	Albuminoidal substances	7.3	4.3	4.3	4.3	3.0
2	Meat and edible meat offal	38.2	35.4	35.4	35.4	2.8
44	Wood and articles of wood	12.6	9.9	9.9	6.4	2.7
91	Clocks and watches	11.1	8.4	8.4	8.4	2.7
80	Tin and articles thereof	7.5	5.2	4.9	4.9	2.6

(contd.)

Table 3.6: (contd.)

HS		Average Tariff Rates				Tariff Difference
		2002	2003	2004	2005	2002–05
		(1)	(2)	(3)	(4)	(1)–(4)
84	Non-electrical machinery	7.4	7.4	4.8	4.2	2.6
73	Articles and iron and steel	16.1	16.1	13.7	11.3	2.4
49	Printed books, newspapers etc..	11.6	9.2	9.2	6.8	2.4
75	Nickel and articles thereof	8.4	6.1	6.1	6.1	2.4
89	Skips, boats etc	11.8	9.6	9.6	9.6	2.2
85	Electrical machinery and equipment	12.5	12.5	10.4	8.5	2.1
59	Impregnated, coated or covered textile fabrics	14.3	14.3	12.2	10.3	2.1
51	Wool, fur or animal hair	5.7	5.7	3.8	3.1	1.9
94	Furniture, bedding etc.	20.2	18.3	18.3	18.3	1.9
8	Edible fruits and nuts	34.3	32.4	32.4	32.4	1.9
45	Cork and articles of cork	10.3	8.5	8.5	6.7	1.8
72	Iron and steel	7.6	7.6	5.9	4.7	1.8
	Average all tariff items	**14.3**	**13.3**	**12.0**	**11.0**	**2.3**

Source: See Appendix 4

Table 3.7 provides a summary of chronological events of tariff changes in Thailand over the past three decades. It seems clear that Thailand persistently pursued an open trade policy regime in the context that cross-border protection is heavily reliant on tariff rather non-tariff measures. Over the past three decades, the government tended to lower tariff protection unilaterally. Tariff reduction plans were delayed until the late 1980s because of the poor fiscal situation. Significant tariff reduction was undertaken in the mid 1990s. Nevertheless, despite a series of tariff reductions, the escalating tariff structure is still the key theme in designing the tariff structure, thereby promoting differing economic incentives across industries.

The impact of reforms under the World Trade Organization (WTO) and various regional initiatives such as Asia-Pacific Economic Cooperation (APEC), and the ASEAN-Free Trade Area (AFTA) has been less important, compared to the ongoing unilateral tariff reduction. While AFTA would potentially have an impact on particular industries rather than the overall policy regime, its actual impact has at best had modest results in bringing down intra-regional trade barriers and is threatened by the proliferation of bilateral free trade agreements (FTAs).[13]

3.3.3 Nominal Protection

The past three decades have seen a significant reduction in nominal tariffs. The simple average applied tariff rate sharply declined from 40 per cent between 1985 and 1994 to 23 per cent from 1995 to 1996 and 17 per cent in 1997 (Table 3.5). The downward trend of average tariff was temporarily reversed during the onset of the crisis. The average tariff rate was further reduced to 13.3 per cent in 2003, and was expected to decline further to 12 and 11 per cent in 2004 and 2005–8, respectively.

Table 3.7
A Chronology of Official Tariff Changes in Thailand, 1970–2003

Period	Event
1971	The gap in tariffs between finished consumer goods and intermediate goods widened as a result of tariff increases in the former.
1974	Tariffs for machinery and equipment for both agricultural and industrial use were reduced.
1980	The government addressed tariff reform in the Fifth National Economic and Social Development Plan of Thailand.
Oct 1982	The first attempt to narrow the gap of tariff rates by increasing tariff rates for intermediate chemical products and machinery.
1982–4	- The change in October 1982 was abolished and the previous tariff structure was restored. - A special surcharge on imports was temporarily imposed to generate public revenue.

(contd.)

[13]See the special issue of ASEAN Economic Bulletin (2005) Vol. 22, No.1 for the comprehensive discussion of trade policies in Southeast Asia.

Table 3.7 (contd.)

1985	Raise tariffs by 5 per cent on raw materials and intermediate goods, 10 per cent for finished goods.
1988	Lower tariff rates on several electronics and electrical appliances.
1990	Launch a comprehensive tariff restructuring (reduction and rationalization), implemented in 1995 and 1997.
Oct 1997	- Raise tariff for luxury products e.g. perfumes, cosmetics, clothing, leather products, glassware and crystal products, certain shoes and jewelry, etc. for two years. - 10 per cent surcharge on other goods whose tariff rates are equal to or greater than 5 per cent for two years.
2003	Tariff reduction on 900 intermediate products.

Source: Author's compilation

Despite the persistent decline in tariffs, Thailand remained a high-tariff country by regional standards until about the mid–1990s. During this period, Thailand's simple average tariff rate continued to exceed levels in Malaysia, the Philippines, Indonesia, and even China by a wide margin. Nevertheless, the utilization of non-tariff measures, represented by the coverage ratio of non-tariff barriers (NTBs), in Thailand has been low compared to most other East Asian countries (Table 3.8). This makes tariffs virtually the sole means of border protection.

Despite the persistence of escalating tariff structures, the distribution of tariff lines has significantly changed between the pre– and post– mid–1990s tariff restructuring (Table 3.9). Since during 1997–2002, there was no significant change in tariffs, this study uses the 2002 tariff rates to represent the tariff structure during 1997–2002. In 2002, more than 50 per cent of products were subject to tariff rates lower than 10 per cent. This was in sharp contrast to the pre-restructuring period where only around 30 per cent of total tariff lines were at rates between 0–10 per cent and almost half were at rates of 20 per cent or above.

Table 3.8
Coverage Ratio of Non-tariff Barriers (NTBs) in Import Trade*
(unweighted, per cent)

	1984–87	1988–90	1991–93	1997–2000
China	10.6	23.2	11.3	5.7
Indonesia	94.7	9.4	2.7	3.1
Korea, Rep	8.8	4.0	2.6	1.5
Malaysia	3.7	2.8	2.1	2.3
The Philippines	44.9	n.a.	n.a.	1.8
Thailand	12.4	8.5	5.5	2.1

Notes: n.a.= not available

*Calculated as a percentage of the import value of HS6 tariff lines affected by NTBs in total imports. NTBs include quantitative restrictions in the form of all types of licenses and import authorization, quotas, import prohibitions, advanced import deposits, foreign exchange restrictions, fixed customs valuations, and state trading monopolies. Figures reported under a given sub-period relate to a single year within that sub-period.

Source: Athukorala, Jongwanich and Kohpaiboon (2004) based on Hoekman *et al.* (2002, Table A-1) for the period 1985–89; WTO, Trade Policy Review – Country Report (various) and individual country tariff schedules available from the Asia Pacific Economic Cooperation (APEC) Secretariat online data base, www.apec.org for other years.

However, the second round of tariff restructuring in 2002 did not alter the distribution of tariff lines. It basically involved shifting the tariff lines from the 16–20 per cent bracket to a lower bracket with little impact on lines above the 20 per cent bracket (Table 3.9). The changes proposed for the next two years appear to follow the same pattern, while the changes proposed for 2006–2008 seem negligible. This will result in a further widening of tariff differences between intermediate and finished products.

Table 3.9
Share of 4–digit Harmonized System (HS) Categories of Applied Tariff Rates in Thailand, 1989–2008

Tariff bands	1989	1995	2002	2003	2004–08
0	2.5	2.6	5.6	5.7	6.0
0.1–5	14.4	17.3	33.3	37.7	48.8
5.1–10	14.2	17.6	14.1	14.2	14.8
10.1–15	12.7	3.2	3.9	4.5	3.6
15.1–20	15.4	16.4	21.4	17.9	8.4
20.1–30	15.8	16	13.8	14.3	12.7
30–100	25	26.8	7.8	5.8	5.7

Source: Data for 1989 and 1995 from WTO (1990) and (1995), respectively. Data for 2002–08 are from Athukorala, Jongwanich and Kohpaiboon (2004).

In general, tariff rates are higher for manufacturing, compared with agriculture and other primary product sectors. This is indicated in Table 3.10 by the fact that the average applied tariff rates (without the various exemption) for the manufacturing sector are higher than those for the overall economy between 1980 and 2003. This is consistent with patterns observed in other developing countries and reflects the belief in industrialization as the road to economic independence. Furthermore, the comparison of tariff rates across industries clearly points out the presence of a tariff escalating structure. Tariff rates are particularly high for agricultural-processing, especially beverages, food processing, and import-substituting consumer products e.g. garments, footwear. Intermediate products like metal products, machinery, chemical products are generally subject to lower tariff rates.

Table 3.10
Nominal and Effective Rates of Protection in Thailand, 1980–2003 (per cent)

	1980	1985	2002	2003
Nominal rate of protection (NRP)				
Agro-processing	34.4	30.9	22.7	20.3
Textile products	41.0	27.8	18.9	18.6
Leather and Footwear products	54.1	26.8	18.8	18.5
Wood products	31.6	28.2	13.7	13.5
Paper and pulp	24.0	17.8	14.4	10.5
Chemical and petroleum products	32.8	21.4	9.4	8.4
Rubber products	29.1	26.8	23.2	23.2
Other non-metal products	36.7	23.0	15.0	10.0
Metal products	25.2	16.6	13.2	10.7
Machinery	22.4	14.3	6.2	6.2
Consumer goods and motor vehicles	31.2	19.7	11.4	10.6
Total Manufacturing	32.9	23.8	16.4	15.4
Overall	n.a.	22.9	14.7	13.9
Effective rate of protection (ERP)				
Agro-processing	58.1	135.2	26.9	21.2
Textile products	74.5	118.4	35.6	35.4
Leather and Footwear products	87.8	152.7	26.3	28.5
Wood products	65.4	62.0	25.2	25.4

(contd.)

Table 3.10 (contd.)

	1980	1985	2002	2003
Paper and Pulp	20.4	53.5	46.8	31.8
Chemical and Petroleum products	43.0	44.5	15.6	13.9
Rubber products	2.1	42.0	65.3	65.6
Other Non-Metal products	72.1	108.5	32.5	20.1
Metal products	35.6	70.9	23.0	18.5
Machinery	27.1	29.3	2.0	3.1
Consumer goods and motor vehicles	48.4	45.6	15.3	15.3
Total manufacturing	51.7	78.4	25.2	23.6
Overall	n.a.	65.9	20.6	18.2
Coefficient variation (CV) of ERPs	120	200	188	204
Spearman Rank Correlation Coefficient with 2002 ERP	0.5618	n.a.		
Spearman Rank Correlation Coefficient with 2003 ERP	0.4809	n.a.	0.9334	1

Notes: detail of ERP estimates for 1985 is not available. Spearman Rank Correlation Coefficient (*rho*) is defined by $1-6\sum\left(\frac{d^2}{N(N^2-1)}\right)$ where d= the difference in statistical rank of corresponding variables.
Source: ERP estimates for 1980 are from Akrasanee and Ajanant (1986), those of 1985 from World Bank (1988) and of 2002–3 are from Athukorala, Jongwanich and Kohpaiboon (2004). See details in Appendix 5.

3.3.4 Evaluation of the Trade Policy Regime

In this section, restrictiveness of the trade policy regime is evaluated using several indices, which can be categorized into two groups: aggregate measure and ERP. In the aggregate measure, there are five indicators, i.e. the widely used trade to GDP, the trade to goods GDP, the ratio of export-gross output in the manufacturing sector, the incidence of applied tariff rates and incidence of applied tariff rates in manufacturing products. The clear advantage of the first group is to illustrate the time pattern of the level of trade restrictiveness over the past three decades.

Figure 3.4.A and 3.4.B illustrate the time pattern of five measures of trade policy restrictiveness, i.e. the widely-used trade to GDP or degree of openness (*OPEN1*), the trade to goods GDP (*OPEN2*), the ratio of export-gross output in the manufacturing sector (*EX_OUTPUT*), the incidence of applied tariff rates i.e. the percentage of tariff

revenues to total imports (*TARIFF1*), and the incidence of applied tariff rates in the manufacturing sector (*TARIFF2*). For *OPEN1*, *OPEN2*, and *EX_OUTPUT*, an increase in the measure implies the regime has become less restrictive and vice versa. In contrast, a downward trend of *TARIFF1* and *TARIFF2* means a less restrictive regime and vice versa.

Despite the difference in the way each measure is constructed, all measures indicate the trade regime in Thailand has gradually become more open over the past three decades. The correlation coefficients of these measures are very high (Table 3.11). The time pattern for all measures is consistent with the development of the trade policy regime discussed so far. That is, the level of trade restrictiveness reduces considerably from around the mid 1980s.

Figure 3.4

Pattern of Indicators of Trade Openness in Thailand, 1970–2002

Figure 3.4.A: Trade to GDP *(OPEN1)*, Trade to goods GDP (*OPEN2*) and Export-gross Output of the Manufacturing Sector (*EX_OUTPUT*) (per cent)

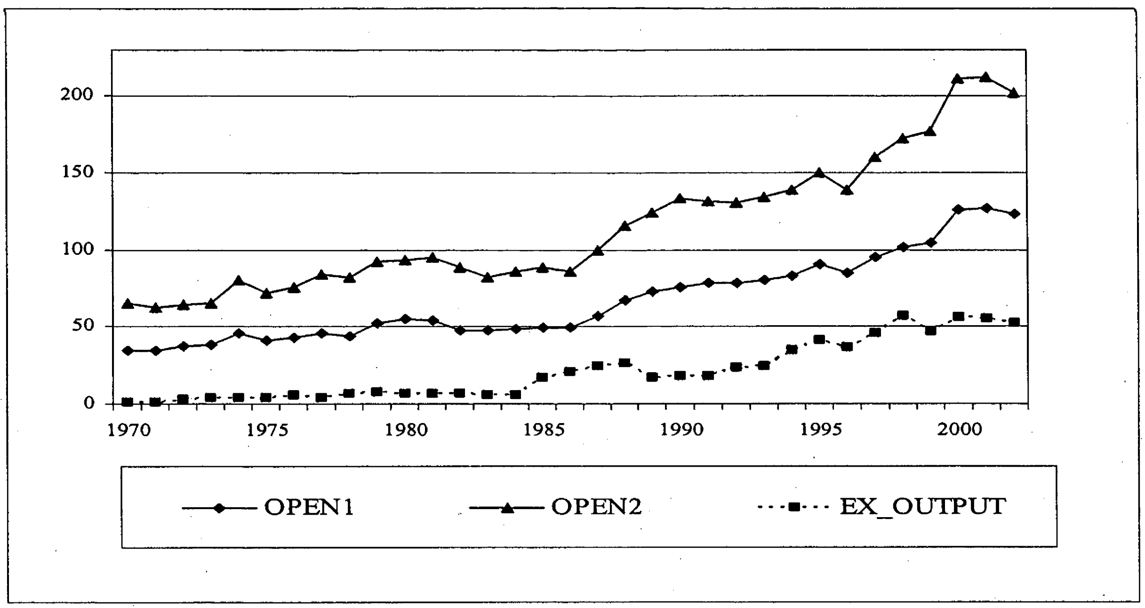
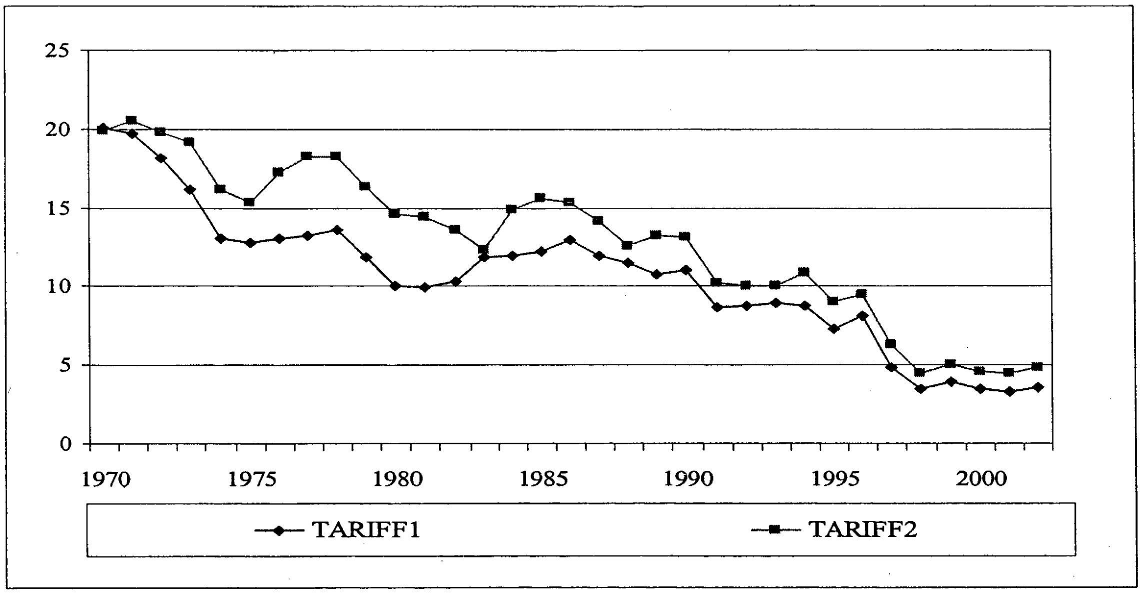


Figure 3.4.B: Incidence of Applied Tariff Rate for the Whole Economy (*TARIFF1*) and for the Manufacturing Sector (*TARIFF2*) (per cent)



Source: See Appendix 6.

Table 3.11
Correlation Coefficient Matrix of Indices of Trade Policy Openness in Thailand, 1970–2002

	OPEN1	*OPEN2*	*EX_OUTPUT*	*TARIFF1*	*TARIFF2*
OPEN1	1				
OPEN2	0.999	1			
EX_OUTPUT	0.950	0.949	1		
TARIFF1	-0.911	-0.913	-0.871	1	
TARIFF2	-0.950	-0.948	-0.925	0.961	1

Notes: *OPEN1* = trade to GDP (per cent)
OPEN2 = trade to goods GDP (per cent)
EX_OUTPUT = export-gross output ratio in the manufacturing sector (per cent)
TARIFF1 = incidence of applied tariff rate (per cent)
TARIFF2 = incidence of applied tariff rate in the manufacturing sector (per cent)
Source: See Appendix 6.

It is worth noting there is a significant difference between the incidence of applied tariff rates and average tariff rates. While the average applied tariff remained more or less unchanged from the late 1980s to the early 1990s, there has been a continuing reduction in *TARIFF1* and *TARIFF2* especially since the mid 1980s. This could either be due to the change in import items from high-tariff to lower tariff items, or to the effectiveness of various tariff exemption schemes. The former does not seem to explain the widened difference satisfactorily because there have only been minor changes in the country's import structure during this period. Hence, the difference would reflect the effectiveness of various import duty exemption and drawback schemes.

However, these indices cannot provide inferences on relative restrictiveness and resource allocation across industries. The relative restrictiveness across industries needs to be examined in the context of the escalating tariff structure as pursued in Thailand. The resource allocation effects of an escalating tariff structure on a given product sector depend not only on the tariff rate applicable to that sector but also on the rate applicable to all other sectors, which provide production inputs (intermediate and capital goods), both directly and indirectly. Thus, estimates of ERP are needed to examine the overall incentives provided for domestic traded goods production by combining the tariffs on each sector as well as tariffs on its input-supplying sectors in the context of input-output linkages within the economy. In this study, ERP estimates from previous studies from 1980 to 2003 are compared. All the estimates are based on Corden's method for calculating effective protection. All previous studies except Athukorala, Jongwanich and Kohpaiboon (2004) have implicitly assumed all tariff rates are binding on all products, and estimates of ERP accurately represent the potential incentive effects of the protective structure (henceforth referred to as import-competing ERP, ERP_{IC}). In fact, as in many developing countries, Thailand has had several schemes of input tariff exemption for exporters, which are fully discussed in the previous section. Taking into account the presence of these schemes, ERP tends to be lowered (henceforth referred to as export-oriented ERP, ERP_{XO}). Thus, the ERP_{IC} estimates tended to overestimate the degree of trade restrictiveness for export-oriented industries (Athukorala, Jongwanich and Kohpaiboon, 2004).

ERP_{IC} estimates from different studies have been based on different types of data and different product definitions. Some have used official tariff rates, whereas others have used tariff rates estimated from customs duty collections or from price comparison. It is difficult to draw inference from direct comparison of the industry's ERP_{IC} estimates.

In order to overcome such constraints, the rank correlation of ERP estimates rather than a simple correlation is constructed to provide statistical evidence of changes of inter-industry protection structure over the period.

Table 3.10 provides a comparison of the ERP estimates between 1980 and 2003. Firstly, from 1980 to 2003, ERP_{IC} estimates exhibited a downward trend in all industries. The simple average of the ERP_{IC} in the manufacturing sector reduced from 51.7 per cent in 1980 to 20.6 per cent and 18.2 per cent in 2002 and 2003, respectively. It is consistent with the key finding drawn from the series of trade restrictiveness measures above. Statistical evidence in Chapter 6 suggests that the level of protection is one of the crucial factors determining a foreign presence across industries. The implication from the reduction of protection level in all industries is that the Thai manufacturing sector has become less attractive for tariff-hopping FDI. A more open trade and investment policy regime invites more export-oriented FDI.

Secondly, the pattern of ERP_{IC} differences across industries did not change between 1980 and 2003. The escalating tariff structure resulted in higher ERP estimates for finished goods like agro-processing products, textiles, and leather products than for intermediate products. In some intermediates, the presence of the tariff structure caused a negative ERP_{IC} value. This finding is not surprising but reflects the general belief among developing countries in an escalating tariff structure. In fact, such a structure creates a distortion impact on resource allocation in favour of import-substituting industries as opposed to export-oriented ones.

Thirdly, the dispersion of protection seems to be more or less unchanged. The coefficient of variation (CV) of ERP_{IC} estimates, the standard deviation of ERP normalized by its mean, changed slightly between 1985 and 2003 to around 2. The unchanged CV was a direct outcome of uneven tariff reduction across industries. The increase in CV between 2002 and 2003 is an obvious example where tariff reduction emphasizes intermediate rather than finished products. Interestingly, the rank correlation coefficients of the ERP_{IC} from 1975–2002 and 1975–2003 are 56.18 and 48.09 per cent, respectively. These coefficients indicate a change in the industry ranking according to the level of protection, thereby changing the degree of tariff protection across industries. It implies that unchanged ERP dispersion does not necessarily mean there is no change.

Furthermore, Table 3.12 provides both ERP_{IC} and ERP_{XO} estimates for 2002–3 of selected items, according to the magnitude of the difference between ERP_{IC} and ERP_{XO}.[14] While the former represents the potential incentive effects of the protective structure, the latter measures the incentive toward exporters where exporters fully reimburse their tariff on imported inputs with the share of exports in total output of a given sector. Both of these estimates are averaged, using the export-output ratio weight (ERP_W).

Table 3.12
ERP Estimates of Import-competing (ERP_{IC}), Export-oriented (ERP_{XO}) Industries and their (weighted) Average (ERP_W), of Selected Items, 2002–3

IO Code	Description	2002			2003		
		ERP_{IC}	ERP_{XO}	ERP_W	ERP_{IC}	ERP_{XO}	ERP_W
118	Radios, television sets & communication equipment	6.2	-0.7	-0.1	6.7	-0.7	-0.1
130	Photographic & optical goods	5.9	-0.3	0.3	3.9	-0.2	0.2
117	Electrical industrial machinery & appliances	8.9	-0.5	0.8	10.1	-0.5	1.0
092	Other chemical products	14.8	-0.3	1.5	13.5	-0.3	1.3
046	Canning & preserving of fruits & vegetables	-65.6	-1.9	-7.5	-64.8	-1.9	-7.4
107	Non-ferrous metal	13.6	-0.2	1.8	7.0	-0.1	0.9
097	Other rubber products	66.8	-0.5	11.1	67.4	-0.5	11.2
099	Ceramic and earthware	46.6	-0.1	8.4	40.1	-0.1	7.2
071	Knitting	71.0	-0.4	13.8	71.4	-0.4	13.9
077	Footwear, except of rubber	29.7	-0.6	6.0	30.9	-0.6	6.2
043	Canning & preserving of meat	92.6	-0.2	19.2	90.5	-0.2	18.8
084	Basic chemicals	0.4	-0.1	0.1	0.7	-0.1	0.2
073	Carpets and rugs	30.3	-0.3	7.9	24.9	-0.3	6.5
116	Office equipment & machinery	-1.5	-0.2	-0.4	-1.1	-0.2	-0.3
120	Insulated wire and cables	19.2	-0.3	5.2	22.8	-0.2	6.4

(contd.)

[14] See a full discussion of the calculation in Appendix 7.

Table 3.12 (contd.)

IO Code	Description	2002	2003	IO Code	Description	2002	2003
		ERP_{IC}	ERP_{XO}			ERP_{IC}	ERP_{XO}
133	Recreational & athletic equipment	7.9	-0.5	2.2	9.1	-0.5	2.5
122	Other electrical apparatuses & supplies	-4.4	-0.4	-1.3	-2.5	-0.3	-0.8
119	Other electrical appliances	37.2	-0.8	13.8	39.0	-0.7	14.5
095	Rubber sheet& block rubber	72.1	-0.1	27.0	72.2	-0.1	27.0
129	Scientific equipment	-6.1	-0.3	-2.3	-5.7	-0.3	-2.2
	Manufacturing	**25.2**	**-0.4**	**17.8**	**23.6**	**-0.4**	**16.5**

Source: See Appendix 8.

ERP_W estimates for the manufacturing sector in 2002 and 2003 are 17.8 and 16.5 per cent, respectively, compared to ERP_{IC} of 25.2 per cent in 2002 and 23.6 per cent in 2003. The considerable reduction in the total ERP in manufacturing comes from 19 industry sectors where the ERP reductions are more than 60 per cent. These sectors include some processed food sectors – canning & preserving of food (IO 43, and 46), some garment sectors (IO 71, 73,and 77), other chemical products (IO 92), rubber sheet & block rubber (IO 95), other rubber products (IO 97), ceramic and earthen wares (IO 99), non-ferrous metal (IO 107), electrical products (IO 116–120, and 122), and photographic & optical goods (IO 130). For example, in 2003 the ERP of canning & preserving of meat (IO 43) reduces from 90.5 to 18.8 per cent and the ERP of knitting (IO 71) falls from 71.4 to 13.9 per cent. All of these tend to be labour-intensive sectors, in which Thailand has a comparative advantage in the world market. The findings imply a less adverse impact of an escalating tariff structure on export-oriented activities.

3.4 Conclusions

In this chapter, we have surveyed the general investment climate and policy-induced incentives in Thailand during the past three decades in order to provide the setting for the following analysis of the pattern and determinants of MNE involvement and its developmental implications. It is found that over the years, Thailand has successfully built a general investment climate conducive to enticing foreign investors.

A favourable macroeconomic environment has been maintained by stabilizing the domestic price level and the nominal exchange rate, and implementing disciplined monetary and fiscal policies. Combined with political stability and policy certainty, Thailand has pursued a market-friendly approach toward foreign investors. Foreign business can operate without any significant discrimination between local and foreign entrepreneurs. Labour market conditions are likely to be favourable for labour-intensive industries because of low wage rates.

Nevertheless, the shortage of skilled labour could be a significant impediment in moving from simple assembly to higher value-added activities. The role of government in productive sectors is limited in the provision of basic infrastructure and limited R&D investment. Public investment in basic infrastructure and R&D is still lower than the standard in other middle-income developing countries. These could become another obstacle to the country's long-term economic growth.

With regard to the policy-induced economic incentives, the government has used trade policy and investment promotion regimes to influence resource allocation in the private sectors. Trade and investment policy regimes started with an IS industrialization strategy, i.e. offering greater economic incentive for enterprises to produce for the domestic market as opposed to exports. The regimes have gradually changed toward liberalization. With regard to the trade policy regime where tariffs have been the key instrument, the escalating tariff structure with a high level of tariff rates was pursued until the late 1980s. From about the late 1980s, considerable tariff reductions have been implemented, thereby reducing NRP and ERP. A considerable reduction in tariffs has been less likely to entice tariff-hopping FDI inflows. However, the escalating tariff structure remains, thereby resulting in a wide spread of protection across industries. On the other hand, investment promotion schemes started with promoting import substituting industries. From the mid–1980s, the scheme has been more neutral, by gradually shifting to promote industrial decentralization. Several tariff exemptions on inputs were introduced to reduce the burden for exporters during transition periods of tariff reduction.

Appendix 3
Evolution of Board of Investment (BOI) Incentives since 1989

September 1987	January 1989	November 1990	April 1993	2000
Exemption and/or reduction of import duty and business tax on machinery[1]				
Exemption for projects in Bangkok and Samut Prakarn in which exports not less than 80 per cent of total sales or are located in industrial zones	Zone 1: export-oriented projects (exports no less than 80 per cent) /all projects in industrial estates or promoted industrial zones /projects which produce and supply raw materials or parts mainly to manufacturers of engines, machinery, and electronic products located in the same zone. Zone 2: export-oriented projects/ projects that manufacture engineering products, or are agro-based, or encourage the use of domestic agricultural products, or use agricultural products as their main raw materials or use domestic supplies for at least 60 per cent of the total value of raw materials, or produce and supply raw material or parts mostly to manufacturers of engines, machinery and electrical and electronic products located in the same zone, or locate factories in industrial estates or promoted industrial zones. 50 per cent tax reduction in cases of all other projects in Zone 2. Zone 3: all projects	Exemption from business tax and 50 per cent reduction of import duty on machinery which is not included in the tariff reduction notification of the Ministry of Finance and is subject to tariff >10 per cent. Zone 1: incentives provided only for export-oriented projects or those in industrial estates or promoted industrial zones. Zones 2 and 3 : all projects	Zone 1: 50 per cent reduction of import duties on machinery in which duty rate is > 10 per cent for export-oriented projects or projects in industrial estates /promoted industrial zones. Zone 2: Same as Zone 1 but applies for all projects Zone 3: Exemption of import duties on machinery.	Zone 1: 50 per cent reduction of import duties on machinery of which duty rate is > 10 per cent. Zone 2 : Same as Zone 1. Zone 3: Exemption of import duty on machinery.

(contd.)

[1] No exemption from business tax due to the introduction of value-added tax (VAT) in lieu of business tax since 1993.

Appendix 3 (contd.)

September 1987	January 1989	November 1990	April 1993	2000
Reduction of import duty and business tax on raw or essential materials used				
General: exemption from import duty and business tax on raw or essential materials used in the manufacture of exports for 1 year for projects exporting at least 30 per cent of production output Investment Promotion Zones (IPZs)[2]: 50 per cent reduction for 1 year on materials used for producing for the domestic market. Exemption from import duty on raw materials used in the manufacture of exports for 5 years.	Same as 1987.	Zones 1 and 2: exemption from import duty and business tax on raw or essential materials used in the manufacture of exports for a period of 1 year. Zone 3: exemption from import duty and business tax on raw or essential materials used in the manufacture of exports for a period of 5 years.	Zones 1 and 2: exemption from import duty and business tax on raw or essential materials used in the manufacture of exports for a period of 1 year for projects exporting at least 30 per cent of total sales. Zone 3: exemption from import duty and business tax on raw or essential materials used in the manufacture of exports for a period of 5 years for projects exporting at least 30 per cent of total sales. 75 per cent reduction of import duty on raw or essential materials used in production for the domestic market for 5 years.	Zones 1 and 2: same as in 1993. Zone 3: exemption from import duty on raw or essential materials used in the manufacturing export products for 5 years.
Exemption from corporate income tax				
For Projects in Bangkok and Samut Prakarn but not located in industrial estates, 3–year exemption if 2 of the following criteria are met: export not less than 80 per cent of total sales; save or earn at least US$1 million in foreign exchange per year; employ at least 200 persons full time.	Zone 1: 3–year exemption for projects in industrial estates or promoted industrial zones provided they export at least 80 per cent of their output, or produce and supply raw materials or parts mainly for manufacturers of engines, machinery, and electrical and electronic products located in the same zone.	Zone 1: 3–year exemption for projects in industrial estates or promoted industrial zones and export at least 80 per cent of their output. Zone 2: 3–year exemption for projects outside industrial estates or promoted industrial zones, and 5 years for projects in industrial estates or promoted industrial zones.	Zone 1: Same as 1990. Zone 2: same as 1990 except for projects in industrial estates or promoted industrial zones that receive 7–year exemption. Zone 3: 8 year exemption.	Zone 1: 3–year exemption for projects located in industrial estates or promoted industrial zones, provided that such a project with capital investment of US$ 2.5 million or more (excluding cost of land and working capital) obtains ISO 9000 or similar international standard certification within 2 years from start-up date, otherwise one year exemption.

(contd.)

[2] The zones covered 67 provinces except Bangkok, Samut Prakarn, Nakhom Pathom, Nonta Buri, Pathum Thani and Samut Sakhon.

Appendix 3(contd.)

September 1987	January 1989	November 1990	April 1993	2000
For projects in four neighbouring provinces (Nakhom Pathom, Nonta Buri, Pathum Thani and Samut Sakhon)and in industrial estates in Bangkok and Samut Prakarn, 3–year exemption extendible yearly to a maximum of 5 years for projects meeting one or more of the following criteria; agro-based activities or encourage the use of domestic agricultural products, use agricultural products as main raw materials; use domestic supplies for at least 60 per cent of the total raw material value; save or earn at least US$ 1 million in foreign exchange per year; employ at least 200 persons full time; projects are located in industrial estates or promoted industrial zones. For projects in IPZs, exemption for 4 years, extendible yearly to a maximum of 8 years for target activities, and 7 years for other activities. The criteria for extension are the same as for the four neighbouring provinces.	Zone 2: Exemption for 3 years extendible to a maximum of 5 years if one or more of the following criteria are met: save or earn at least US$ 2 million in foreign exchange per year; manufacture engineering products; produce or supply raw materials or parts mainly to manufacturers of engines, machinery, and electrical and electronic products located in the same zone; are agro-based or encourage the use of domestic agricultural products as main raw materials, or use domestic supplies for at least 60 per cent of raw material value; are located in industrial estates or promoted industrial zone. Zone 3: exemption for 5 years for target activities and 4 years for other activities, extendible to a maximum of 8 years if one or more of the following criteria are met; save or earn at least US$ 1 million in foreign exchange per year, are agro-based or encourage the use of domestic agricultural products as the main raw materials, or use domestic supplies for at least 50 per cent of raw material value; employ at least 200 persons full time; are located in industrial estates or promoted industrial zones; or are considered by the Board to be of special importance.	Zone 3: 6–year exemption for projects outside industrial estates or promoted industrial zones, and 8 years for projects in industrial estates or promoted industrial zones.		Zone 2: 3–year exemption for projects located within industrial estates or promoted industrial zones, extendible to 5 years, provided that such a project with capital investment of US$ 2.5 million or more (excluding cost of land and working capital) obtains ISO9000 or similar international standard certification within 2 years from its start-up date, otherwise one-year exemption. Zone 3: 8–year exemption for projects with capital investment of US$ 2.5 million or more (excluding cost of land and working capital) obtains ISO9000 or similar international standard certification within 2 years from its start-up date, otherwise one-year exemption.

(contd.)

Appendix 3 (contd.)

September 1987	January 1989	November 1990	April 1993	2000
Special privileges for projects in the Investment Promotion Zone (IPZ)				
IPZ comprised all provinces other than Bangkok, Samut Prakarn, Nakhom Pathom, Nonta Buri, Pathum Thani and Samut Sakhon. (1) 90 per cent reduction of business tax on sales for 5 years from the time income is first earned. (2) 50 per cent reduction of corporate income tax for 5 years after the exemption period. (3) Privileges granted on a case-by-case basis: double deduction of water, electricity and transportation costs from taxable income for 10 years from the date of first sales.; deduction of 25 per cent of the installation and construction costs of infrastructure facilities from the calculation of net profits.	Zone 3 was designated as the IPZs. The following additional incentives were granted as the same as in 1987.	Zone 3 was designated as the IPZs. The following additional incentives were granted as the same as in 1987.	Zone 3 was designated as the IPZs. The following additional incentives were granted as the same as in 1987 except (1) no longer be granted because of the change from business tax to VAT system.	
Special additional tax and duty reductions for export-oriented projects				
For promoted projects exporting at least 30 per cent of total output, exemption from import duty, and business tax for one year for the proportion of imported raw and essential materials used in production for export. The exemption period could be extended on a case-by-case basis.	Same as in 1987	Same as in 1987	Same as in 1987	

(contd.)

Appendix 3 (contd.)

September 1987	January 1989	November 1990	April 1993	2000
For target activities in the IPZs, import duty and business tax exemption on imported raw materials and essential materials for 5 years for the manufacture of exports. Exemption of import duty and business tax may be granted for imported goods which are re-exported. Exemption of export duty and business tax on exports may be granted. The Board would consider approving the deduction from taxable income of 5 per cent of increment in export earning over the preceding year.	Same as in 1987	Same as in 1987	Same as in 1987	None

Sources: 1987 privileges are summarized from World Bank (1988) and others from WTO (1995, 1999, 2003).

From 1993 to the present, the BOI introduced additional incentives for enterprises to relocate their factories in remote locations. These incentives were changed in 2000 as summarized in Table A.3. In addition, the BOI grants a corporate income tax exemption for 3 years to promoted projects, which invest in research and development activities. These projects can also import machinery and equipment for R&D activities with a tax reduction or exemption for a period of 8 years starting from the arrival date of the first shipment.

Table A.3
Incentives for Factory Relocation

1993	2000
Relocate to Zone 2	
- Corporate income tax exemption for 3 years, extendible to 7 years if projects are relocated to industrial estates or promoted industrial zones.	-Corporate income tax exemption for a period of 5 years, provided that such a project with capital investment of 10 million baht or more (excluding cost of land and working capital) obtains ISO9000 or similar international standard certification within 2 years from the start-up date of its new plant, otherwise the corporate income tax exemption will be reduced by 1 year.
Relocate to Zone 3	
-8–year corporate income tax exemption, 50 per cent reduction of corporate income tax for a period of 5 years after the exemption period. - Double deduction from taxable income of water, electricity, and transportation costs for a period of 10 years. - Deduction from the net profit of 25 per cent of the costs of installation or construction of infrastructure facilities.	*Relocate into 40 provinces in Zone 3*[1] - Corporate income tax exemption for a period of 8 years, provided that such a project with capital investment of 10 million baht or more (excluding cost of land and working capital) obtain ISO 9000 or similar international standard certification within 2 years from its start-up date, otherwise the corporate income tax exemption will be reduced by 1 year; - 50 per cent reduction of corporate income tax for 5 years after the exemption period

(contd.)

Table A.3(contd.)

1993	2000
	- Double deduction from taxable income of transportation, electricity, and water costs for 10 years from the date of first revenue derived from promoted activity. *Relocate into other 18 provinces in Zone 3*[2] - Same as the above 40 provinces with the additional privilege i.e. deduction from net profit of 25 per cent of the project's infrastructure installation or construction cost for 10 years from the date of first sale, and net profit for one or more years of any year can be chosen for such deduction. The deduction is additional to normal depreciation.

Notes: [1]The 40 provinces consist of Krabi, Kamphaeng Phet, Khon Kaen, Chanthaburi, Chai Nat, Chaiyaphum, Chumphon, Chiang Rai, Chiang Mai, Trang, Trat, Tak, Nakhon Rachasima, Nakhon Si Thammarat, Nakhon Sawan, Prachuab Khiri Khan, Prachin Buri, Phangnga, Phattalunk, Pichit, Phitsanulok, Phetchaburi, Phetchabun, Mukdahan, Mae Hong Son, Ranong, Lop Buri, Lamphang, Lamphun, Loei, Songkhla, Sa Kaew, Sing Buri, Sukhothai, Surat Thani, Nong Khai, Udon Thani, Uttaradit, Uthai Thani, and Ubon Ratchathani.

[2] The 18 provinces consist of Kalasin, Nakhon Phanom, Narathiwat, Nan, Buri Ram, Pattani, Phayao, Phrae, Maha Sarakham, Yasothon, Yala, Roi Et, Si Sa Ket, Sakhon Nakhon, Sathun, Surin, Nong Bualamphu, and Amnat Charoen.

Sources: 1993 from WTO (1995) and 2000 from BOI available at (http://www.boi.go.th/english.announcements.announcement1_2543.html).

Appendix 4

Nominal Tariff (per cent), 2002–5

HS		2002	2003	2004	2005
1	Live animals	11.0	10.5	10.5	10.5
2	Meat and edible meat offal	38.2	35.4	35.4	35.4
3	Fish and crustaceans, molluscs and other aquatic invertebrates	5.0	5.0	5.0	5.0
4	Dairy produce; birds' eggs; natural honey; edible products of animal origin, n.e.s.	24.2	23.3	23.3	23.3
5	Products of animal origin, n.e.s.	12.5	12.5	12.5	12.5
6	Live trees and other plants; bulbs, roots and the like; cut flowers and ornamental foliage	34.0	33.2	33.2	33.2
7	Edible vegetables and certain roots and tubers	38.7	35.4	35.4	35.4
8	Edible fruit and nuts; peel of citrus fruit or melons	34.3	32.4	32.4	32.4
9	Coffee, tea, mate and spices	23.7	23.4	23.4	23.4
10	Cereals	0.0	0.0	0.0	0.0
11	Milling industry products; malt; starches; inulin; wheat gluten	30.1	26.2	25.5	25.5
12	Oil seeds and oleaginous fruits; miscellaneous grains, seeds and fruits; industrial or medicinal plants; straw and fodder	17.9	16.5	16.5	16.5
13	Lac; gums; resins and other vegetable saps and extracts	16.1	10.0	10.0	10.0
14	Vegetable plaiting materials and vegetable products, n.e.s.	18.5	18.1	18.1	18.1
15	Animal or vegetable fats and oils and their cleavage products; prepared edible fats; animal or vegetable waxes	13.4	12.8	12.8	12.8
16	Edible preparations of meat, fish, crustaceans, molluscs or other aquatic invertebrates	25.7	25.7	25.7	25.7
17	Sugars and sugar confectionery	19.2	18.2	18.2	18.2
18	Cocoa and cocoa preparations	13.2	12.6	12.6	12.6
19	Preparations of cereals, flour, starch or milk; bakers' wares	26.6	25.3	25.3	25.3
20	Preparations of vegetables, fruit, nuts, or other parts of plants	28.9	28.9	28.9	28.9

(contd.)

Appendix 4 (contd.)

HS		2002	2003	2004	2005
21	Miscellaneous edible preparations	30.3	24.1	24.1	24.1
22	Beverages, spirits and vinegar	45.9	45.8	45.8	45.8
23	Residues and waste from the food industries; prepared animal feed	8.5	7.8	7.8	7.8
24	Tobacco and manufactured tobacco substitutes	50.0	50.0	50.0	50.0
25	Salt; sulfur; earths and stone; plastering materials, lime and cement	2.5	2.5	2.5	2.5
26	Ores, slag and ash	1.0	1.0	1.0	1.0
27	Mineral fuels, mineral oils and products of their distillation; bituminous substances; mineral waxes	2.0	1.9	1.9	1.9
28	Inorganic chemicals; organic or inorganic compounds of precious metals, of rare-earth metals, of radioactive elements or of isotopes	2.8	2.8	2.8	2.8
29	Organic chemicals	1.8	1.8	1.7	1.7
30	Pharmaceutical products	6.3	6.3	6.3	6.3
31	Fertilizers	5.2	4.8	4.8	4.8
32	Tanning or dyeing extracts; tannins and derivatives; dyes, pigments and other coloring matter; paints and varnishes; putty and other mastics; inks	9.6	6.0	6.0	6.0
33	Essential oils and resinoids; perfumery, cosmetic or toilet preparations	15.4	15.4	15.4	15.4
34	Soap etc.; lubricating products; waxes, polishing or scouring products; candles etc., modeling pastes; dental waxes and dental plaster preparations	12.0	8.1	8.1	7.3
35	Albuminoidal substances; modified starches; glues; enzymes	7.3	4.3	4.3	4.3
36	Explosives; pyrotechnic products; matches; pyrophoric alloys; certain combustible preparations	20.0	18.8	18.8	18.8
37	Photographic or cinematographic goods	15.2	13.7	13.7	13.7
38	Miscellaneous chemical products	5.7	4.9	4.9	4.9
39	Plastics and articles thereof	17.8	17.8	17.8	17.8
40	Rubber and articles thereof	23.3	23.3	15.0	8.6

(contd.)

Appendix 4 (contd.)

HS		2002	2003	2004	2005
41	Raw hides and skins (other than furskins) and leather	4.6	4.3	4.3	4.3
42	Articles of leather; saddlery and harness; travel goods, handbags and similar containers; articles of gut (other than silkworm gut)	27.2	27.2	27.2	27.2
43	Furskins and artificial fur; manufactures thereof	9.5	8.1	8.1	8.1
44	Wood and articles of wood; wood charcoal	12.6	9.9	9.9	6.4
45	Cork and articles of cork	10.3	8.5	8.5	6.7
46	Manufactures of straw, esparto or other plaiting materials; basketware and wickerwork	24.0	24.0	24.0	24.0
47	Pulp of wood or other fibrous cellulosic material; recovered (waste and scrap) paper and paperboard	1.0	1.0	1.0	1.0
48	Paper and paperboard; articles of paper pulp, paper or paperboard	17.7	12.2	12.2	6.8
49	Printed books, newspapers, pictures and other printed products; manuscripts, typescripts and plans	11.6	9.2	9.2	6.8
50	Silk, including yarns and woven fabrics thereof	14.9	14.9	8.9	5.1
51	Wool and fine or coarse animal hair, including yarns and woven fabrics thereof; horsehair yarn and woven fabric	5.7	5.7	3.8	3.1
52	Cotton, including yarns and woven fabrics thereof	15.5	15.5	9.2	4.8
53	Vegetable textile fibers n.e.s.; yarns and woven fabrics of vegetable textile fibers n.e.s. and paper	9.8	9.8	6.8	5.0
54	Manmade filaments, including yarns and woven fabrics thereof	15.0	15.0	8.9	5.0
55	Manmade staple fibers, including yarns and woven fabrics thereof	15.9	15.9	9.4	4.8
56	Wadding, felt and nonwovens; special yarns; twine, cordage, ropes and cables and articles thereof	17.7	17.7	11.4	6.1
57	Carpets and other textile floor coverings	30.0	30.0	30.0	30.0
58	Special woven fabrics; tufted textile fabrics; lace; tapestries; trimmings; embroidery	20.0	20.0	13.2	6.1
59	Impregnated, coated, covered or laminated textile fabrics; textile articles suitable for industrial use	14.3	14.3	12.2	10.3
60	Knitted or crocheted fabrics	20.0	20.0	12.5	5.0

(contd.)

Appendix 4 (contd.)

HS		2002	2003	2004	2005
61	Articles of apparel and clothing accessories, knitted or crocheted	29.9	29.9	29.9	29.9
62	Articles of apparel and clothing accessories, not knitted or crocheted	35.9	35.9	35.9	35.9
63	Made-up textile articles n.e.s.; needlecraft sets; worn clothing and worn textile articles; rags	26.7	26.7	26.6	26.6
64	Footwear, gaiters and the like; parts of such articles	26.6	26.6	26.6	26.6
65	Headgear and parts thereof	22.7	22.7	22.7	22.7
66	Umbrellas, sun umbrellas, walking-sticks, seat-sticks, whips, riding-crops and parts thereof	19.3	19.3	19.3	19.3
67	Prepared feathers and down and articles thereof; artificial flowers; articles of human hair	27.5	26.9	26.9	26.9
68	Articles of stone, plaster, cement, asbestos, mica or similar materials	18.3	11.6	11.6	11.6
69	Ceramic products	22.7	18.0	18.0	18.0
70	Glass and glassware	18.0	10.1	10.1	10.1
71	Natural or cultured pearls, precious or semiprecious stones, precious metals; precious metal clad metals, articles thereof; imitation jewelry; coin	5.7	5.4	5.4	5.2
72	Iron and steel	7.6	7.6	5.9	4.7
73	Articles of iron or steel	16.1	16.1	13.7	11.3
74	Copper and articles thereof	10.6	6.3	6.3	6.3
75	Nickel and articles thereof	8.4	6.1	6.1	6.1
76	Aluminum and articles thereof	11.6	8.3	8.1	8.1
78	Lead and articles thereof	9.2	4.9	4.5	4.5
79	Zinc and articles thereof	9.0	5.9	4.1	4.1
80	Tin and articles thereof	7.5	5.2	4.9	4.9
81	Base metals n.e.s.; cermets; articles thereof	9.4	3.2	2.5	2.5
82	Tools, implements, cutlery, spoons and forks, of base metal; parts thereof of base metal	29.9	29.9	29.9	29.9

(contd.)

Appendix 4 (contd.)

HS		2002	2003	2004	2005
83	Miscellaneous articles of base metal	19.1	13.6	13.6	13.6
84	Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof	7.4	7.4	4.8	4.2
85	Electrical machinery and equipment and parts thereof; sound recorders and reproducers, television recorders and reproducers, parts and accessories	12.5	12.5	10.4	8.5
86	Railway or tramway locomotives, rolling stock, track fixtures and fittings, and parts thereof; mechanical etc. Traffic signal equipment of all kinds	2.9	2.7	2.7	2.7
87	Vehicles, other than railway or tramway rolling stock, and parts and accessories thereof	38.2	38.2	33.5	32.2
88	Aircraft, spacecraft, and parts thereof	2.7	2.7	2.7	2.7
89	Ships, boats and floating structures	11.8	9.6	9.6	9.6
90	Optical, photographic, cinematographic, measuring, checking, precision, medical or surgical instruments and apparatus; parts and accessories thereof	5.7	4.3	4.3	4.3
91	Clocks and watches and parts thereof	11.1	8.4	8.4	8.4
92	Musical instruments; parts and accessories thereof	10.9	10.9	10.9	10.9
93	Arms and ammunition; parts and accessories thereof	24.3	24.3	24.3	24.3
94	Furniture; bedding, cushions etc.; lamps and lighting fittings n.e.s.; illuminated signs, nameplates and the like; prefabricated buildings	20.2	18.3	18.3	18.3
95	Toys, games and sports equipment; parts and accessories thereof	15.1	15.1	15.1	15.1
96	Miscellaneous manufactured articles	15.6	14.0	14.0	14.0
97	Works of art, collectors' pieces and antiques	10.0	10.0	10.0	10.0
	Average tariff	**14.3**	**13.3**	**12.0**	**11.0**

Source: Official Documents, Ministry of Finance.

Appendix 5
Estimates of Effective Rate of Protection in Manufacturing Sectors, 1980–2003

IO Code	Description	1980	2002	2003
042	Slaughtering	n.a.	-23.38	-27.15
043	Canning & preserving of meat	71.17	92.61	90.49
044	Dairy products	28.99	5.34	8.70
045	Canning & preserving of fruit & vegetables	-36.12	21.18	11.56
046	Canning & preserving of fish & seafood	-22.86	-65.60	-64.75
047	Coconut and palm oil	9.91	-248.41	-240.05
048	Other vegetable & animal oils	84.79	94.16	92.04
049	Rice milling	-7.12	20.94	20.97
050	Flour & milled sago products & tapioca milling	-1.31	20.11	25.27
051	Grinding corn	-4.29	-1.37	-1.16
052	Flour & other grain milling	124.78	204.17	164.29
053	Bakery and other	297.66	40.54	36.69
054	Noodles & similar products	n.a.	55.23	61.23
055	Sugar refineries	-32.04	38.22	34.15
056	Confectionery & snacks	87.31	58.53	61.45
058	Monosodium glutamate	125.6	55.71	-20.29
059	Coffee & cocoa & tea processing	59.25	-0.18	-7.66
060	Other food products	152.04	29.57	19.19
061	Fish meal & animal feed	-11.06	-13.09	-11.86
062	Distilling & blending of spirits	88.31	77.40	77.92
063	Breweries	71.35	78.82	79.61
064	Soft drinks & carbonated water	70.07	3.68	1.88
066	Tobacco products	63.14	74.06	74.18
067	Spinning	20.17	-12.19	-11.94
068	Weaving	349.83	46.25	46.08
069	Textile bleaching, printing & finishing	-16.59	22.66	24.05
070	Made-up textile goods	43.6	42.46	42.80
071	Knitting	29.44	71.03	71.42
072	Wearing apparel	75.1	71.45	72.58
073	Carpets and Rugs	58.46	30.29	24.94
074	Jute mill products	36.26	12.99	13.54
075	Tannery and leather finishing	6.12	-5.92	-0.45
076	Leather products	172.92	55.08	54.99
077	Footwear, except of rubber	84.36	29.68	30.91

(contd.)

Appendix 5 (contd.)

IO Code	Description	1980	2002	2003
078	Saw mill & wooden construction materials	20.08	5.86	4.75
079	Wood and cork products	51.66	37.19	38.22
080	Wooden furniture & fixtures	124.38	32.50	33.29
081	Paper and paperboard	36.5	5.46	3.96
082	Paper & paperboard products	26.6	115.51	77.42
083	Printing & publishing	-1.79	19.35	13.97
084	Basic chemicals	23.72	0.41	0.68
085	Fertilizer, pesticides and insecticides	-11.64	8.70	8.56
086	Petrochemical products	34.4	30.37	30.95
087	Paint	26.04	10.05	1.05
088	Drugs and medicines	12.38	-2.21	-0.21
089	Soap & cleaning preparations	73.64	9.48	3.27
090	Cosmetics	83.17	60.33	63.44
091	Matches	127.88	30.11	27.62
092	Other chemical products	44.26	14.80	13.55
093	Petroleum refinery & gas separated plant	n.a.	9.64	4.63
094	Other coal & petroleum products	15.72	-0.40	-0.31
095	Rubber sheet & block rubber	-34.72	72.09	72.19
096	Tyres and tubes	38.89	56.91	57.28
097	Other rubber products	n.a.	66.81	67.38
098	Plastic wares	79.74	23.38	23.74
099	Ceramic and earthenware	96.45	46.58	40.13
100	Glass & glass products	64.97	30.94	19.40
101	Structural clay products	66.94	53.68	25.24
102	Cement	0.35	-0.53	0.18
103	Concrete and cement products	57.46	42.45	13.07
104	Other non-metallic products	138.9	31.22	18.99
105	Iron and steel	-2.21	-1.43	-0.56
106	Secondary steel products	20.65	15.37	14.66
107	Non-ferrous metal	4.09	13.61	6.98
108	Cutlery and hand tools	68.37	37.24	17.54
109	Metal furniture & fixtures	n.a.	35.49	34.68
110	Structural metal products	45.18	25.68	19.06
111	Other fabricated metal products	77.23	35.30	37.25
112	Engines and turbines	11.59	10.87	11.91

(contd.)

Appendix 5 (contd.)

IO Code	Description	1980	2002	2003
113	Agricultural machinery & equipment	10.81	-1.23	-0.85
114	Wood & metal working machinery	6.9	-3.44	-1.14
115	Special industrial machinery	16.3	-1.68	-0.32
116	Office equipment & machinery	97.33	-1.51	-1.12
117	Electrical industrial machinery & appliances	19.46	8.93	10.09
118	Radios, television sets & communications equipment	49.19	6.17	6.72
119	Other electrical appliances	44.86	37.18	39.01
120	Insulated wires and cables	44.86	19.16	22.82
121	Electrical accumulators & batteries	45.99	-15.12	-9.71
122	Other electrical apparatuses & supplies	49.73	-4.45	-2.50
123	Ship building	52.44	7.01	3.09
124	Railway equipment	-2.91	-2.67	-1.71
125	Motor vehicles	181.73	61.04	62.00
126	Motorcycles & bicycles & other carriages	77.3	93.83	94.71
128	Aircraft	n.a.	-0.94	-0.44
129	Scientific equipment	19.44	-6.07	-5.75
130	Photographic & optical goods	21.21	5.89	3.88
131	Watches and clocks	41.07	9.93	5.84
132	Jewelry & related articles	16.62	-4.56	-1.62
133	Recreational & athletic equipment	23.79	7.91	9.05
134	Other manufacturing goods	60.43	29.70	19.94
Number of available ERP estimates		84	90	90
Unweighted average		52.1	24.6	21.2
Min		-36	-248	-240
Max		350	204	164
Coefficient variation		120	188	204

Source: ERP estimates of 1980 are from Akrasanee and Ajanant (1986), those of 2002-3 are from Athukorala, Jongwanich and Kohpaiboon. (2004).

Appendix 6
Measures of Trade Openness

As discussed in Chapter 2, there is no unique measure of the openness of the trade policy regime.[15] In this study, five measures of trade openness are constructed.

1. A widely used trade to GDP or degree of openness (*OPEN1*). This is constructed by the dollar value of external trades of goods and services as a proportion of GDP. The data for external trade are from the BOT, *Bank of Thailand Quarterly Bulletin*, and those for GDP from the Office of National Economic and Social Development Board (NESDB), *National Income Account*. The greater the value of *OPEN1*, the less the level of trade restrictiveness.

2. Trade-to goods GDP (*OPEN2*). This is from the World Bank, *World Development Indicators* (CD ROM). Similar to *OPEN1*, an increase of *OPEN2* means that the trade regime becomes more open.

3. The export-gross output ratio in the manufacturing sector (*EX_OUTPUT*). Manufacturing export value is obtained from the United Nations Trade Statistics available from the International Economic Data Bank (IEDB) at the Australian National University (ANU), whereas gross output is from the United Nations Industrial Development Organization (UNIDO), *Industrial Statistics Database* (CD ROM). The greater the value of *EX_OUTPUT*, the less restrictive the trade regime.

4. Incidence of applied tariff rates for overall (manufacturing) economy, *TARIFF1* (*TARIFF2*) is the ratio between total (manufacturing) tariff revenues and value of total (manufacturing) import. Data are obtained from the BOT, *Bank of Thailand Quarterly Bulletin.*

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[15] For a succinct discussion of various measures of openness and a detailed listing of related references, see Edwards (1998).

Table A.6
Indices of Trade Openness in Thailand (per cent), 1970–2003

	OPEN1	*OPEN2*	*EX_OUTPUT*	*TARIFF1*	*TARIFF2*
1970	34.4	65.0	0.9	20.1	19.9
1971	34.8	62.5	1.3	19.8	20.6
1972	37.3	64.4	2.3	18.2	19.8
1973	38.6	65.1	3.8	16.2	19.1
1974	45.6	80.5	4.1	13.0	16.2
1975	41.4	72.0	4.0	12.8	15.3
1976	42.9	75.7	5.2	13.0	17.3
1977	45.3	83.5	3.6	13.2	18.3
1978	44.0	82.0	6.6	13.6	18.3
1979	51.9	92.3	7.7	11.9	16.3
1980	54.5	93.6	6.8	10.1	14.6
1981	54.0	94.7	6.5	10.0	14.5
1982	47.6	88.1	6.8	10.3	13.6
1983	47.4	82.1	5.2	11.9	12.4
1984	48.1	86.0	6.0	11.9	14.9
1985	49.2	88.3	17.0	12.3	15.6
1986	49.2	85.9	20.1	13.0	15.4
1987	57.2	99.5	23.9	12.0	14.2
1988	67.4	115.8	26.4	11.5	12.6
1989	72.4	123.6	16.6	10.8	13.3
1990	75.8	133.0	17.8	11.0	13.2
1991	78.5	131.0	17.7	8.7	10.2
1992	78.0	130.4	23.2	8.7	10.1
1993	80.2	134.4	24.5	9.0	10.0
1994	82.6	138.5	34.5	8.7	10.9
1995	90.4	150.2	41.0	7.3	9.0
1996	84.8	139.1	36.3	8.1	9.5
1997	94.6	159.7	45.2	4.9	6.3
1998	101.9	172.4	57.1	3.5	4.5
1999	104.1	176.5	46.8	3.9	5.0
2000	125.4	211.0	56.0	3.5	4.6
2001	126.5	212.0	55.0	3.3	4.5
2002	123.3	201.9	51.9	3.5	4.8

Source: Author's calculation from data discussed in text.

Appendix 7
Estimation of Effective Rate of Protection

ERP measures the proportionate increase in per unit value added of a sector due to the complete system of tariffs (Corden 1966, 1971; Greenaway and Milner 2003). More specifically, it takes into account the protection on output and the cost-raising effects of protection on inputs. By definition, ERP for j^{th} product can be expressed as follows:[16]

$$ERP_{IC}^{j} = \frac{t_j - \sum_{i=1}^{n} a_{ij} t_i}{1 - \sum_{i=1}^{n} a_{ij}} \qquad \text{(A.7.1)}$$

where t_j = nominal tariff on j^{th} product
t_i = nominal tariff on i^{th} input
a_{ij} = share of i^{th} input in the value j^{th} product

Equation (A.7.1) tells us that effective protection enjoyed by a given product depends upon the interplay between output (t_j) and input tariffs (t_i) and the share of imported inputs in production costs (a_{ij}). In other words, the overall tariff structure has both tax and subsidy elements; whereas tariffs on the final good operate as a subsidy, tariffs on intermediate inputs operate as a tax.

We have so far assumed that tariffs are the only instrument of trade protection. In general, countries might use other instruments such as subsidies and import quotas in addition to tariffs as instruments of trade intervention. To capture these impacts, t_j should be defined in broader terms to combine the nominal tariff on j^{th} activity and tariff equivalent of subsidies, quantitative restrictions, and other forms of trade intervention.

Nonetheless, in Thailand, these various non-tariff barriers are now rather negligible as an outcome of continuous liberalization reforms over the past two decades.

[16] See details of this formula in Corden (1971) and Greenaway and Milner (2003).

Thus, tariffs have been the main trade policy instrument to influence the country's resource allocation since 1970.

In addition, as in many other developing countries, tariff exceptions on imported inputs used have been an important feature of the tariff regime in Thailand (see above). This study assumes exporters apply tariff exemptions for imported inputs under Section 19 of the Customs Law to evaluate the presence of administration cost involved. Under this duty drawback scheme, the importer may use a bank guarantee or a guarantee issued by the Ministry of Finance (MOF) in lieu of the payment of import duty. The refund is administered after export. Within this scheme, it implies that exporters can reimburse all their import duty so that input tariffs for ERP calculation should be set at zero. However, exporters who use this scheme through the bank guarantee system have to pay the bank a 2.3 per cent commission. This commission rate is a standard rate charged by several Thai commercial banks.

To incorporate the incentive effect of the duty drawback scheme in our effective protection calculations, we first estimate ERP separately for import-competing sectors (ERP_{IC}) and export-oriented sectors (ERP_{XO}). Total protection (that is, the combined protection on import-competing and export-oriented production), ERP_W, is then obtained as the weighted average of the two measures.

As discussed, ERP_{IC}^{j} is estimated by applying Equation (A.7.1). It is modified as follows to estimate ERP_{XO}^{j}

$$ERP_{XO}^{j} = \frac{0-\sum_{i=1}^{n} a_{ij}t_i \times 0.023}{1-\sum_{i=1}^{n} a_{ij}} \qquad \text{(A.7.2)}$$

The total protection (ERP_T) in the j^{th} sector is

$$ERP_{W}^{j} = \gamma_j ERP_{IC}^{j} + \left(1-\gamma_j\right) ERP_{XO}^{j} \qquad \text{(A.7.3)}$$

where γ_j is the share of exports in the total output of a given sector.

Appendix 8
ERP Estimates of Import-competing (ERP_{IC}), Export-oriented (ERP_{XO}) industries and their (weighted) Average (ERP_W), 2002–3

IO Code		Percentage of Value added	Export-Output Ratio (per cent)	2002			2003		
				ERP_{IC}	ERP_{XO}	ERP_W	ERP_{IC}	ERP_{XO}	ERP_W
	Manufacturing	**73.63**	**39.69**	**25.2**	**-0.4**	**17.8**	**23.6**	**-0.4**	**16.5**
	Agro-processing	6.62	31.68	-0.2	-1.0	1.4	-2.3	-1.0	-0.2
042	Slaughtering	1.41	0.04	-23.4	-1.0	-23.4	-27.2	-1.0	-27.1
043	Canning & preserving of meat	0.63	79.10	92.6	-0.2	19.2	90.5	-0.2	18.8
044	Dairy products	0.33	7.50	5.3	-0.8	4.9	8.7	-0.7	8.0
045	Canning & preserving of fruits & vegetables	0.71	56.61	21.2	-0.7	8.8	11.6	-0.7	4.6
046	Canning & preserving of fish & seafood	1.46	91.28	-65.6	-1.9	-7.5	-64.8	-1.9	-7.4
047	Coconut and Palm Oil	0.06	7.16	-248.4	-5.7	-231.0	-240.1	-5.5	-223.3
048	Other vegetable & animal oils	0.09	8.00	94.2	-0.8	86.6	92.0	-0.7	84.6
049	Rice milling	1.69	44.31	20.9	0.0	11.7	21.0	0.0	11.7
050	Flour & sago mild products & tapioca milling	0.15	40.92	20.1	-6.1	9.4	25.3	-5.9	12.5
051	Grinding corn	0.00	0.00	-1.4	0.0	-1.4	-1.2	0.0	-1.2
052	Flour & other grain milling	0.10	13.53	204.2	-0.3	176.5	164.3	-0.3	142.0
	Other manufacturing	**67.01**	**39.14**	**27.7**	**-0.4**	**19.4**	**26.2**	**-0.3**	**18.1**
053	Bakery and other	0.28	21.65	40.5	-0.8	31.6	36.7	-0.7	28.6
054	Noodle & similar products	0.12	15.06	55.2	-0.9	46.8	61.2	-0.7	51.9
055	Sugar refineries	0.98	52.33	38.2	-0.1	18.2	34.2	-0.1	16.2
056	Confectionery & snack	0.10	27.74	58.5	-0.6	42.1	61.5	-0.5	44.3
058	Monosodium glutamate	0.09	51.52	55.7	-0.9	26.6	-20.3	-0.8	-10.3
059	Coffee & cocoa & tea processing	0.09	4.25	-0.2	-1.0	-0.2	-7.7	-1.0	-7.4

(contd.)

Appendix 8 (contd.)

IO Code		Percentage of Value added	Export-Output Ratio (per cent)	2002			2003		
				ERP_{IC}	ERP_{XO}	ERP_{W}	ERP_{IC}	ERP_{XO}	ERP_{W}
060	Other food products	0.63	51.96	29.6	-0.4	14.0	19.2	-0.3	9.1
061	Fish meal & animal feed	0.35	16.55	-13.1	-1.5	-11.2	-11.9	-1.5	-10.2
062	Distilling & blending of spirits	2.08	0.93	77.4	-0.1	76.7	77.9	-0.1	77.2
063	Breweries	2.07	0.67	78.8	-0.4	78.3	79.6	-0.4	79.1
064	Soft drinks & carbonated water	0.98	3.95	3.7	-0.3	3.5	1.9	-0.3	1.8
066	Tobacco products	1.53	1.07	74.1	0.0	73.3	74.2	0.0	73.4
067	Spinning	2.05	18.64	-12.2	-0.6	-10.0	-11.9	-0.6	-9.8
068	Weaving	2.63	24.41	46.3	-0.2	34.9	46.1	-0.2	34.8
069	Textile bleaching, printing & finishing	0.13	0.00	22.7	-0.6	22.7	24.1	-0.5	24.1
070	Made-up textile goods	0.46	24.31	42.5	-0.7	32.0	42.8	-0.7	32.2
071	Knitting	0.76	80.11	71.0	-0.4	13.8	71.4	-0.4	13.9
072	Wearing apparels	4.86	27.73	71.5	-0.8	51.4	72.6	-0.8	52.2
073	Carpets and Rugs	0.08	73.19	30.3	-0.3	7.9	24.9	-0.3	6.5
074	Jute mill products	0.03	58.49	13.0	-0.5	5.1	13.5	-0.5	5.4
075	Tannery and Leather Finishing	0.08	71.25	-5.9	-1.1	-2.5	-0.5	-0.9	-0.8
076	Leather products	1.83	27.64	55.1	-0.3	39.8	55.0	-0.3	39.7
077	Footwear, Except of Rubber	0.89	78.39	29.7	-0.6	6.0	30.9	-0.6	6.3
078	Saw mill & wooden construction materials	0.34	30.82	5.9	-0.2	4.0	4.8	-0.2	3.2
079	Wood and cork products	0.30	50.21	37.2	-0.2	18.4	38.2	-0.2	18.9
080	Wooden furniture & fixtures	1.29	36.07	32.5	-0.2	20.7	33.3	-0.1	21.2
081	Paper and Paperboard	1.64	29.06	5.5	-0.1	3.8	4.0	-0.1	2.8
082	Paper & paperboard products	0.35	13.26	29.6	-0.4	14.0	19.2	-0.3	9.1

(contd.)

Appendix 8 (contd.)

IO Code		Percentage of Value added	Export-Output Ratio (per cent)	2002			2003		
				ERP_{IC}	ERP_{XO}	ERP_{W}	ERP_{IC}	ERP_{XO}	ERP_{W}
083	Printing & publishing	0.76	4.22	-13.1	-1.5	-11.2	-11.9	-1.5	-10.2
084	Basic chemicals	0.33	63.69	0.4	-0.1	0.1	0.7	-0.1	0.2
085	Fertilizer, pesticides and insecticides	0.15	22.74	8.7	-0.2	6.7	8.6	-0.2	6.6
086	Petrochemical products	1.33	47.98	30.4	-0.6	15.5	31.0	-0.5	15.8
087	Paint	0.17	11.47	10.1	-0.4	8.9	1.1	-0.4	0.9
088	Drugs and Medicines	0.42	12.46	-2.2	-0.6	-2.0	-0.2	-0.5	-0.3
089	Soap & cleaning preparations	0.28	17.21	9.5	-0.4	7.8	3.3	-0.4	2.7
090	Cosmetics	0.12	28.89	60.3	-0.8	42.7	63.4	-0.7	44.9
091	Matches	0.01	1.95	30.1	-0.3	29.5	27.6	-0.2	27.1
092	Other chemical products	0.23	88.35	14.8	-0.3	1.5	13.6	-0.3	1.3
093	Petroleum refinery & gas separated plant	6.44	6.89	9.6	0.0	9.0	4.6	0.0	4.3
094	Other coal & petroleum products	0.98	11.92	-0.4	0.0	-0.4	-0.3	0.0	-0.3
095	Rubber sheet & block rubber	0.41	62.51	72.1	-0.1	27.0	72.2	-0.1	27.0
096	Types and Tubes	0.61	34.10	56.9	-0.6	37.3	57.3	-0.6	37.6
097	Other rubber products	0.40	82.72	66.8	-0.5	11.1	67.4	-0.5	11.2
098	Plastic wares	1.12	42.75	23.4	-0.7	13.1	23.7	-0.7	13.3
099	Ceramic and Earthenware	0.27	81.78	46.6	-0.1	8.4	40.1	-0.1	7.2
100	Glass & glass products	0.28	52.58	30.9	-0.2	14.6	19.4	-0.2	9.1
101	Structural clay products	0.24	0.00	53.7	-0.1	53.7	25.2	-0.1	25.2
102	Cement	1.35	16.26	-0.5	-0.1	-0.5	0.2	0.0	0.1
103	Concrete and Cement Products	0.73	0.70	42.5	-0.1	42.2	13.1	-0.1	13.0
104	Other non-metallic products	0.12	27.85	31.2	-0.2	22.5	19.0	-0.1	13.7

(contd.)

Appendix 8 (contd.)

IO Code		Percentage of Value added	Export-Output Ratio (per cent)	2002			2003		
				ERP_{IC}	ERP_{XO}	ERP_W	ERP_{IC}	ERP_{XO}	ERP_W
105	Iron and Steel	0.06	23.44	-1.4	-0.2	-1.1	-0.6	-0.2	-0.5
106	Secondary steel products	1.36	35.83	15.4	-0.1	9.8	14.7	-0.1	9.4
107	Non-ferrous metal	0.74	86.16	13.6	-0.2	1.8	7.0	-0.1	0.9
108	Cutlery and Hand Tools	0.45	36.69	37.2	-0.3	23.5	17.5	-0.2	11.0
109	Metal furniture & fixtures	0.16	37.54	35.5	-0.8	21.9	34.7	-0.8	21.4
110	Structural metal products	0.24	38.19	25.7	-0.3	15.8	19.1	-0.3	11.7
111	Other fabricated metal products	1.20	47.82	35.3	-0.3	18.3	37.3	-0.3	19.3
112	Engines and Turbines	0.19	34.24	10.9	-0.8	6.9	11.9	-0.8	7.6
113	Agricultural machinery & equipment	0.05	57.54	-1.2	-0.4	-0.8	-0.9	-0.4	-0.6
114	Wood & metal working machines	0.11	47.73	-3.4	-0.3	-2.0	-1.1	-0.3	-0.7
115	Special industrial machinery	0.72	39.51	-1.7	-0.4	-1.2	-0.3	-0.4	-0.4
116	Office equipment & machinery	5.80	89.28	-1.5	-0.2	-0.4	-1.1	-0.2	-0.3
117	Electrical industrial machinery & appliances	0.93	86.50	8.9	-0.5	0.8	10.1	-0.5	1.0
118	Radios, television sets & communication equipment	3.24	91.99	6.2	-0.7	-0.1	6.7	-0.7	-0.1
119	Other electrical appliances	0.32	61.56	37.2	-0.8	13.8	39.0	-0.7	14.6
120	Insulated Wire and Cables	0.52	71.49	19.2	-0.3	5.3	22.8	-0.2	6.4
121	Electrical accumulators & batteries	0.14	34.33	-15.1	-0.7	-10.2	-9.7	-0.5	-6.6
122	Other electrical apparatuses & supplies	0.52	76.63	-4.5	-0.4	-1.3	-2.5	-0.3	-0.8
123	Ship building	0.33	3.14	7.0	-0.4	6.8	3.1	-0.3	3.0

(contd.)

Appendix 8 (contd.)

IO Code		Percentage of Value added	Export-Output Ratio (per cent)	2002			2003		
				ERP_{IC}	ERP_{XO}	ERP_{W}	ERP_{IC}	ERP_{XO}	ERP_{W}
124	Railway equipment	0.01	1.02	-2.7	-0.3	-2.6	-1.7	-0.3	-1.7
125	Motor vehicles	1.03	56.97	61.0	-0.8	25.8	62.0	-0.8	26.2
126	Motorcycles & bicycles & other carriages	0.37	49.39	93.8	-1.3	46.8	94.7	-1.3	47.3
128	Aircraft	0.16	4.81	-0.9	-0.3	-0.9	-0.4	-0.3	-0.4
129	Scientific equipment	0.32	64.96	-6.1	-0.3	-2.3	-5.8	-0.3	-2.2
130	Photographic & optical goods	0.60	91.02	5.9	-0.3	0.3	3.9	-0.2	0.2
131	Watches and Clocks	0.49	55.58	9.9	-0.3	4.3	5.8	-0.2	2.5
132	Jewelry & related articles	2.10	33.35	-4.6	-0.2	-3.1	-1.6	-0.1	-1.1
133	Recreational & athletic equipment	0.19	68.33	7.9	-0.5	2.2	9.1	-0.5	2.5
134	Other manufacturing goods	0.89	56.45	29.7	-0.5	12.7	19.9	-0.4	8.5

Source: compiled from data supplied from Athukorala, Jongwanich and Kohpaiboon (2004).

Chapter 4: Industrialization in Thailand and Multinational Enterprise Involvement

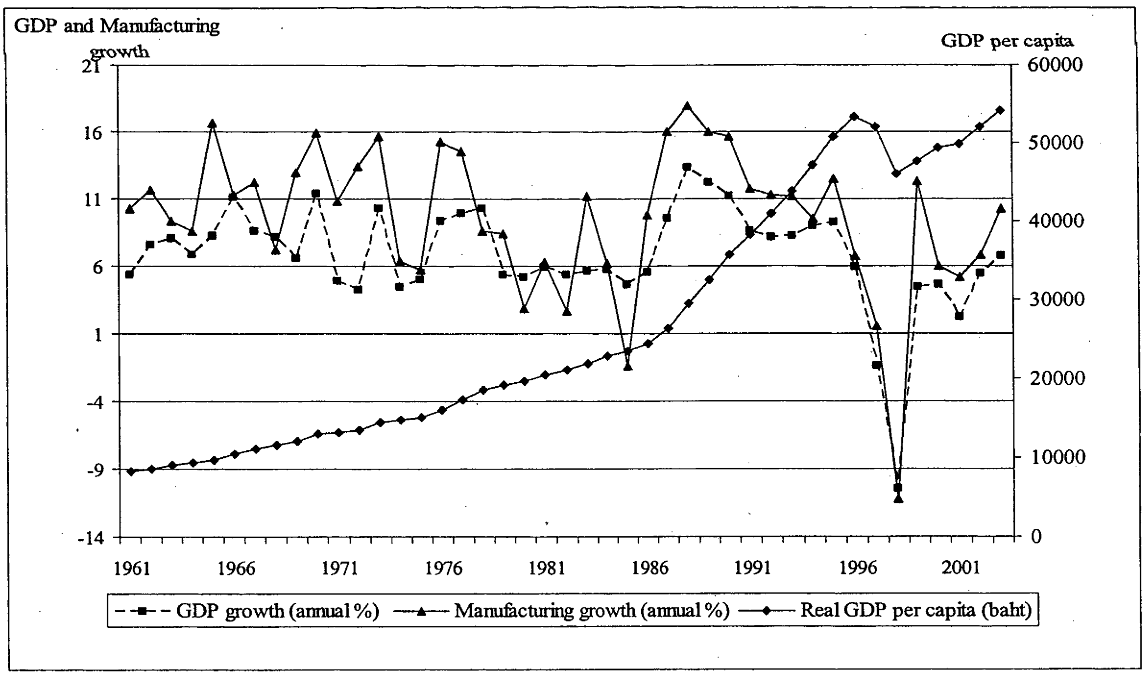
This chapter aims to illustrate the industrialization process in Thailand and MNE involvement over the past four decades. The chapter begins with a discussion of growth performance and structural changes in the Thai economy during the post war period. Section 4.2 focuses on the increasing industrialization in Thailand. Several aspects of Thai manufacturing such as output growth, sectoral composition, market orientation, and labour absorption are examined to evaluate the industrialization process and its contribution to the economy overall.

Section 4.3 discusses MNE involvement in Thailand. Even though MNEs can be involved in host economies through both FDI and non-FDI channels, this discussion mostly concerns the FDI channel. This is due to the unavailability of data concerning the non-FDI channels, especially secondary data. In this section, we begin with trends and patterns of total FDI inflows in Thailand over the past four decades. These are also compared with other developing countries, especially ASEAN-4 neighbours, in Section 4.3.2. Direct investors in Thailand are broken down according to geographical distribution and their investment patterns are examined in Section 4.3.3. Section 4.4 investigates manufacturing FDI as to trends, its relative importance and sectoral composition. We rely on the Industrial Census 1997 (data for 1996) conducted by the National Statistics Office (NSO) to evaluate the level of FDI involvement in Thai manufacturing. This section ends by closely examining characteristics of manufacturing FDI inflows from the mid-1980s onward. Data on BOI-promoted projects between 1989 and 1998 are used to gain insight into several characteristics such as degree of capital intensity, market orientation and foreign equity holding. Concluding remarks are in the final section.

4.1 Economic Growth and Structural Changes

During the post war period up to 1996, Thailand's growth performance was remarkable. The average annual growth of real GDP between 1961 and 1996 was 7.7 per cent. Rapid growth occurred without a single year experiencing negative growth of income per capita (Figure 4.1). This was a unique achievement among developing countries (Warr, 1993). The Thai economy registered an annual growth rate of 7.1 per cent from 1961 to 1986. From 1987 onwards, economic growth rates were even higher. From 1987 to 1996, real GDP grew at an average annual rate of almost 10 per cent. Growth performance in this decade ending in 1996 exceeded that of any other country (Warr, 1999: 631). This period of rapid growth was interrupted by the financial crisis that began in 1997. Economic growth dropped dramatically to -1.4 and -10.5 per cent in 1997 and 1998, respectively. The economy recovered gradually and achieved an annual growth rate of 7 per cent by 2003.

Figure 4.1
Economic Growth, GDP per Capita and Manufacturing Growth, 1961–2003



Source: IMF, *International Financial Statistics* (CD-ROM)

In terms of output, the agricultural sector, which was predominantly a tradable sector in the economy, has been displaced by the manufacturing sector. The agricultural sector, which accounted for 41.5 per cent in the 1950s, steadily declined to 24.1 and 17.7 per cent in the 1970s and 1980s, respectively. In the 1990s, the agricultural share of GDP was 11.6 per cent (Figure 4.2 A). In contrast, the manufacturing sector, which accounted for only 11.6 per cent in the 1950s, has become increasingly important to the Thai economy since the early 1960s. In 1979, for the first time, the manufacturing share in the GDP overtook that of agriculture, increasing from 20 per cent in the 1970s to 24.5 and 31.6 per cent in the 1980s and 1990s, respectively. During the period 2001–3, the manufacturing sector accounted almost 40 per cent of GDP.

Similar to the output structure, manufacturing goods have become the major Thai export since the mid–1980s. The share of manufacturing to total exports increased from 16.5 per cent in the 1970s to 30.8 per cent in the first half of the 1980s. From 1987 onwards, manufacturing exports have accounted for more than half of the country's exports, increasing from 53.8 per cent in the second half of the 1980s to 75.2 per cent during the period 2001–3 (Figure 4.2.B).

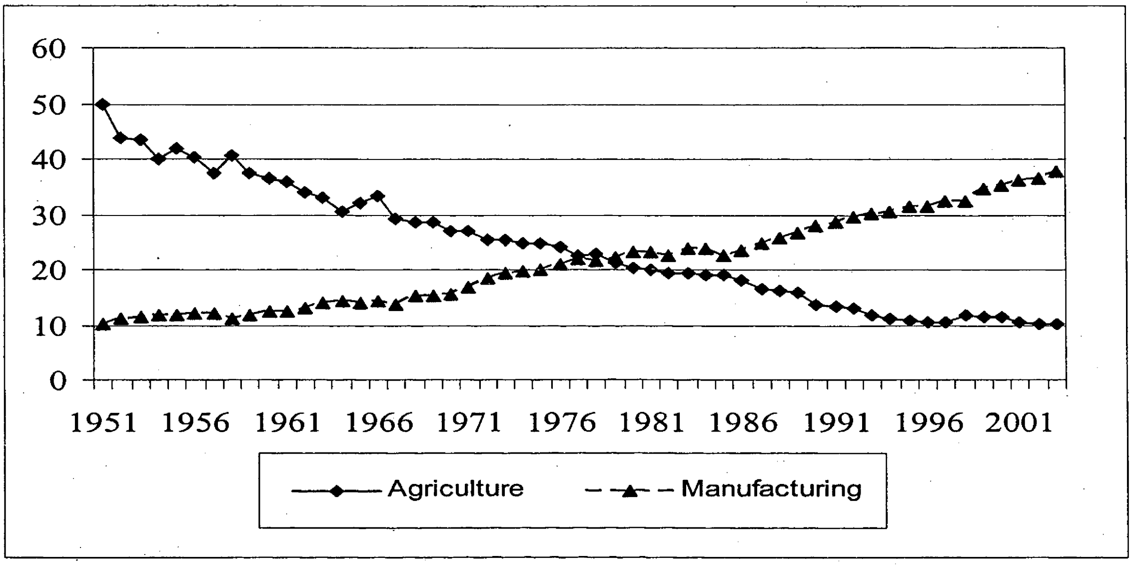
Nevertheless, structural changes in output and export have not been matched by similar changes in employment. A large proportion of employment is still absorbed by the agricultural sector. The share of manufacturing employment increased slightly over the past three decades, from 7.2 per cent in the 1970s to 9.5 and 14.3 per cent in the 1980s and 1990s, respectively (Figure 4.2.C).

4.2 Industrialization in Thailand

During the post war era, the manufacturing sector grew even faster than other sectors, resulting in the increased importance of the manufacturing sector, especially between 1986 and 1996. Manufacturing output grew at an average annual rate of 9.7 per cent during the period 1961–85. From 1986 to 1996, Thai manufacturing grew rapidly at an annual average rate of around 13 per cent. However, from the onset of the financial crisis, manufacturing sector growth has slowed down, dropping to 4.4 per cent per annum

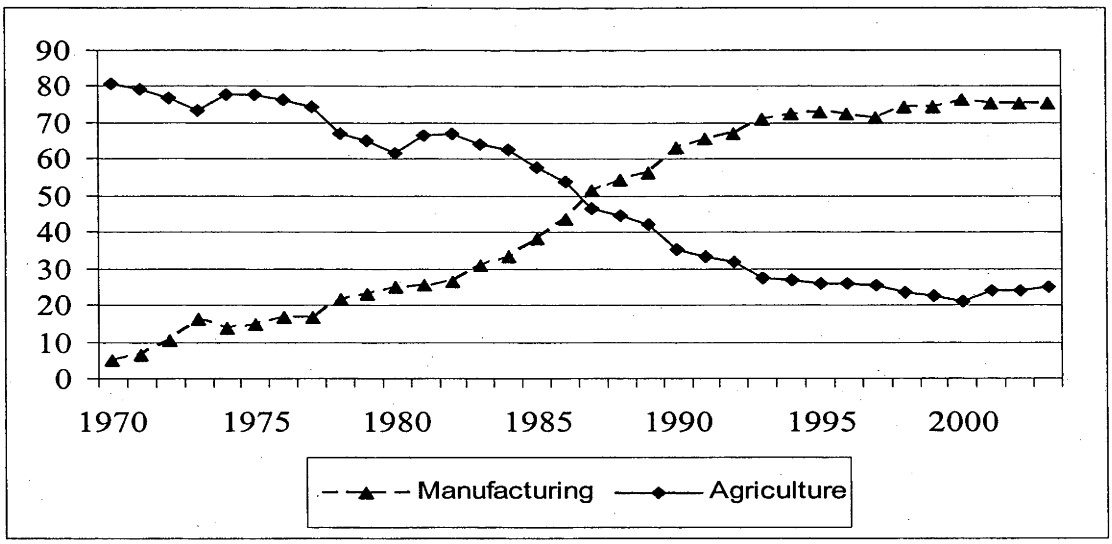
Figure 4.2
Structural Change in the Thai Economy, 1950–2003

4.2.A: GDP Share (per cent)



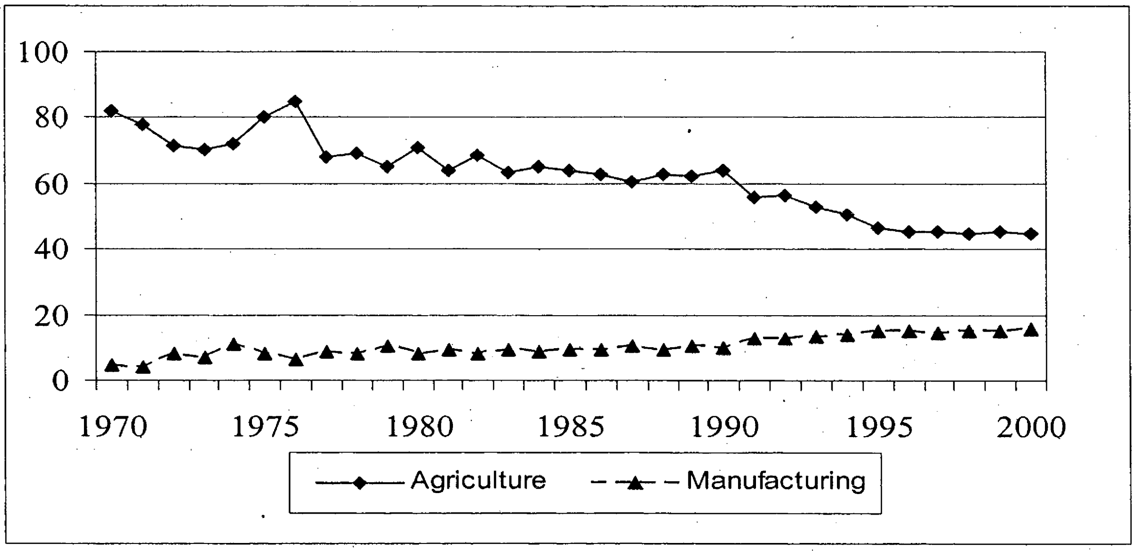
Sources: The data during the period 1951–59 are compiled from Warr and Nidhiprabha (1996) based on Wilson (1983) and those for the period 1960 to the present are from IMF, *International Financial Statistics* (CD ROM).

4.2.B: Export Share (per cent)



Sources: Data during the period 1970–2000 are compiled from the UN COMTRADE database held at International Economic Data Bank (IEDB), the Australian National University, and those for the period 2001–3 are from the World Trade Atlas database.

4.2.C: Employment Share (per cent)

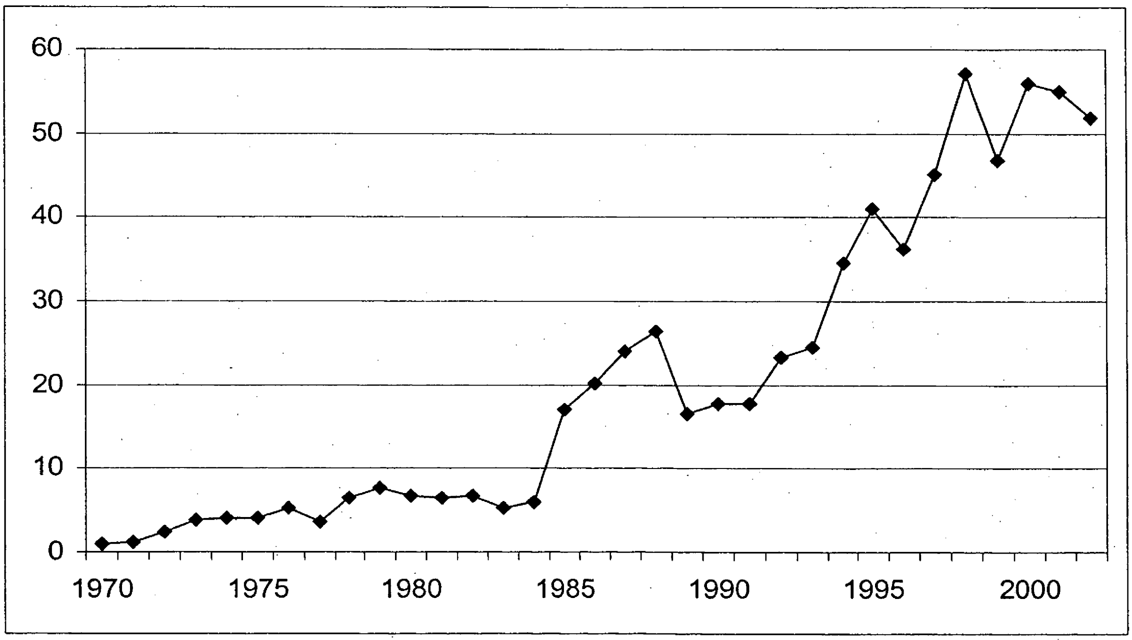


Source: World Bank, *World Development Indicators* (CD ROM)

Over the past four decades, growth patterns of Thai manufacturing can be separated into two sub-periods: 1960–85 and 1986 to the present. The aim of this separation is to illustrate growth performance in different industrialization strategies between IS and EP regimes. As mentioned in Chapter 3, Thailand pursued a typical IS industrialization strategy between the early 1960s and the mid–1980s.[1] From then on, the industrialization strategy has become more reliant on EP. The mid–1980s is selected because there is a noticeable change in the market orientation of manufacturing products. As illustrated in Figure 4.3, the export-output ratio of the manufacturing sector was around 5.5 per cent from 1970–85. It has increased rapidly from the mid–1980s to the present (Figure 4.3). Henceforth, the first period is referred to as the IS industrialization period and the latter as the EP industrialization period.

[1]Although according to the Third National Economic and Social Development Plan covering the period 1972-6 Thailand officially espoused an EP industrialization strategy, trade and investment policies between the 1970s and the mid–1980s were still typical of an IS industrialization strategy. On several occasions the Thai government increased tariffs and widened tariff differences between intermediated and finished products. See full discussion in Chapter 3.

Figure 4.3
The Export-output Ratio (per cent) of the Thai Manufacturing Sector, 1970–2002



Source: See Appendix 6.

4.2.1 The Import-substitution Industrialization Period (1960–85)

During these first two and a half decades, Thailand promoted an IS industrialization strategy. As discussed in Chapter 3, while the government pursued private-sector-led industrialization, the government used investment privileges granted by the BOI, tariff protection and an escalating tariff structure to encourage local IS manufacturing. These policy-induced incentives distorted the domestic incentive structure and favoured import-substituting industries over export-oriented ones. This led to an expansion of private investment and output growth in the IS manufacturing sector.

As Krueger (1992: p.43–4) argues, in most developing countries, a rapid expansion of import-substituting industries continued while easy IS opportunities (meeting domestic demand in textiles, footwear, some food processing, and other light labour-intensive activities) could be exploited. Only after this did growth slow and the cost of additional investment in new import-substituting activities rise. This characterization is applicable to Thailand. Between the 1960s and the mid–1970s, the growth of the manufacturing sector was rapid at an average annual rate of 11.2 per cent (Figure 4.1). As a result, the share of the manufacturing sector to GDP rapidly increased from 11.6 per cent in the 1950s to 14.2 and 18.6 per cent during the 1960s and the first half of the 1970s, respectively (Figure 4.2.A). Between 1976 and 1985 the tendency of manufacturing growth was downward and bottomed out in 1985. The average annual growth dropped from 10.4 per cent during the period 1971–5 to 5 per cent during the period 1981–5. The manufacturing share in the GDP remained more or less the same at around 22 per cent between 1976 and 1985.[2]

In a case of Thai manufacturing, the shortfall of foreign exchange earnings as a result of the world oil price hike during the late 1970s constrained manufacturing growth under an IS industrialization strategy. While an IS industrialization strategy resulted in a substantial reduction in consumer goods imports, these import categories were displaced by imports of capital goods and raw materials. More importantly, the import dependence of the latter was less flexible so that output expansion must go hand in hand with intermediate imports, thereby creating demand for foreign exchange. As long as the country maintains the ability to earn foreign exchange, it can maintain import-substituting manufacturing growth.

During the 1960s and the first half of the 1970s, the world oil price hike raised demand for foreign exchange and adversely affected the growth of the manufacturing sector. However, this was cushioned by the boom in commodity prices as well as continued high transfer and service account earnings (World Bank, 1984). As a result, the country did not have a serious foreign exchange shortage and manufacturing growth was not disrupted. By contrast, between the late 1970s and the early 1980s when oil price increases hit the world economy for a second time, as well as a drop in commodity prices, this resulted in a foreign exchange shortage and an economic recession in the

[2] Note that to some extent, the manufacturing share during this period reflected the distorted prices arising from industry protection because domestic prices were artificially high. The national accounts for this period could have overstated the actual size of the country's manufacturing.

early 1980s. This retarded import-substituting manufacturing growth (World Bank, 1984).

During the IS industrialization period, the country's industrialization process began with rapid manufacturing expansion in textiles and clothing, transport equipment, basic metal industries, and chemical products. As seen in Table 4.1, textile industries as a share of manufacturing value added dramatically increased from 1.7 per cent in 1950 to 13.1 per cent from 1976 to 1980. Similarly, the share of transport equipment industries dominated by the automotive industry increased from 0.4 to 8.3 per cent during the period under consideration. The clothing industry grew slightly faster than the overall manufacturing sector so its share increased slightly from 7.4 per cent in 1950 to 9.3 per cent during the period 1971–5.

In addition, many of these import-substituting industries began with easy IS opportunities, for example, the textile industries where there is a wide range of production technology involved, from highly capital intensive, i.e. synthetic fibres to labour intensive, i.e. fabrics. Rapid expansion of the Thai textile industry took place in the most labour-intensive segment, i.e. the weaving industry.[3] Similarly, the Thai automotive industry began with local manufacture of bulky, simple and quasi nontradable parts[4], whereas it was heavily reliant on imports of complicated parts, especially engines.

Import-substituting industries did not contribute significantly to employment (Figure 4.2.C). Between 1970 and 1985, manufacturing employment accounted for only 8.2 per cent of total employment. The employment share of the manufacturing sector increased from 4.5 per cent in 1970 to around 8.4 per cent in 1975 and then remained more or less unchanged at this level during the following decade ending in 1985.

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[3]In the weaving industry, there is a wide range of weaving machines involved, such as air jets, water jets, rapiers, projectiles, and shuttle looms (Pack, 1987). The degree of capital intensity is ranked ascendingly. During this period, the Thai weaving industry was heavily reliant on shuttle loom machines. (Akira, 1989; Suphachalasai, 1989,1992; Kohpaiboon, 1995)

[4] See details in Chapters 7 and 8.

Table 4.1
Sectoral Composition (per cent) of Thai Manufacturing, 1950–2002

	1950	1967–70	1971–5	1976–80	1981–5	1986–90	1991–5	1996–2000	2001–2
Food and beverages	47.4	34.7	24.2	24.7	21.5	18.1	15.1	15.1	17.3
Tobacco	13.6	8.8	7.6	6.2	4.9	3.4	2.3	1.5	1.3
Textiles	1.7	7.5	12.2	13.1	10.7	10.9	8.7	7.2	7.1
Clothing	7.4	6.0	9.3	8.5	9.4	10.5	9.4	7.4	6.9
Leather, leather products and footwear	7.5	3.3	2.2	1.8	2.2	3.4	3.5	3.4	3.7
Wood and wood products	8.9	2.2	3.5	3.0	2.6	1.8	0.7	0.3	0.3
Furniture and fixtures	0.9	0.9	1.4	1.5	2.7	2.9	2.2	1.1	0.7
Paper and paper products	0.4	2.3	1.3	1.5	1.6	1.4	1.5	2.0	2.1
Printing, publishing and allied industries	2.6	0.9	1.5	1.5	1.7	1.2	1.1	0.9	0.8
Chemicals and chemical products	0	2.4	3.6	3.4	3.0	2.9	2.7	4.6	4.8
Petroleum refineries and petroleum products	0.4	5.9	7.8	7.2	8.8	7.0	6.6	10.2	10.1
Rubber and plastic products	1.7	6.0	2.6	2.6	2.2	2.7	2.9	3.2	3.5
Non-metallic mineral products	0.1	6.0	3.9	4.0	5.1	5.4	5.9	5.0	4.6
Basic metal industries	0	1.9	2.1	2.0	2.1	1.7	1.7	1.4	1.3
Fabricated metal products	0	0.9	2.6	2.0	2.5	2.6	2.7	2.9	2.8
Machinery	0.4	2.1	2.8	2.8	3.0	4.1	6.5	9.3	7.9
Electrical machinery and supplies	6.4	1.4	1.8	2.6	3.7	5.1	8.6	11.0	12.8
Transport equipment	0.4	5.1	7.2	8.3	8.0	8.1	9.5	6.3	6.2
Other manufacturing industries	0.2	1.6	2.5	3.1	4.5	6.8	8.4	7.3	7.6
Total value added	100	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Source: National Economic and Social Development Board, *National Income Accounts*, (various issues).

4.2.2 The Export-promotion Industrialization Period (1986–present)

An IS industrialization strategy, which commenced in the early 1960s, resulted in local manufacturing being heavily reliant on imported intermediate goods. Thus, the successive balance of payment deficits between the late 1970s and the early 1980s gradually caused the government to shift the industrialization strategy toward EP. While the trade policy regime remained unchanged due to poor fiscal positions and high public foreign debt during the early 1980s, the government used the BOI promotion scheme partly to mitigate the adverse impact of input tariffs on the international competitiveness of export-oriented industries (Akira, 1989: p.270). The BOI granted tariff exemptions on imported inputs over and above usual investment promotion privileges for export-oriented activities.

In addition, the Thai government undertook a series of currency devaluations during the first half of the 1980s (Warr and Nidhiprabha, 1996: p.206) to improve external imbalances. Thailand's exchange rate increased from roughly 20 baht/$ during the period 1960–80 to around 27.16 baht/$ in 1985, i.e. the nominal exchange rate devalued by around 36 per cent. The currency devaluation affected the incentives to manufacturing in favour of export. It raised the dollar costs of imported inputs and the price of finished products of import-substituting industries. In contrast, for export-oriented manufacturers, the currency devaluation lowered the price of domestic products for import-country consumers. It is usual for export-oriented products to use imported intermediates, and the currency devaluation increased the cost of imported inputs and production costs of finished goods (in local currency). However, increased production costs do not affect price competitiveness because they are converted from local to foreign currencies when these products are exported. Due to the fact that output value is always greater than input value, i.e. positive value added, the net effect of currency devaluation on price competitiveness is always positive, regardless of the level of import content. Changes in these internal factors made Thailand a very attractive location for export-oriented and efficiency-seeking MNEs.

In the meantime, these East Asian investors were seeking an export base abroad to maintain their international competitiveness in labour-intensive export products in the mid–1980s. The erosion in their home countries' international competitiveness was the outcome of wage increases and currency appreciation in the mid–1980s. In addition, the imposition and gradual tightening of quantitative restrictions by developed countries constrained certain labour-intensive exports, mostly textiles, garments and footwear, from these East Asian exporters (Wells, 1986). In the electronics industry and other durable consumer goods industries, technological innovations began to allow these investors to slice up the value chain of their production, relocating labour-intensive segments rather than entire industries to benefit from cheap labour available abroad (Krugman, 1995).[5] As a result, manufacturers from Japan and the North East Asian NICs have become actively involved with outward direct investment and have established a regional network to strengthen their international competitiveness. Thailand is selected by these investors to be their labour intensive export base.[6]

All in all, there were massive export-oriented FDI inflows in Thai manufacturing as discussed in detail in Section 4.4. In addition, Thai manufacturing exports rapidly expanded from 1986 to 1995.[7] Their share in total exports increased from 21.7 per cent during the period 1970–85 to 55.8 per cent and 72.2 per cent in the second half of the 1980s and the 1990s (Table 4.2). From 2001 to 2003, manufacturing export accounted for 75.2 per cent of the country's exports. Manufacturing exports commenced with several processed food products, especially canned pineapple, canned tuna, frozen chicken and traditional labour-intensive manufactured goods, in particular garments, in the late 1970s. Other traditional labour-intensive manufactured items like footwear,

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[5] This is one of the ongoing processes of globalization. This process has been known by various different names such as vertical specialization, international production sharing, outsourcing, and product fragmentation. In addition, Athukorala (2003b) probes this process (referred to in his paper as 'product fragmentation') in the context of East Asian countries.

[6]For further discussion, see Petri (1993); Athukorala and Menon (1996); Dobson and Chia, (1997); and Hill and Athukorala (1998).

[7]Note that the average annual export growth during the period 1986–95 was slightly lower than that in the period 1970–85. However this comparison has to be qualified for the low export base in the latter period.

Table 4.2

Export Composition (per cent) of Thai Merchandise Trade, 1970–2003

	1970–5	1976–80	1981–5	1986–90	1991–5	1996–2000	2001	2002	2003
Export value ($million)	1,436	4,395	6,851	15,859	39,851	58,597	65,165	68,157	80,253
Export Composition (per cent)									
1. Primary products	77.2	67.3	63.4	42.5	28.3	23.6	23.9	24.2	24.9
1.1 Food (SITC 0+1+4)	54.9	51.6	52.3	34.2	22.4	17.2	17.7	16.9	14.2
1.1.1 Unprocessed food	38.3	33.9	31.7	14.6	6.1	4.2	5.2	4.2	2.8
Rice	16.5	15.0	14.6	7.4	3.7	3.2	2.4	2.4	2.3
Tapioca	10.8	10.5	10.3	5.3	2.2	1.1	0.7	0.5	0.5
1.1.2 Processed food*	16.5	17.8	20.6	19.6	16.3	13.0	12.5	12.7	11.5
Canned pineapple	0.5	1.2	1.4	1.1	0.7	0.4	0.3	0.3	0.4
Canned tuna	0.9	1.5	3.5	5.5	4.3	3.9	1.9	2.0	1.9
Processed chicken	0.0	0.4	0.8	1.3	1.0	0.7	0.9	0.9	0.8
Processed shrimp	2.7	3.6	3.6	4.5	4.8	3.1	3.7	2.8	2.4
1.2 Agricultural raw materials (SITC 2-27-28)	18.7	13.2	9.4	6.9	4.7	3.8	3.1	4.0	4.7
Rubber (SITC 23)	10.8	9.9	7.2	5.6	3.7	2.9	2.0	2.5	3.5
1.3 Non-agricultural primary products (SITC 3+27+28+68)	3.7	2.5	1.7	1.5	1.3	2.5	3.1	3.2	3.0
2. Manufacturing products (SITC 5+6+7+8-68)	12.6	21.5	30.9	55.8	70.5	73.8	75.1	75.4	75.1
2.1 Clothing (SITC 84)	1.7	3.6	6.6	12.0	10.4	6.0	5.5	5.3	4.5

(contd.)

Table 4.2 (contd.)

	1970–5	1976–80	1981–5	1986–90	1991–5	1996–2000	2001	2002	2003
2.2 Machinery and transport equipment (SITC 7)	0.6	3.8	6.4	15.8	28.1	39.5	40.4	43.9	42.5
2.3 Electronic machinery (SITC 72)	0.5	3.3	5.2	8.9	14.2	18.8	19.7	21.5	20.8
2.4 Automotive& parts (SITC 73)	0.0	0.1	0.1	0.4	0.7	0.8	4.3	5.6	6.5
2.5 Footwear (SITC 85)	0.0	0.1	1.0	2.4	3.2	1.5	1.2	1.2	1.0
2.6 Jewellery (SITC 8971 and 8972)	0.2	0.4	0.7	2.6	1.9	1.6	1.6	1.7	1.5
Annual growth (per cent)									
Total Export	28.2	24.4	2.4	26.9	19.7	4.8	-6.6	4.6	17.7
1. Primary products	27.6	18.8	1.5	15.3	12.7	0.7	5.4	5.9	21.5
1.1 Food (SITC 0+1+4)	35.0	17.8	2.9	15.8	10.8	-1.7	16.3	-0.1	-0.9
1.1.1 Unprocessed food	29.7	20.8	-1.7	6.2	4.5	-4.7	61.6	-14.1	-23.2
Rice	36.8	30.9	-0.3	10.6	13.1	-2.1	-3.1	3.1	14.2
Tapioca	22.2	37.3	-4.2	11.0	-2.7	-5.9	-3.4	-29.1	27.2
1.1.2 Processed food*	53.9	12.5	12.8	25.0	13.7	-0.6	4.3	5.7	6.6
Canned pineapple	68.4	33.2	13.0	13.3	3.0	4.7	-2.8	8.6	25.3
Canned tuna	65.3	44.5	26.0	29.9	11.7	4.3	-49.3	6.7	16.1
Processed chicken	5233.2	171.0	19.3	41.0	7.4	0.7	38.1	5.4	5.4
Processed shrimp	59.4	22.3	7.7	31.7	18.2	-4.4	30.6	-20.3	0.6
1.2 Agricultural raw materials (SITC 2-27-28)	15.5	22.0	-1.4	13.5	21.9	-4.0	-11.8	36.4	36.4
Rubber (SITC 23)	22.5	30.5	-2.5	14.8	23.2	-6.5	-15.8	31.4	61.0
1.3 Non-agricultural primary products (SITC 3+27+28+68)	26.1	30.5	2.6	19.9	15.8	42.0	-21.7	9.7	9.7
2. Manufacturing products (SITC 5+6+7+8-68)	65.1	39.0	11.1	40.5	23.2	5.7	-7.9	5.0	17.2

(contd.)

Table 4.2 (contd.)

	1970–5	1976–80	1981–5	1986–90	1991–5	1996–2000	2001	2002	2003
2.1 Clothing (SITC 84)	157.1	38.9	17.2	39.4	11.8	-2.6	-4.5	0.4	0.4
2.2 Machinery and transport equipment (SITC 7)	117.5	69.4	12.3	49.6	31.3	10.7	-8.9	13.8	13.8
2.3 Electronic Machinery (SITC 72)	181.3	72.2	6.4	40.4	31.4	11.8	-14.2	14.0	14.0
2.4 Automotive& parts (SITC 73)	131.0	78.2	4.3	77.8	52.5	29.6	230.5	36.6	36.6
2.5 Footwear (SITC 85)	141.6	127.0	45.1	55.9	23.9	-12.9	0.6	0.2	0.2
2.6 Jewellery (SITC 8971 and 8972)	42.7	50.8	26.1	52.5	10.8	-0.2	19.2	6.3	6.3

Note: * The processed food is composed of fish products, meat products, diary products, flour and cereals, other preserved fruit, fresh fruit and vegetables, preserved vegetable, sugar and molasses, coffee extracts, cocoa, and chocolates, preserved animal feeds, margarine and food preparations, beverages (alcoholic and non-alcoholic), tobacco products, animal oils and vegetable oils. The definition of processed food is similar to that used in Athukorala and Sen (1998)

Source: Data during the period 1970-2000 are compiled from the UN COMTRADE database held at the International Economic Data Bank (IEDB), the Australian National University, and those during the period 2001–3 are from the World Trade Atlas database jewels and gems showed a rapid rise in exports during the period 1986–95. Further diversification of the export mix took place as Thailand became an increasing attractive location for assembly activities, especially in electronics within the broader category of machinery and transport equipment (SITC 7). This resulted in the increased importance of manufacturing exports (Figure 4.2.B). In contrast, exports of primary products, which were dominated by a few agricultural commodities, i.e. rice, tapioca and natural rubber, have become relatively less important, compared to manufacturing. Despite the presence of double digit growth, the primary export share in total exports declined dramatically from 77.6 per cent in the first half of the 1970s to less than 25 per cent from 1996 to the present (Table 4.2).

The rapid growth in manufacturing exports in the mid–1980s led to the rapid growth in manufacturing output. This was a classic example of the export-led growth phenomenon. Manufacturing export growth increased from 11.1 per cent in the first half of the 1980s to 40.5 and 18 per cent during the periods 1986–90 and 1991–6, respectively. The average annual growth of manufacturing output jumped to 15.1 per cent and declined slightly to 10.5 per cent during the same periods, respectively (Figure 4.4). As a result, the share of the manufacturing sector in GDP increased from 22 per cent in the first half of the 1980s to 27 per cent in the decade ending in 1996.

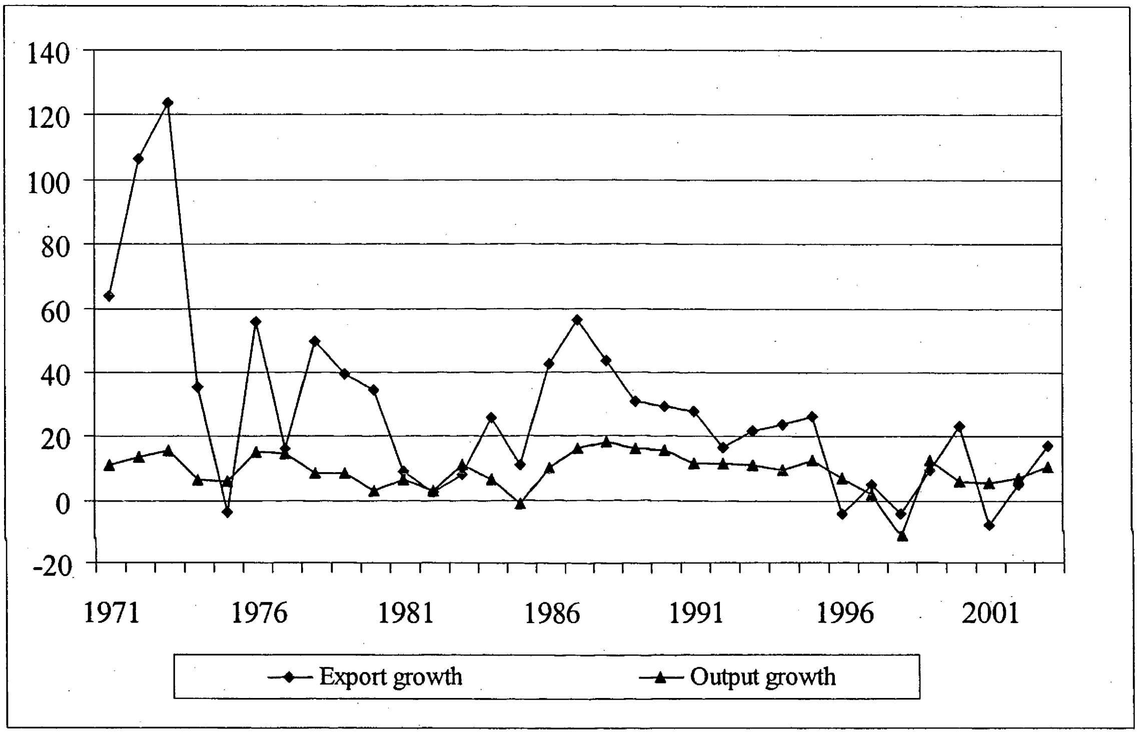
Labour-intensive manufacturing industries —clothing, footwear, leather products, furniture, toys, jewels and gems, and electronics— have had an impressive growth record.[8] Their total share increased from 17.4 per cent in the 1970s to 28.7 and 31.2 per cent in the second half of the 1980s and the 1990s, respectively (Table 4.1). While capital-intensive industries, such as textiles and chemicals, figured prominently among the declining sectors, transportation equipment retained its share.

The expansion of such labour-intensive manufactured products not only meant increased importance for the sector in terms of export earnings but also in terms of

[8] Toys, jewelry and gems were the dominant items in other manufacturing products. For example, in 1998-2000, they accounted for 70 per cent. The electronics industry is referred to in table 4.1 as electrical machinery and supplies.

employment absorption. Its employment share increased to 13.6 per cent and 15.1 per cent in 1991–5 and 1996–2000 respectively, from around 8 per cent during the period 1970–85 (Figure 4.2.C). Nevertheless, its performance in employment absorption seemed to be far from satisfactory. More than 50 per cent of employed workers are still in the agricultural sector whose income share is around 10 per cent.

Figure 4.4
Annual Growth Rate (per cent) of Manufacturing Output and Export, 1971–2003.



Sources: Output growth is from National Economic and Social Development Board on-line database, available at www.nesdb.go.th

Export data during the period 1970–2000 are compiled from the UN COMTRADE database held at the International Economic Data Bank, the Australian National University, and those for the period 2001–03 are from the World Trade Atlas database.

There was a slowdown in manufacturing export growth during 1996–8. The average annual growth rate of manufacturing exports declined from 23.2 per cent during the period 1991–5 to zero per cent between 1996 and 1998 (Figure 4.4). This was mainly due to the upward trend of the real wage rate and the successive appreciation of the real exchange rate (RER), especially in the early 1990s (Warr, 1999: p.644–5). Hence, the competitiveness of manufacturing exports deteriorated. The export slowdown resulted in a decline in manufacturing output growth from 12 per cent in 1995 to less than 2 per cent in 1997, and to a negative growth rate of 11 per cent in 1998.

Although the dramatic currency depreciation during the onset of the crisis should have been the catalyst for a manufacturing export boom, manufacturing exporters were restrained by the credit crunch in the financial sector. Exporters could not access adequate funds to buy necessary imported materials. This was especially true for high import-content manufacturers. Devaluation caused an increase in the dollar costs of import intermediates so that exporters needed additional operating funds to buy these intermediates. The credit crunch in the financial sector could retard the growth of Thai manufacturing exports. Manufacturing export growth has resumed since 1999. The annual growth rate in 1999–2003 was 10 per cent, and manufacturing output grew 8 per cent a year during the same period.

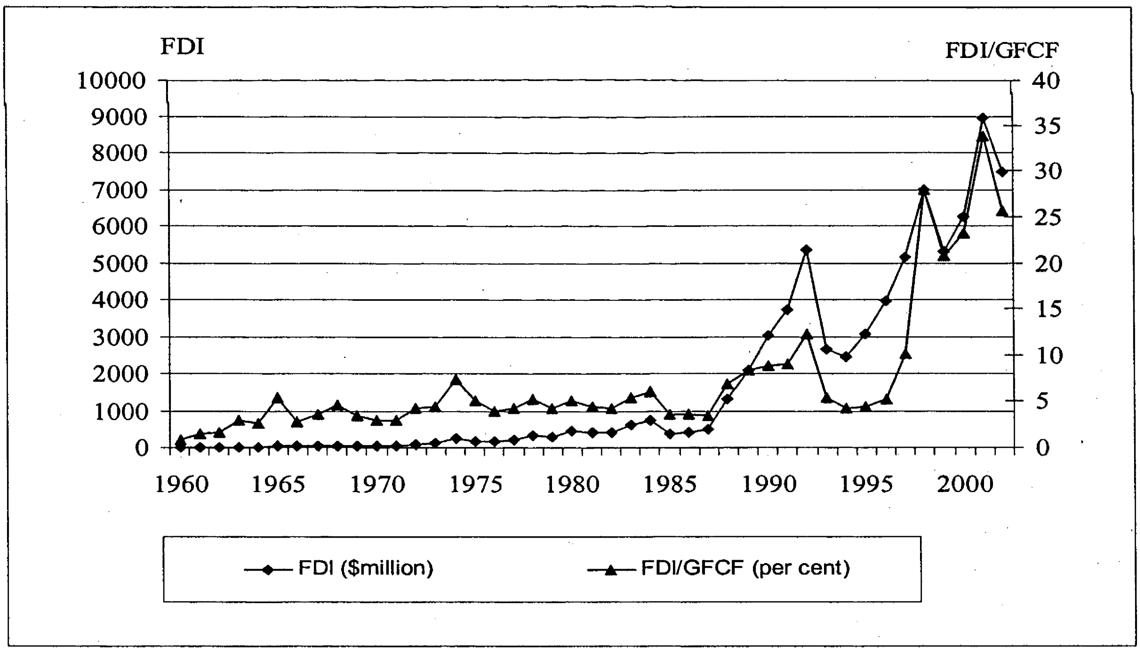
4.3 Multinational Enterprise Involvement

4.3.1. Trends and Patterns of FDI Inflows in Thailand

MNE involvement measured by FDI inflows has been increasingly important to the Thai economy over the past four decades. FDI inflows increased from $32 million in the 1960s to $982 million and $4,481 million in the 1980s and the 1990s, respectively. From 2001 to 2003, FDI inflows were $7,952 million (Figure 4.5). The share of FDI inflows to gross fixed capital formation (GFCF) increased from 3.1 per cent in the 1960s to 5.4 and 12.3 per cent in the 1980s and 1990s, respectively. Between 2001 and 2002, FDI inflows accounted for 29.7 per cent of GFCF (Figure 4.5).

Growth patterns of FDI inflows in Thailand can be clearly divided into two periods; 1960–85 and 1986 to the present. The mid–1980s is when the industrialization strategy changed. FDI inflows in the former period were far lower than those in the latter. During the period 1960–85, when Thailand pursued trade and investment policy regimes to promote an IS industrialization strategy, annual average values of FDI inflows moderately increased from $32 million in the 1960s to $207 million and $508 million in the 1970s and the first half of the 1980s, respectively (Figure 4.5). The 1960–85 FDI flows averaged out at 3.9 per cent of the country's GFCF. By contrast, from 1986 to 2003, when the policy regimes had changed toward an EP industrialization strategy, FDI inflows dramatically increased and became increasingly important to the country's accumulation process. The annual value of FDI inflows jumped to $1,456 and $3,437 million during the period 1986–90 and 1991–5, respectively. Despite the financial crisis in 1997, FDI inflows even increased from $5,525 and $7,952 million during the period 1996–2000 and 2001–3, respectively. Their share of GFCF increased to 12.3 per cent in the 1990s, from 6.2 per cent between 1986 and 1990. For the period 2001–2, FDI inflows accounted for 29.7 per cent of GFCF. The evidence from Thailand strongly supports the argument that the amount of FDI inflows tends to be lower in an IS regime, compared to a policy regime geared toward EP.

Figure 4.5
FDI Inflows ($million) and Percentage Share to Gross Fixed Capital Formation (GFCF), 1960–2002



Sources: Gross fixed capital formation (GFCF) is from National Economic and Social Development Board, on-line database, available at www.nesdb.go.th
FDI inflows are from Bank of Thailand, on-line database, available at www.bot.or.th

Even though there was substantial merger and acquisition (M&A) FDI during the onset of the crisis, the net FDI inflows outside of M&A — greenfield FDI — accounted for more than 50 per cent of total FDI inflows. M&A FDI inflows, which were $168 million between 1990 and 1996, increased to $1,564 million during the period 1997–2002.[9] Nevertheless, M&A FDI inflows between 1997 and 2002 accounted for only 23.5 per cent of the total FDI inflows. More than three quarters were greenfield FDI inflows (Table 4.3).

Table 4.3
Total, Mergers and Acquisition (M&A), and Greenfield FDI Inflows ($million) in Thailand, 1990–2003

	Total FDI Inflows[1] (1)	M&A FDI Inflows[2] (2)	Greenfield FDI Inflows (3) = (1)-(2)
1990	3,030	70	2,960 (98.7)
1991	3,700	79	3,621 (97.9)
1992	5,340	498	4,842 (90.7)
1993	2,639	42	2,597 (98.4)
1994	2,452	89	2,363 (96.4)
1995	3,052	161	2,891 (94.7)
1996	3,940	234	3,706 (94.1)
1997	5,142	633	4,509 (87.7)
1998	6,981	3,209	3,772 (54)
1999	5,307	2,011	3,296 (62.1)
2000	6,256	2,569	3,687 (58.9)
2001	8,844	957	7,887 (89.2)
2002p	7,425	247	7,178 (96.7)
2003p	7,408	55	7,353 (99.3)

Notes: p = preliminary and the number in parentheses is the percentage share of total FDI inflows.
Sources : [1] Bank of Thailand, on-line database, available at www.bot.or.th
[2] UNCTAD, *World Investment Report*, available at http://www.unctad.org

[9]The period coverage is due to data availability. UNCTAD commenced compiling M&A data in 1987, available at http://www.unctad.org.

4.3.2 Comparisons between Thailand and Other Developing Countries

In the context of developing countries, Thailand has become increasingly important as a FDI recipient country. The share of FDI inflows in Thailand to total FDI in developing countries increased from 2.3 per cent during the period 1970–5 to 4.8 per cent in the decade ending in 1995. Between 1996 and 2003, its share declined slightly to 3.5 per cent (Table 4.4). Notwithstanding the rapid growth of FDI inflows in Thailand, Thailand's share of FDI inflows into East Asian economies has declined over the past three decades, mainly due to the sharp increase in FDI inflows into China. China became the largest FDI recipient country in the world between 1990 and 2003, accounting for 27 per cent of inflows into developing countries and 51.9 per cent into East Asian economies. Excluding China from the East Asian economies, Thailand is average among other high-performance East Asian economies in enticing FDI inflows.

Among ASEAN-5 countries, Thailand is average in terms of attracting FDI inflows. Between 1970 and 2000, Thailand accounted for 18 per cent of total FDI inflows to ASEAN-5 countries. This share was lower than that of Singapore (accounting for 39.3 per cent) and Malaysia (26.4 per cent), but larger than that of Indonesia (10.8 per cent) and the Philippines (5.5 per cent). During the period 2001–3, Thailand's share sharply increased to 38.6 per cent. This was due to the negative FDI inflows to Indonesia that occurred between 1998 and 2002 and the declining trend of FDI inflows in Malaysia and the Philippines (Table 4.4).

In Thailand, the significance of FDI in the country's capital accumulation, measured by a percentage of FDI to GFCF, is relatively high by developing countries' standards. During the period 1970–2003, FDI amounted to 13.9 percent of GFCF in Thailand, while the average level for developing countries was 7 percent. Among ASEAN-5 countries, there was a difference between pre- and post-crisis. During the pre-crisis period i.e. 1970–96, the share of FDI to GFCF in Thailand was 5.3 per cent, far lower than Singapore (23.8 per cent) and Malaysia (13.8 per cent). It was slightly higher than that of Indonesia (3.6 per cent) and the Philippines (4.1 per cent).

Table 4.4
FDI Inflows to Thailand: An International Comparison, 1970–2003

	1970–5	1976–80	1981–5	1986–90	1991–5	1996–2000	2001	2002	2003
FDI inflows ($million)	115	285	508	1,456	3,437	5,525	8,958	7,489	7,408
Relative importance (per cent)									
Share in world	0.6	0.8	0.8	0.9	1.5	0.7	1.1	1.1	1.3
Share in developing countries	2.3	3.6	2.5	5.2	4.3	2.7	4.1	4.8	4.3
Share in Asia	10.5	13.3	4.4	8.9	6.5	4.9	8.0	7.9	6.9
Share in East Asia	10.7	12.7	9.3	9.5	7.1	5.3	9.1	9.2	8.2
Share in High-performance East Asian Economies	11.1	12.1	9.1	9.8	7.3	5.6	9.0	9.0	8.1
Share in ASEAN-5 countries	14.9	16.3	15.7	20.6	18.7	21.6	39.7	40.8	35.3
As a percentage of GFCF									
World	2.3	2.0	2.6	4.1	4.1	12.0	12.0	10.1	7.5
Developed countries	2.2	2.1	2.3	4.3	3.5	11.7	11.5	10.0	6.7
Developing countries	3.4	1.9	3.3	3.3	6.0	12.5	13.1	9.9	10.0
Africa	4.2	1.5	2.1	2.8	5.3	8.9	20.7	12.3	13.9
Latin America and the Caribbean	4.2	3.2	4.0	4.0	7.4	18.8	19.8	14.9	11.2
Asia	2.0	1.2	3.3	3.2	5.7	10.7	10.2	8.3	9.3
- South Asia	0.3	0.6	0.8	0.9	1.8	3.0	2.2	3.3	4.9
- East Asia	3.0	2.0	2.3	4.2	6.9	11.5	10.4	8.2	9.2

(contd.)

Table 4.4 (contd.)

	1970–5	1976–80	1981–5	1986–90	1991–5	1996–2000	2001	2002	2003
High Performance East Asian Economies	7.0	5.9	6.4	11.5	11.3	18.7	20.4	13.5	16.2
China	0.0	0.0	1.1	2.8	11.2	13.0	10.5	11.5	12.4
Hong Kong, China	10.1	8.8	12.5	27.0	14.8	53.6	55.7	25.8	38.4
Indonesia	5.5	2.6	1.1	2.3	5.1	-0.9	-9.7	0.4	-1.8
Korea, Republic of	4.6	0.6	0.6	1.3	0.6	3.9	2.6	1.8	2.1
Malaysia	13.9	12.8	11.0	10.7	19.7	16.9	2.5	14.5	10.8
Singapore	16.8	16.9	18.4	38.3	29.3	41.7	60.1	25.6	45.7
Taiwan Province of China	0.8	0.9	1.5	3.6	2.3	3.6	7.8	2.9	0.9
Thailand	4.5	4.5	4.7	6.2	7.1	17.5	33.8	25.7	21.5
Other East Asian Economies	0.2	-0.1	-0.1	0.2	0.4	1.4	-0.4	-0.4	-0.3
The Philippines	2.2	1.7	0.7	6.8	8.6	10.2	6.9	11.9	2.2
Vietnam	0.0	0.0	0.0	4.5	35.8	24.4	13.6	11.4	15.2

Notes: GFCF = Gross fixed capital formation
The data of Thailand in 2002 –3 are preliminary.
ASEAN-5 countries are composed of Indonesia, Malaysia, the Philippines, Singapore and Thailand.

Sources: The data of Thailand are from Bank of Thailand, on-line database, available at www.bot.or.th.
The data of other countries are from UNCTAD, *World Investment Report*, available at http://www.unctad.org

To some extent, the relatively low share of FDI during this period reflected the way Thailand financed domestic investment beyond national saving, i.e. the investment-saving gap. During the period 1986–96, Thailand was more reliant on other forms of capital flow (OFCF), i.e. portfolio, commercial bank borrowings, etc., to finance the country's investment-saving gap. The value of OFCF in Thailand was the highest in ASEAN-5 countries and accounted for 78.1 per cent of total capital inflows during the period 1986–96 (Table 4.5). The share of OFCF in Thailand was the second highest among ASEAN-5 countries, just lower than that of the Philippines (82.8 per cent) but higher than Indonesia (57.6 per cent), Singapore (56.7 per cent) and Malaysia (8.7 per cent). As discussed in Appendix 1, OFCF tend to be more volatile than FDI. Along with inappropriate exchange rate policies and a poorly regulated domestic financial system, the high proportion of OFCF has been hypothesized as a key factor in explaining the crisis (Hill and Athukorala, 1998: p.24; Warr, 1999).

From 1997 to 2003, when many countries were aware of the adverse effect of OFCF, FDI as a ratio of GFCF increased for the developing countries. In Thailand, it increased to 23.3 per cent. This was still far lower than Singapore (44.8 per cent), but slightly higher than Malaysia (13.6 per cent), the Philippines (9.1 per cent) and Indonesia (-3.6 per cent).[10]

4.3.3 Geographical Distribution of FDI Inflows in Thailand.

Japan has been the largest direct investor in Thailand over the past three decades. From 1970 to the present, Japanese direct investors accounted for 23 per cent of FDI inflows (Table 4.6). During the period 1970–85, FDI inflows from Japan accounted for 19.3 per cent, ranked second after the US. Since 1986, Japanese investors have become increasingly involved in Thailand. Its share increased to 41.1 per cent between 1986 and 1990. Notwithstanding the greatly increased value of Japanese FDI, direct investment flows from North East Asian NICs increased even faster in the 1990s. As a result, the Japanese share declined to 19.1 per cent in the 1990s.

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[10]The negative figure in the case of Indonesia is as a result of negative FDI inflows during the onset of the crisis, i.e. 1998-2001.

Table 4.5
ASEAN-5: Capital Inflows and Composition ($million), 1986–2003

		1986–90	1991–5	1996–2000	1997	1998	1999	2000	2001	2002	2003
Indonesia	Capital Inflows	3,457	6,624	-2,238	-424	-9,479	-4,990	-7,746	-7,188	-673	-951
	FDI	599	2,343	843	4,678	-241	-1,866	-4,550	-2,977	145	-597
	Portolio	-37	1,936	-641	-2,632	-1,878	-1,792	-1,909	-243	1,222	2,252
	Other	2,896	2,345	-2,440	-2,470	-7,360	-1,332	-1,287	-3,968	-2,040	-2,606
Malaysia	Capital Inflows	543	6,734	4,591	7,988	3,269	2,712	1,423	-945	4,096	1,399
	FDI	1,182	5,064	4,803	6,323	2,714	3,895	3,788	554	3,203	2,474
	Portolio	-128	-749	-654	-248	283	-892	-2,145	-666	-836	274
	Other	-511	2,419	441	1,912	272	-291	-220	-833	1,728	-1,349
Philippines	Capital Inflows	897	4,940	9,775	6,256	362	17,167	11,975	13,743	11,609	10,866
	FDI	497	1,147	1,632	1,260	2,212	1,725	1,345	982	1,792	319
	Portfolio	66	939	2,820	600	-325	7,681	1,019	1,449	2,281	880
	Other	334	2,854	5,323	4,396	-1,525	7,761	9,611	11,312	7,536	9,667
Singapore	Capital Inflows	5,749	12,483	27,698	54,346	-1,404	31,450	28,823	20,714	-277	11,409
	FDI	3,333	6,384	12,743	13,608	7,690	16,067	17,217	15,038	5,730	11,409
	Portfolio	208	779	463	-489	702	3,159	-2,036	187	-1,272	n.a.
	Other	2,208	5,320	14,492	41,227	-9,796	12,224	13,642	5,490	-4,735	n.a.
Thailand	Capital Inflows	4,482	16,426	-2,820	-7,604	-10,925	-9,766	-5,205	1,536	532	-532
	FDI	1,456	3,437	5,525	5,142	6,981	5,307	6,256	8,958	7,489	7,408
	Portfolio	459	2,574	1,573	4,598	338	-109	-546	-525	-694	356
	Other	2,567	10,416	-9,918	-17,344	-18,243	-14,964	-10,914	-6,897	-6,263	-8,296

Sources: FDI Data of Thailand are from Bank of Thailand, on-line database, available at www.bot.or.th and those of other countries are from UNCTAD, *World Investment Report*, available at http://www.unctad.org

Other forms of capital flows are compiled from IMF, *International Financial Statistics* (CD ROM).

Table 4.6
Shares (per cent) of FDI Inflows classified by Home Country, 1970–2003

	1970–5	1976–80	1981–5	1986–90	1991–5	1996–2000	1997	1998	1999	2000	2001	2002p	2003p
Japan	22.8	15.8	19.2	41.1	15.1	23.1	27.9	23.7	17.3	25.2	25.3	18.8	22.3
The US	39.6	16.5	20.7	10.3	11.0	17.7	18.1	22.6	14.6	16.4	10.1	5.0	4.4
The EU	11.5	9.0	13.8	8.1	8.7	18.5	11.9	20.0	34.0	15.4	14.9	15.3	9.0
NICs	10.5	18.1	15.3	22.3	22.7	12.2	17.4	12.0	8.3	10.7	4.0	3.7	7.8
- Hong Kong	10.0	17.9	14.8	12.7	19.0	8.1	12.0	8.1	5.3	7.0	2.4	1.9	6.1
-Taiwan	0.3	0.0	0.4	9.0	3.2	3.5	4.7	2.7	2.9	3.6	1.3	1.2	1.3
- Korea, PRC.	0.2	0.2	0.0	0.6	0.4	0.6	0.7	1.2	0.1	0.1	0.3	0.6	0.4
Others	15.6	40.6	30.9	18.3	42.5	28.5	24.7	21.7	25.7	32.3	45.7	57.2	56.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Value of FDI Inflows ($million)	115	285	508	1,456	3,437	5,525	5,142	6,981	5,307	6,256	8,958	7,489	7,408

Note: p= preliminary
Source: Bank of Thailand, on-line database, available at www.bot.or.th.

Direct investors from the NICs gained in relative importance in Thailand during the EP industrialization period. Between 1986 and 1995, the NICs were the second largest direct investors, accounting for 22.5 per cent, increasing from 17.1 per cent during the period 1970–85. Among the NICs, Hong Kong is the most important, accounting for 11.4 per cent of FDI inflows during the period 1970–2000. Between 2001 and 2003, its share declined slightly to 5.2 per cent.

The US investors were on par with Japanese ones during the period 1970–85, accounting for 24.7 per cent of total FDI inflows. While the dollar value of US FDI inflows increased, their share of total inflows has declined significantly to 10.7 per cent during the period 1986–95. This was a result of the sharp increase of FDI inflows from Japan and the NICs. From 1996 onward, the US direct investors resumed their relative importance, especially in the manufacturing sector. The share of US FDI to total FDI inflows increased to 16.7 per cent and declined to 6.7 per cent during the period 1996–2000 and 2001–3, respectively. More importantly, the US FDI inflows have increasingly been involved in the manufacturing sector. In the 1980s, 26.7 per cent of US FDI stock in Thailand was in the manufacturing sector. Its proportion increased to almost 40 per cent in the 1990s and to 50 per cent between 2001 and 2002. Machinery, electronic equipment and chemical industries are the major areas where US direct investors increased their involvement in Thai manufacturing (Table 4.7).

During the period 1970–95, patterns of direct investment from the EU are to some extent similar to those from the US. The relative importance of FDI from the EU steadily declined until the onset of the financial crisis, from 11.5 per cent during the period 1970–75 to 8.7 per cent during the period 1991–5. During the onset of the financial crisis, i.e. 1997–9, there were unusually high FDI inflows from the EU, compared to their historical trend over the past two decades, increasing to 22 per cent between 1997 and 1999.

Table4.7
Sectoral Composition (per cent) of US Affiliates in Thailand, 1982–2002

	1982–5	1986–90	1991–5	1996–2000	2001–2
Manufacturing	19.0	33.8	34.8	40.5	50.1
- Food and kindred products	0.5	1.3	2.7	1.4	0.5
- Chemicals and allied products	3.6	4.6	6.7	9.0	14.1
- Primary and fabricated metals	0.3	0.9	1.2	1.4	1.3
- Transportation equipment	0.0	0.0	0.0	1.4	0.9
- Machinery, electronic equipment and other manufacturing	14.6	27.0	24.3	27.3	33.2
Wholesale trade	4.1	7.4	8.4	7.3	0.0
Banking	4.9	7.1	8.7	8.7	0.0
Finance banking, insurance, and real estate	0.2	0.8	2.3	6.7	0.0
Services	0.9	1.4	1.8	0.8	0.0
Mining, petroleum and utilities	70.9	49.5	44.1	36.0	49.9
Total industries	100	100	100	100	100
Value of US FDI Stock ($million)	1,001	1,403	3,086	5,173	6,664

Source: Calculated from the US Bureau of Statistics, *US Investment Abroad*, various issues.

4.4 Manufacturing FDI

4.4.1. Trends and Patterns

Manufacturing FDI grew steadily from 1970 to the mid–1980s. The average annual value of manufacturing FDI inflows increased from $38 million in the 1970s to $126 million in the first half of the 1980s. Its annual growth rate during this period was 19 per cent. From then on, manufacturing FDI sharply increased to $676 million and almost $1 billion during the periods 1986–90 and 1991–5, respectively. The rapid increase of manufacturing FDI was not disrupted by the financial crisis in 1997. Its value continued to increase at an annual average of $2.5 billion between 1996 and 2003.

Over the past three decades, the manufacturing sector has been the largest destination of direct investment. It accounted for 31.9 per cent from 1970 to the present, followed by financial institutions (22.7 per cent) and trade (18.8 per cent) (Table 4.8).

From 1970 to the mid–1980s, manufacturing FDI accounted for less than 25 per cent of total FDI inflows, but from then on, it gained in relative importance its share increasing to almost 40 per cent of total FDI inflows in the 1990s. The influx of manufacturing FDI was a result of export-oriented labour-intensive FDI, especially from East Asian direct investors.[11] This increased importance of North East Asian NIC investors in Thailand was consistent with the experience of other Southeast Asian countries (Hill and Athukorala, 1998: p.33–4).

The sectoral breakdown of manufacturing FDI has coincided with the Thai industrialization process. Manufacturing FDI inflows from 1970 to the mid–1980s were mainly involved with import-substituting industries such as textiles, automobiles, and chemicals. FDI inflows to textiles, chemicals, electrical machinery and appliances, and foods and sugars accounted for 32.4, 16, 14.3 and 10.4 per cent, respectively, of total manufacturing FDI inflows between 1970 and 1980 (Table 4.8). A key incentive for manufacturing FDI inflows during this period was the highly-protected domestic market owing to an IS industrialization strategy. Manufacturing FDI inflows were typical market-seeking FDI (Akira, 1989). The highly-protected domestic market encouraged MNEs to establish affiliates in host countries and produce for the local market instead of producing in home countries and exporting to host countries.

From the mid–1980s onward, foreign firms shifted their interest from import-substituting industries to traditional labour-intensive manufacturing industries such as clothing, footwear, and toys classified in other manufacturing industries (Table 4.8). More recently, labour-intensive assembly activities in electrical machinery and electronic appliances have been the main attraction for foreign investors. The share of electrical machinery and electronic appliances in total manufacturing FDI inflows increased from 14.3 per cent in the 1970s to 30 per cent in the 1990s.

[11] See a full discussion below in Section 4.2.2.

Table 4.8

Sectoral Composition (per cent) of FDI Inflows in Thailand, 1970–2003

	1970–5	1976–80	1981–5	1986–90	1991–5	1996–2000	2001	2002p	2003p
Manufacturing	31.9	16.1	25.2	44.2	31.0	44.5	44.3	26.4	26.9
- Food & sugar	3.1	1.5	2.6	3.7	1.8	2.3	1.3	0.5	1.7
- Textiles	11.8	4.0	2.1	3.6	1.4	1.3	0.7	0.4	0.6
- Metal & non-metallic	1.5	0.7	2.9	5.3	2.7	5.3	4.3	4.2	3.2
- Electrical machiney & appliances	2.3	4.5	5.2	13.6	9.4	13.9	16.0	8.3	6.9
- Machinery & transport equipment	1.1	1.4	1.9	2.0	2.7	9.4	7.2	5.2	7.9
- Chemicals	5.3	2.5	2.9	6.0	4.9	5.2	4.4	3.2	1.9
- Petroleum products	5.2	0.7	6.4	2.4	2.6	2.5	6.6	0.5	0.1
- Construction materials	0.5	0.1	0.2	0.1	0.3	0.5	0.1	0.3	0.1
- Other manufacturing	1.1	0.8	1.0	7.5	5.0	4.0	3.6	3.6	4.7
Financial institutions	16.8	57.2	30.2	14.8	20.5	5.8	0.5	0.7	1.2
Trade	22.0	10.0	12.7	17.2	14.5	23.4	24.3	50.3	46.4
Construction	12.5	5.7	10.5	8.4	5.8	2.7	0.1	0.3	0.6

(contd.)

Table 4.8 (contd.)

	1970–5	1976–80	1981–5	1986–90	1991–5	1996–2000	2001	2002p	2003p
Mining & quarrying	9.3	3.3	14.3	1.8	2.8	1.4	21.0	2.6	2.3
Agriculture	0.2	0.5	0.4	1.6	0.4	0.0	0.0	0.0	0.3
Services	5.5	6.1	4.7	4.5	2.8	7.4	3.2	11.8	3.8
Investment & holding company	0.0	0.0	0.0	0.0	1.6	7.0	1.9	0.7	6.0
Real estate	1.9	1.0	2.1	7.0	19.8	5.4	1.6	1.3	3.1
Others	0.0	0.0	0.0	0.5	0.8	2.4	3.0	5.9	9.3
Total FDI inflows	100	100	100	100	100	100	100	100	100

Note: p= preliminary
Source: Bank of Thailand, on-line database available at www.bot.or.th

To indicate the level of FDI involvement in Thai manufacturing, we compiled data from unpublished returns to the Industrial Census 1997 (data for 1996) conducted by NSO. The year 1996 is chosen for the study because 1997–9 data are not 'normal' years, compared to the 1996 ones. The firm coverage of the survey for 1993–5 is rather incomplete. The census covers 32,489 plants, belonging to 126 four-digit industries of TSIC. Of these, 23,677 plants responded to the questionnaire. The census was cleaned up by firstly deleting plants which had not responded to one or more the key questions and which had provided seemingly unrealistic information such as the negative value added, no report of value of raw materials and capital stocks, or the initial capital stock of less than 1,500 baht. And then, 21 industries that are either to serve niches in the domestic market (e.g. processing of nuclear fuel, manufacture of weapons and ammunition), in the service sector (e.g. publishing of recorded media, building and repairing of ships) or explicitly preserved for local enterprises (e.g. manufacture of ovens, furnaces and furnace burners, manufacture of coke oven products, manufacture of bicycles and invalid carriages). Plants with employment of less than 10 workers are also excluded.

As has been identified by Ramstetter (2004), there are some duplicated records in survey return, presumably because plants belonging to the same firm filled the questionnaire using the same records. The procedure followed in dealing with this problem was to treat the records that report the same value of the nine key variables of interest in this study[12], are counted as one record. There are 4,900 such cases which reduced to 2,064 as a result of this screening. Thus, the final sample drop to 15,624 plants (1,510 foreign-owned and 14,114 domestic-owned plants) across 105 industries.[13] These plants accounted for 61.5 per cent of the Thailand's manufacturing value added and 36.5 per cent of manufacturing labour force in 1996.

[12] The nine variables are registered capital, number of male workers, number of female workers, sale value, values of (initial and ending periods) capital stocks, value of raw materials, wage paid and stock of raw materials.

[13]The number of domestically owned plants are higher than Ramstetter (2004), i.e. 8,672 plants. This is because Ramstetter (2004) focuses on plants with employment greater than 20 workers. There are approximately 6,000 plants with employment between 10-19 workers. Nevertheless, a number of duplicated records are at a comparable level. Ramstetter (2004) finds around 4,400 duplicated records, which have identical values of 9-10 key variables.

Information at the plant level is aggregated to the industry level in order to reveal the level of FDI involvement in Thai manufacturing.[14] Measured in all four aspects, i.e. gross output, value added, export and employment, FDI plays a vital role in Thai manufacturing. Almost 50 per cent of gross output was manufactured by foreign plants, accounting for 48.3 per cent of total manufacturing value added. Foreign plants tend to be more export oriented than local ones. The export values of foreign and local plants were 44.9 and 24.1 per cent, respectively, for total sales.[15] As a result, the level of FDI involvement measured in terms of exports was even higher than gross output and value added. Foreign plants accounted for 58.9 per cent of manufacturing exports. Nonetheless, in terms of employment share, FDI involvement became less important. Foreign plants accounted for 35 per cent of manufacturing employment. Their relatively lesser importance in terms of employment reflects the capital-intense nature of foreign firms widely observed in many developing countries.

4.4.2 Export-oriented Labour-intensive Manufacturing FDI

As seen above, there were massive manufacturing FDI inflows from 1986 to 2003. In this subsection, we investigate the BOI-promoted projects during the period 1989–98 to illustrate their characteristics. Although, as mentioned in Chapter 3, the BOI privileges granted for export-oriented projects were in effect between the mid–1980s and 2000, the period covered here misses some observations during the mid–1980s, due to the lack of available data. Nevertheless, the data set from 1989–98 is still able to shed light on the characteristics of these massive manufacturing FDI inflows.

In Table 4.9, the number of projects, capital investment, employment level, capital-labour ratio and percentage share of foreign ownership are compiled. Both the full sample and the export-oriented sub-sample (a firm whose export value was greater

[14] See details in Appendix 9.

[15] Similar to the information of foreign ownership, firms were asked to reveal their export-sale ratio by selecting one of these five options; zero per cent, 1-49 per cent, 50 per cent, 50–99 per cent and 100 per cent. To approximate the firm's export-sale ratio, we use the mid-point average. That is, the approximated export-sale ratio of firms who reveal in the range of 1–49 per cent and 50–99 per cent , are 25 per cent and 75 percent, respectively.

than 80 per cent of total sales)[16] are reported in order to examine whether the latter is different from the former. Three inferences can be drawn from this table. Firstly, there were sizable export-oriented projects receiving investment privileges from the BOI. 3,638 out of 7,961 projects, or 45.7 per cent of total projects, were export-oriented. Among the export-oriented projects, electronics was the most important item, accounting for 25.9, 45 and 34 per cent in terms of project numbers, capital investment and employment, respectively. It was followed by machines and parts, processed foods, electrical appliances, clothing and footwear, in terms of the number of projects and capital investment. Nevertheless in terms of employment, processed food, clothing and footwear were more important than machines and parts and electrical appliances. Note that the increased importance of export-oriented FDI is also found in cases of US affiliates. As mentioned, US manufacturing FDI has become increasingly important since 1986 (Table 4.8). Manufacturing FDI tends to exhibit a higher degree of export orientation than non-manufacturing FDI, with the former averaging 63.7 per cent of between 1986 and 2002, compared to 30.9 per cent for the latter (Table 4.10).

Secondly, these projects were labour intensive, compared with the rest of BOI-promoted projects. They accounted for only 20 per cent of total capital investment but 55.5 per cent of total employment. Thus, the capital labour ratio of these export-oriented BOI-promoted firms tends to be lower than that of the totally BOI-promoted ones. Even though electronics, electrical appliances, and machines and parts are widely regarded as high-technology and capital-intensive products, export-oriented firms in these industries have more or less the same level of capital-labour ratio as do products like clothing, toys, and processed foods.

Finally, there are systematic differences in the foreign equity holdings across industries. In general, the totally promoted projects exhibited lower foreign-equity holdings than export-oriented projects. This reflects the presence of restrictions on foreign ownership in domestic-market oriented projects (export-sale ratio less than 30 per

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[16]We recognize that this is a very high cut-off point, but the choice is dictated by data availability.

Table 4.9
Selected Indicators of BOI-Promoted Firms, 1989–98

Total BOI-promoted projects

	Number of projects	Total Capital Investment (billion baht)	Total Employment (1,000 workers)	Capital-labour Ratio (1,000 baht/worker)	Foreign Ownership (per cent)
Processed foods	166	19.2	95	202	26.8
Frozen seafood	83	10.5	45	233	29.9
Frozen food	10	1.2	5	228	44.4
Canned food	58	5.3	38	138	19.3
Canned pineapple	9	0.9	3	293	10.8
Frozen chicken	6	1.3	3	407	37.2
Clothing	173	11.3	103	110	45.2
Footwear	135	11.0	82	135	27.8
Toy	89	4.5	45	100	31.2
Electronics	1,086	346.1	448	773	73.2
Electrical appliances	208	40.2	54	745	63.3
Machines and parts	783	169.8	119	1,427	46.0
Total	7,961	3,640.2	2,164	1,682	36.8

(contd.)

Table 4.9 (contd.)
Export-oriented BOI-promoted projects

	Number of projects	Total Capital Investment (billion baht)	Total Employment (1,000 workers)	Capital-labour Ratio (1,000 baht/worker)	Foreign Ownership (per cent)
Processed foods	130	15.4	72,765	212	30.7
Frozen seafood	66	8.8	35,271	250	34.7
Frozen food	8	0.3	362	917	56.5
Canned food	42	4.2	31,983	131	22.0
Canned pineapple	8	0.7	1,864	396	13.8
Frozen chicken	6	1.3	3,285	407	37.2
Clothing	107	6.7	65,756	102	43.2
Footwear	96	8.7	64,449	136	45.6
Toy	78	4.0	42,318	95	31.9
Electronics	941	312.9	415,917	752	75.7
Electrical appliances	114	26.6	61,694	432	84.0
Machines and parts	215	28.8	43,375	665	76.7
Total	3638	719.4	1,201,848	599	62.4

Source: Compiled from BOI, *BOI Investment Statistics* (various issues).

Table 4.10

Export-sale Ratio (per cent) of US Affiliates in Thailand, 1986–2002

Period	Manufacturing			Total Industries		
	(1)	(2)	(2)/ (1)	(3)	(4)	(4)/ (3)
	Total Sales ($million)	Export ($million)	(per cent)	Total Sales ($million)	Export ($million)	(per cent)
1986	632	370	58.5	2,760	524	19.0
1987	850	546	64.2	3,391	718	21.2
1988	1,040	639	61.4	3,669	831	22.6
1989	2,132	1562	73.3	5,456	1,734	31.8
1990	2,555	1786	69.9	6,690	2,110	31.5
1991	2,836	2067	72.9	7,465	2,353	31.5
1992	2,811	1844	65.6	7,496	2,171	29.0
1993	3,104	1,900	61.2	8,171	2,215	27.1
1994	3,838	2,387	62.2	9,627	2,608	27.1
1995	5,086	2,929	57.6	12,520	3,202	25.6
1996	5,714	3,565	62.4	14,243	4,027	28.3
1997	5,763	3,622	62.8	14,745	4,644	31.5
1998	6,533	4,782	73.2	12,596	5,462	43.4
1999	9,539	5,701	59.8	14,566	5,965	41.0
2000	9,751	5,668	58.1	16,498	6,086	36.9
2001	10,491	6,461	61.6	17,530	6,938	39.6
2002	11,351	6,670	58.8	19,548	7,403	37.9
Average			63.7			30.9

Source: Calculated from the US Bureau of Statistics, *US Investment Abroad* (various issues).

cent). Furthermore, among export-oriented activities, it is clear that in the processed food industries and other traditional labour-intensive industries like clothing, footwear, and toy industries, they were unlikely to hold majority equity ownership. During the period 1989–98, the share of foreign equity was 31 per cent in processed foods. This figure is comparable to other labour-intensive industries like clothing (43.2 per cent), footwear (45.6 per cent), and toy industries (32 per cent), but far below the average of all other industries at 63 per cent. In contrast, the pattern of foreign-equity holding figures in these industries is far less than in electronics (84 per cent), machines and parts (77 per cent) and electrical appliances (84 per cent) industries.

The systematic differences in foreign ownership are consistent with those in previous studies (e.g. Rhee *et al.*,1984; Oman, 1988; Moran, 2002: p.5). The economic rationale behind the systematic differences is due to the fact that industries like the processed food, apparel, footwear, and toy industries are likely to involve relatively stable/mature production technology that is widely available. There is less need for local enterprises in these industries to share ownership and control with foreign investors in exchange for accessing advanced technology. This is different from industries like the automotive, electronics, electrical appliances, and machines and parts industries where production technology *per se* is a proprietary asset and is more likely to be subject to rapid changes.

4.5 Conclusions

This chapter has surveyed industrialization in Thailand and the role of MNEs over the past four decades. Generally, MNEs can be involved in host economies through both FDI and non-FDI channels. Because of the unavailability of non-FDI channel data, the discussion in this chapter mostly relates to the FDI channel. Over the past four decades, the Thai economy changed structurally from an agrarian to a more industrialized economy. Nowadays, the manufacturing sector dominates output and export. Nevertheless, the growth performance and contributions to the overall economy are different between IS (1960 to around the mid 1980s) and EP industrialization strategies. The latter strategy is more beneficial than the former in terms of output growth, employment generation and foreign exchange earnings.

MNEs, through the FDI channel, have been extensively involved in industrialization in Thailand for the past four decades. It seems clear that trends and patterns of MNE (FDI) involvement are different, partly influenced by the nature of the trade policy regime. FDI involvement, measured in terms of the value of FDI inflows, increased dramatically in the EP industrialization period, compared to that in the IS one. This finding in Thai manufacturing corroborates the theoretical postulation by Bhagwati (1978) and empirical findings in cross-sectional inter-country analysis

(Balasubramanyam and Salisu, 1991). Evaluated in 1996, FDI involvement accounted for around 50 per cent of manufacturing gross output and value added, and almost 60 per cent of manufacturing export. The degree of FDI involvement in Thai manufacturing is slightly less in terms of manufacturing employment.

In addition, FDI inflows in an EP industrialization period are likely to be more export oriented and labour intensive as illustrated by the pattern of BOI-promoted projects during the period 1986-2003. These are the areas where Thailand has a comparative advantage, thereby improving the resource allocation, enhancing the ability of foreign exchange earnings and promoting economic growth.

Appendix 9
MNE Involvement in Thai Manufacturing

Industry		Foreign Involvement (percentage of total firms)				Export Orientation	
		Output	Employment	Export	Value added	Foreign firms	Local firms
1511	Production of meat and meat products	42.1	27.5	59.9	40.7	75.9	36.8
1512	Processing and preserving of fish and fish products	34.5	25.2	37.4	33.7	85.0	75.2
1513	Processing of fruit and vegetables	26.3	32.5	28.2	21.2	77.0	69.7
1514	Manufacture of vegetable and animal oils and fats	12.8	29.1	3.2	25.3	1.0	4.3
1520	Manufacture of diary products	21.7	22.7	26.3	28.4	8.4	6.5
1531	Manufacture of grain mill products	6.1	6.3	5.3	6.2	37.1	42.8
1532	Manufacture of starches and starch products	34.8	32.2	42.4	41.0	65.5	47.7
1533	Manufacture of prepared animal feeds	18.5	14.9	21.6	19.8	5.3	4.4
1541	Manufacture of bakery products	9.9	7.6	68.7	10.3	71.2	3.5
1542	Manufacture of sugar	22.1	14.0	24.3	18.8	75.3	66.7
1543	Manufacture of cocoa, chocolate and sugar confectionery	44.4	33.9	51.0	42.7	26.5	20.3
1544	Manufacture of macaroni, noodles, couscous, and similar farinaceous products	26.3	13.8	31.0	19.9	34.3	27.3
1549	Manufacture of other food products	68.2	19.3	85.6	71.0	43.0	15.4
1554	Manufacture of soft drink; bottling of mineral waters	69.2	85.6	44.1	72.6	17.6	50.4
1600	Manufacture of tobacco products	5.3	8.9	18.4	2.8	87.4	21.5
1711	Preparation and spinning of textile fibres; weaving of textiles	59.0	48.4	67.5	56.9	44.4	30.8
1712	Finishing of textiles	36.3	22.0	55.9	37.7	29.3	13.2

(contd.)

Appendix 9 (contd.)

Industry		Foreign Involvement (percentage of total firms)				Export Orientation	
		Output	Employment	Export	Value added	Foreign firms	Local firms
1721	Manufacture of made-up textile articles, except apparel	63.9	15.9	49.1	78.0	11.3	20.8
1722	Manufacture of carpets and rugs	90.5	86.4	89.3	86.7	35.0	39.7
1723	Manufacture of cordage, rope, twine and netting	28.3	8.9	39.8	18.8	42.3	25.3
1729	Manufacture of other textiles n.e.c.	85.3	71.0	96.4	84.6	37.9	8.2
1730	Manufacture of knitted and crocheted fabrics and articles	46.1	31.8	40.4	62.5	30.7	38.7
1810	Manufacture of wearing apparel, except fur apparel	36.1	18.5	44.1	32.7	73.0	52.3
1820	Dressing and dyeing of fur, manufacture of articles of fur	44.7	33.6	72.8	42.9	89.6	27.1
1911	Tanning and dressing of leather	25.2	11.5	27.6	59.7	69.7	61.6
1912	Manufacture of luggage, handbags and the like, saddlery and harnesses	43.9	28.2	60.1	40.7	96.2	50.0
1920	Manufacture of footwear	33.7	24.7	47.4	30.7	85.4	48.2
2010	Sawmilling and planning of wood	16.1	7.5	44.9	23.3	69.2	16.3
2021	Manufacture of veneer sheets, manufacture of plywood, laminated board, particle board and other panels and boards	40.9	8.9	64.2	32.6	68.9	26.6

(contd.)

Appendix 9 (contd.)

Industry		Foreign Involvement (percentage of total firms)				Export Orientation	
		Output	Employment	Export	Value added	Foreign firms	Local firms
2022	Manufacture of builders' carpentry and joinery tools	6.4	4.3	0.0	6.5	0.0	13.3
2023	Manufacture of wooden containers	2.0	0.9	9.3	1.9	25.0	5.0
2029	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials	22.7	20.1	21.9	23.3	69.6	72.6
2101	Manufacture of pulp, paper and paperboard	60.1	21.7	81.1	77.3	27.3	9.6
2102	Manufacture of corrugated paper and paperboard and of containers of paper and paperboard	13.7	12.5	17.3	9.9	10.1	7.7
2109	Manufacture of other articles of paper and paperboard	58.4	36.5	85.2	57.5	40.3	9.8
2211	Publishing of books, brochures, musical books and other publications	19.6	9.5	96.6	24.7	49.3	0.4
2212	Publishing of newspapers, journals and periodicals	31.9	37.6	93.8	27.8	8.6	0.3
2219	Other publishing	0.2	0.3	0.0	0.2	0.0	0.7
2221	Printing	5.5	12.4	29.1	3.5	6.4	0.9
2222	Service activities related to printing	0.1	0.3	0.0	0.1	0.0	0.0
2230	Reproduction of recorded media	38.0	27.9	0.0	36.5	0.0	1.1
2320	Manufacture of refined petroleum products	49.3	59.6	50.2	37.2	24.6	23.7

(contd.)

Appendix 9 (contd.)

Industry		Foreign Involvement (percentage of total firms)				Export Orientation	
		Output	Employment	Export	Value added	Foreign firms	Local firms
2411	Manufacture of basic chemicals, except fertilizers and nitrogen compounds	38.7	49.7	64.2	42.5	40.1	14.1
2412	Manufacture of fertilizers and nitrogen compounds	18.5	5.2	27.5	15.1	24.5	14.7
2413	Manufacture of plastics in primary forms and of synthetic rubber	56.9	53.4	64.7	55.4	31.7	22.9
2421	Manufacture of pesticides and other agro-chemical products	49.0	44.4	46.1	48.7	13.8	15.5
2422	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	77.7	54.7	82.0	89.1	10.0	7.6
2423	Manufacture of pharmaceuticals, medicinal chemicals and botanical products	21.5	18.8	36.2	21.4	37.7	18.2
2424	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	69.4	49.6	90.1	75.2	23.9	6.0
2429	Manufacture of other chemical products n.e.c.	63.3	26.2	72.4	65.8	41.4	27.3
2430	Manufacture of man-made fibres	84.7	59.9	92.5	89.5	50.7	22.9
2511	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres	67.5	35.4	59.1	72.9	33.4	48.0
2519	Manufacture of other rubber products	34.3	39.4	36.9	34.8	73.7	65.9
2520	Manufacture of plastic products	34.6	28.0	51.5	35.8	48.5	24.2
2610	Manufacture of glass and glass products	70.4	49.2	72.2	72.5	26.6	24.4

(contd.)

Appendix 9 (contd.)

Industry		Foreign Involvement (percentage of total firms)				Export Orientation	
		Output	Employment	Export	Value added	Foreign firms	Local firms
2691	Manufacture of non-structural non-refractory ceramic ware	29.3	26.4	51.3	27.9	51.0	20.1
2692	Manufacture of refractory ceramic products	52.4	26.7	59.7	63.0	26.5	19.7
2693	Manufacture of structural non-refractory clay products	2.4	2.2	6.0	2.0	36.8	14.2
2694	Manufacture of cement, lime, and plaster	22.3	16.2	28.1	22.0	25.1	18.5
2695	Manufacture of other non-metallic mineral products n.e.c.	23.1	8.0	11.0	17.2	2.2	5.3
2696	Cutting, shaping and finishing of stone	6.6	7.5	0.0	5.4	0.0	1.7
2699	Manufacture of other non-metallic mineral products n.e.c.	7.2	8.1	75.1	5.4	45.9	1.2
2710	Manufacture of basic iron and steel	24.2	20.9	25.0	34.4	13.5	13.0
2720	Manufacture of basic precious and non-ferrous metals	50.8	38.9	69.6	42.9	20.0	9.0
2731	Casting of iron and steel	65.0	43.4	79.2	61.8	10.2	5.0
2732	Casting of non-ferrous metals	22.6	15.8	52.7	20.5	22.1	5.8
2811	Manufacture of structural metal products	62.9	28.2	85.6	49.4	40.1	11.4

(contd.)

Appendix 9 (contd.)

Industry		Foreign Involvement (percentage of total firms)				Export Orientation	
		Output	Employment	Export	Value added	Foreign firms	Local firms
2812	Manufacture of tanks, reservoirs and containers of metal	55.8	65.1	45.5	63.8	13.2	20.0
2891	Forging, pressing, stamping and roll-forming of metal; powder metallurgy	80.4	18.3	92.1	67.1	20.1	7.0
2892	Treatment and coating of metals; general mechanical engineering on a fee or contract basis	84.8	31.8	97.3	86.0	4.7	0.7
2893	Manufacture of cutlery, hand tools and general hardware	47.2	36.7	72.5	48.3	51.0	17.3
2899	Manufacture of other fabricated metal products n.e.c.	51.0	29.2	72.1	50.5	44.8	18.1
2912	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines	50.9	27.0	70.6	55.7	51.7	22.3
2913	Manufacture of bearings, gears, gearing and driving elements	92.9	83.5	100.0	94.2	78.8	0.0
2915	Manufacture of lifting and handling equipment	86.6	49.8	99.3	84.2	44.1	2.1
2919	Manufacture of other general purpose machinery	77.0	47.5	91.1	66.0	66.9	21.8
2921	Manufacture of agricultural and forestry machinery	4.2	1.7	27.2	3.7	77.8	9.1
2922	Manufacture of machine-tools	67.2	56.8	92.7	72.6	63.5	10.3

(contd.)

Appendix 9 (contd.)

Industry		Foreign Involvement (percentage of total firms)				Export Orientation	
		Output	Employment	Export	Value added	Foreign firms	Local firms
2924	Manufacture of machinery for mining, quarrying and construction	23.9	7.8	78.1	34.8	68.4	6.0
2925	Manufacture of machinery for food, beverage and tobacco processing	1.7	1.4	0.0	2.6	0.0	10.4
2926	Manufacture of machinery for textile, apparel and leather production	75.5	77.6	88.5	72.9	55.8	22.5
2929	Manufacture of other special purpose machinery	72.2	37.4	76.3	63.7	72.8	58.6
2930	Manufacture of domestic appliances n.e.c.	86.7	65.7	96.6	79.2	52.8	12.0
3000	Manufacture of office, accounting and computing machinery	98.9	94.7	99.1	97.0	91.3	71.4
3110	Manufacture of electric motors, generators, and transformers	61.4	48.8	74.1	66.6	39.1	21.8
3120	Manufacture of electricity distribution and control apparatus	89.1	61.9	92.1	92.8	83.0	57.9
3130	Manufacture of insulated wire and cables	86.4	80.9	69.9	91.3	13.0	35.5
3140	Manufacture of accumulators, primary cells and primary batteries	83.4	62.5	94.8	87.6	78.1	21.5
3150	Manufacture of electric lamps	44.6	30.2	72.7	42.8	74.4	22.4
3190	Manufacture of other electrical equipment n.e.c.	79.9	67.7	90.5	87.1	46.7	19.5

(contd.)

Appendix 9 (contd.)

Industry		Foreign Involvement (percentage of total firms)				Export Orientation	
		Output	Employment	Export	Value added	Foreign firms	Local firms
3210	Manufacture of electronic valves and tubes and other electronic components	97.0	93.2	98.2	96.3	85.0	51.9
3220	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy	81.2	52.6	91.1	72.6	80.7	34.2
3230	Manufacture of television and radio receivers and associated consumer goods	90.2	81.2	98.8	88.5	76.8	8.4
3311	Manufacture of medical and surgical equipment and or orthopaedic appliances	71.8	50.9	88.2	68.8	72.5	24.6
3320	Manufacture of optical instruments and photographic equipment	91.9	72.1	93.6	92.3	97.2	74.5
3330	Manufacture of watches and clocks	94.0	86.3	94.7	94.7	80.6	71.8
3410	Manufacture of motor vehicles	96.5	85.4	99.6	98.3	25.0	2.7
3420	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	66.5	18.4	86.2	54.7	20.1	6.4
3430	Manufacture of parts and accessories for motor vehicles and their engines	58.4	28.8	80.2	53.9	33.1	11.4
3591	Manufacture of motorcycles	52.2	26.7	79.5	58.6	25.4	7.1
3610	Manufacture of furniture	29.6	15.5	47.7	29.0	69.5	32.0
3691	Manufacture of jewellery and related articles	54.7	42.6	60.8	56.7	87.4	67.9
3693	Manufacture of sports goods	94.3	90.9	98.5	92.0	89.0	23.0
3694	Manufacture of games and toys	25.0	18.7	36.1	31.1	83.8	49.6
3699	Other manufacturing n.e.c.	57.6	27.7	72.1	50.9	92.9	48.8
average		47.8	34.9	58.9	48.3	44.9	24.1

Source: See the text

Chapter 5: The FDI-Growth Nexus in the Thai Manufacturing Sector

This chapter probes the FDI-growth nexus in the manufacturing sector. As mentioned in Chapter 2, while FDI has been widely recognized as a growth-enhancing factor in developing countries, its effect is not automatic but depends on trade policy regimes in host countries, as postulated by the 'Bhagwati hypothesis'. The growth enhancing effect of FDI is likely to be far less, or even negative, under an IS regime compared to a policy regime geared to EP. To examine the growth-enhancing effect of FDI, the growth equation is estimated by applying the co-integration technique to time series data for the period 1970–2002. Three alternative indices of trade openness, (i.e. the trade to goods GDP, the export-gross output ratio in the manufacturing sector and the incidence of applied tariff rates in the manufacturing sector), are used in order to test the sensitivity of results on these indices.

The analysis in this chapter is expected to provide a broad indicator of the impact of FDI on Thai manufacturing. In addition, despite the immense policy relevance, so far only a few studies have undertaken to test the role of the trade policy regime empirically (e.g. Balasubramanyam *et al.*, 1996; Athukorala and Chand, 2000). While these studies generally provide strong support for the hypothesis in the context of inter-country cross-sectional analysis, the analysis is subject to two caveats. Firstly, there are also vast differences among countries with respect to the nature and quality of data, which makes cross-country comparison a rather risky business. Secondly and more importantly, the cross-sectional approach cannot capture the dynamic effects of a shift from an IS regime towards an EP regime. With the failure of an IS regime, developing countries moved towards an EP regime with different speed. Such a dynamic aspect cannot be properly captured by cross-sectional analysis.

This chapter is organized as follows: Section 5.1 presents the empirical model used to examine the FDI-growth nexus. It is followed by a discussion of the data and the econometric method in Section 5.2. The results are presented and discussed in Section 5.3. The final section presents key inferences and policy implications.

5.1 The Model

The empirical model in this chapter involves estimating a growth equation derived in the context of the new growth theory, which provides for capturing the impact of FDI interactively with economic openness on the growth-enhancing effect. The starting point of model formulation is the aggregate production function of the manufacturing sector.

$$Y = f(A, L, K, H) \tag{5.1}$$

where Y = Manufacturing output
L = Manufacturing employment
K = Physical capital stock of the manufacturing sector
H = Human capital stock of the manufacturing sector.
A = Total factor productivity (TFP) of the manufacturing sector

In equation 5.1, manufacturing output is a function of factor inputs consisting of labour (L), and two types of capital —human and physical capital, denoted by H and K, respectively. The effect of technological changes is aggregated and represented by total factor productivity (A).

As argued in Chapter 2, FDI could directly affect output through increasing K as well as creating an impact on A in the host country. To capture the effect of FDI on manufacturing growth, K is composed of domestic and foreign physical capital stock, denoted by K_D and K_F, respectively. Firstly, FDI inflows increase K_F and enlarge the capital stock. This leads to output expansion. In addition, since *FDI* is associated with advanced technology, an increase in K_F potentially enhances the technological capability of the manufacturing sector and positively affects A. All other things being equal, this will also enhance output growth.

Nevertheless, the net growth impact of FDI depends on the nature of the trade policy regime. The key hypothesis is that the more open the trade regime, the greater the impact of FDI on output growth. In an IS regime, FDI (as well as domestic investment) takes place in sectors predominately characterized by high capital intensity in production where the host country does not have a comparative advantage. An increase in FDI inflows could result in immiserizing growth. Moreover, FDI becomes an avenue for foreign companies to maintain a market share and reap extra profit from economic rent, created by the highly-protected domestic market. Such a regime also provides incentives for rent seeking and directly unproductive profit seeking (DUPS) activities. These seems to be less FDI technology spillover under an IS regime. Under this regime, FDI inflows are directed to industries where proprietary assets are important.[1] This creates barriers to entry for local firms and thus constrains technology and efficiency spillovers. Moreover, the protection generated by an IS regime is likely to limit local competition, which is an important factor in stimulating firms to update new technologies in both production and management, and enhances their own productivity. Furthermore, it is more likely that the entry of an MNE affiliate creates a 'market-stealing' effect that adversely affects the productivity of local firms.

In contrast, the main incentives for FDI under an EP regime in a given host country are the relatively low-labour costs and/or the availability of raw materials. This allows foreign investors to operate in an environment that is relatively free from distortion, and leads to output expansion in internationally competitive and export-oriented product lines. Hence, FDI inflows are unlikely to result in immiserizing growth. Moreover, the production of firms in an EP regime is not limited by the size of the domestic market and has the potential to reap economies of scale through international

[1]Proprietary assets are defined as those that can differentiate productivity between firms that own them and those that do not. They can generate profit; other firms cannot quickly or effectively imitate (Caves, 1996).

market penetration. Besides, an EP regime is more conducive to generating favourable spillover effects because FDI is mostly attracted to industries in which the country has comparative advantage. In such industries, there is a greater potential for local firms to catch up with foreign firms and achieve productivity improvement. This generates healthy competition among foreign and local firms that encourages them to keep maintaining their competitiveness in subsequent following periods. All in all, it positively affects output growth.

Thus, in order to capture the total impact of FDI on output growth, both K_F and the interaction term between K_F and a proxy variable for the openness of trade policy regimes (*TP*) are incorporated in the equation.

$$Y = F\,(L,\, H,\, K_D,\, K_F,\, K_F{*}TP) \qquad (5.2)$$

The impact of FDI on output growth depends on both K_F as well as *TP*.

Since reliable data series on domestic and foreign capital stocks in the manufacturing sector are not available for Thailand, the ratio of gross fixed capital formation in the manufacturing sector, net of FDI ($GFCF_N$) to GDP, is employed to represent K_D in this study. This proxy variable has been used in numerous previous studies (e.g. Barro, 1999; Balasubramanyam *et al.*, 1996). Similarly, K_F is proxied by the ratio of manufacturing FDI inflow to manufacturing output. Owing to the lack of an appropriate direct measure of human capital stock, *H* is proxied by public education and research expenditure as a ratio of gross national income (GNI), as has been done in several empirical studies (e.g. McMahon, 1998; Sylwester, 2000). While there are alternative measures such as primary or secondary school enrolment ratios, the choice made here is constrained by data availability for the period under study., i.e. 1970-2002. In addition, since the size of the public sector in Thailand has remained more or less the same around 17 per cent of GDP over the same period,[2] the ratio of public education and research expenditure would be a reasonable proxy of human capital development in Thailand.

As discussed in Chapter 3, there is no unique measure of the openness of the trade policy regime.[3] This study uses three alternative proxies: (a) the ratio of total merchandise trade (import + export) to goods GDP, which is total GDP net of value added in construction and services sectors, (*OPEN1*); (b) the ratio of export to gross output in the manufacturing sector (*OPEN2*); and (c) the ratio of incidence of applied tariff rates, the proportion of total tariff revenue to total imports of the manufacturing sector (*OPEN3*). These three alternatives are introduced to examine the sensitivity of results due to the proxies for the trade policy regime.

The first measure is superior to the widely-used trade to GDP ratio, i.e. degree of openness because the inclusion of non-traded activities (construction and services) as part of the denominator could lead to an under-estimation of exposure to foreign trade of the given economy (Rivera-Batiz and Rivera-Batiz, 1994). This point is particularly relevant in Thailand where construction and financial services recorded rapid growth during the latter part (from the late 1980s) of the period under study. The second measure is based on the premise that greater openness is a prerequisite for successful world market penetration in manufactured goods. In other words, export success in manufacturing is likely to occur under a policy regime where policies are more neutral and allow the market mechanism to effectively indicate the country's comparative advantage (Edwards, 1993). The third openness measure is simply the weighted average actual tariff in the manufacturing sector. The higher the tariffs, the lower the degree of openness.

Therefore, the estimating equation used in the empirical analysis is

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[2] The size of public sector is measured here by the per cent of the sum of public consumption and investment to GDP. There is no significant variation between the 1970s, 1980s and 1990s.

[3] For a succinct discussion of various measures of openness and a detailed listing of related references, see Edwards (1998).

$$Y_t = \alpha + \beta_1 L_t + \beta_2 K_{Dt} + \beta_3 H_t + \beta_4 K_{Ft} + \beta_5 (K_{Ft} * TP_t) \qquad (5.3)$$

where Y = Manufacturing output (in log form)

L = (+) Labour force in the manufacturing sector (in log form)

K_D = (+) Gross fixed capital formation ($GFCF_N$) net of FDI of the manufacturing sector as a percentage of manufacturing output

H = (+) Public education and research expenditure as a percentage of gross national income (GNI)

K_F = (+/-) Foreign direct investment in the manufacturing sector as a percentage of manufacturing output

TP = Openness of the trade policy regime, proxied alternatively by

(+) (1) *OPEN1* = Ratio of total merchandise trade to goods GDP

(+) (2) *OPEN2* = Export-gross output ratio in the manufacturing sector

(-) (3) *OPEN3* = Incidence of applied tariff rates of the manufacturing sector

t = Time subscript.

ε = Stochastic error term

The sign expected for the regression coefficient is given in brackets.

The coefficients β_1, β_2 and β_3 represent output elasticity with respect to labour, (domestic) physical capital, and human capital, respectively. Hence, they all are expected to be positive. The impact of FDI on growth (Y) is given by the partial derivative of Y in (5.4) with respect to K_F, i.e.

$$\frac{\partial Y}{\partial K_F} = \beta_4 + \beta_5 * TP \qquad (5.4)$$

To test the relevance of the hypothesis, the statistical significance of β_5 is examined. Under the Bhagwati hypothesis, the sign of β_5 is expected to be positive for *OPEN1* and *OPEN2* and negative for *OPEN3*. That is, the contribution of FDI to growth will be an increasing function of *OPEN1* and *OPEN2,* and a decreasing function of *OPEN3*. The sign of β_4 is ambiguous and can be positive or negative, depending on the nature of the trade policy bias over the entire sample period. Even when β_4 is negative, it does not imply that the FDI contribution is negative. Whether its contribution is negative or not depends on the size of the coefficient of the interactive term of FDI and the trade policy regime, β_5, compared to β_4.

5.2 Data

The model is estimated using annual data for the period 1970–2002. The full data set are reported in Appendix 10. Data on manufacturing output and gross fixed capital formation (GFCF) are obtained from the *National Income Accounts*, National Economic and Social Development Board (NESDB) of Thailand. These data are in real terms at 1988 prices. FDI inflows, exchange rates, tariff revenue, and international trade are from the *Bank of Thailand Quarterly Bulletin,* the Bank of Thailand (BOT). Data series of FDI inflows are deflated to in terms of 1988 prices by investment price deflators.

The data on the work force come from the *Key Indicators of Developing Asian and Pacific Countries*, the Asian Development Bank (ADB). The *OPEN1* variable, the ratio of total merchandise trade to goods GDP, and the percentage of public education and research expenditure to Gross National Income (GNI) are obtained from *World Development Indicators*, The World Bank.

The statistical summary and correlation matrix of these variables are given in Table 5.1 and 5.2, respectively. Output and FDI seem to exhibit a high correlation in the manufacturing sector. The correlation coefficient between manufacturing output and the share of manufacturing FDI is 0.64. Nevertheless, when manufacturing output and FDI are plotted together in Figure 5.1, it clearly indicates the correlation between output and

FDI is likely to be increasing as the trade policy regime in Thailand become more liberal, as postulated by the Bhagwati hypothesis.

Table 5.1
Statistical Summary of Data used in the Regression Analysis

	Measurement units	Mean	Min	Max	SD
Manufacturing value added (*Y*)	(log) million baht	12.8	11.3	14.0	0.9
Manufacturing employment (*L*)	(log) 1,000 workers	7.8	6.5	8.5	0.6
FDI as a percentage of Y(K_F)	[log(1+proportion)]	0.03	0.008	0.076	0.02
Gross domestic capital formation net of FDI as a percentage of *Y* (K_D)	[log(1+proportion)]	0.126	0.012	0.199	0.052
Public education and research expenditure as a percentage of Gross National Income *(H)*	[log(1+proportion)]	3.0	2.3	3.5	0.4
Merchandise trade to goods GDP *(OPEN1)*	per cent	114.9	62.5	212.0	43.9
Export-output ratio (*OPEN2*)	per cent	20.7	0.9	57.0	18.4
Incidence of applied tariff in manufacturing (*OPEN3*)	per cent	12.9	4.5	20.6	4.9

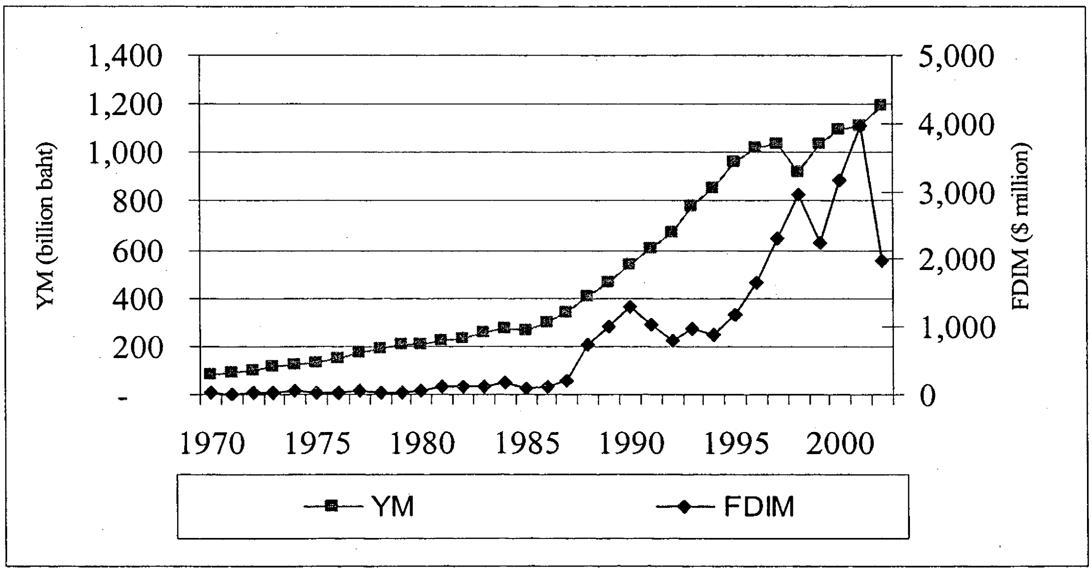
Notes: Mean = simple average; Min = minimum; Max = maximum; SD = standard deviation
Source: Author's calculation; see full data set in Appendix 10

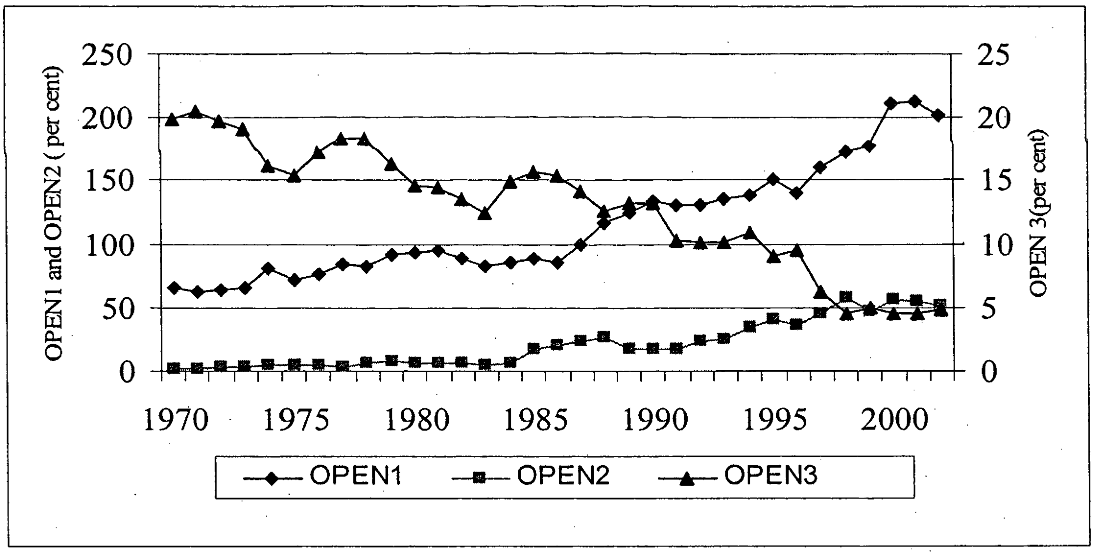
Table 5.2
Correlation Matrix of Data used in the Regression Analysis

	Y	*L*	K_F	K_D	*H*	*OPEN1*	*OPEN2*	*OPEN3*
Y	1.00							
L	0.97	1.00						
K_F	0.64	0.59	1.00					
K_D	-0.15	-0.16	-0.42	1.00				
H	0.87	0.86	0.53	-0.31	1.00			
OPEN1	0.92	0.88	0.79	-0.42	0.79	1.00		
OPEN2	0.91	0.86	0.74	-0.42	0.83	0.95	1.00	
OPEN3	-0.94	-0.92	-0.72	0.40	-0.86	-0.95	-0.93	1.00

Note: see variable notation in Table 5.1
Source: Author's calculation; see full data set in Appendix 10

Figure 5.1
Manufacturing FDI (FDI_M), Output (Y_M), Trade to goods GDP (OPEN1), Export-gross output Ratio (OPEN2) and Incidence Tariff of Manufactured Goods (OPEN3), 1970–2002





Source: See the text.

5.3 Estimation Methods

Conventionally, the standard regression procedure to examine a linear relationship between a pair of random variables X and Y uses the Ordinary Least Squares (OLS) method in the following linear relation, $Y = \alpha + \beta X$. R^2 and the standard t-test of the OLS regression are used to evaluate the overall fit and the statistical significance of estimate. The standard regression procedure is based on the assumption that the data series are stationary. That is, data series grow over time in a fairly steady, constant manner, reflecting smoothly evolving economic forces. In this sense, fluctuations in the series are taken to imply the influence of cyclical or temporary factors, and eventually the series return to their trend growth values. Therefore, the mean, variance, and co-variances of the series tend to remain constant over time.

However, most economic data series are not stationary around a deterministic trend. They have stochastic trends so that some shocks that affect a series will have a permanent effect on the level of the series. This makes the series "wander" without a tendency to revert to mean value. Thus, the mean, variance, and co-variances of the series tend to vary over time. Pursuing the standard regression procedure is likely to lead to the possibility of a Type I error, i.e. accepting the relationship as significant when in fact the two data series are uncorrelated. In other words, the standard regression procedure will produce so-called 'non-sense correlation' or 'spurious regression'.[4]

To guard against the possibility of estimating 'spurious regression', the first step of the estimation process was to examine the time series properties of the data series. The Dickey-Fuller (DF) for unit roots is employed for this purpose. To conduct the DF test for unit roots of X, the variable under consideration, the statistical significance of γ in equation (5.5) is examined with the null hypothesis that γ is equal to zero (X is non-stationary). If the null hypothesis is rejected, X is stationary and vice versa.

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[4]This concept was pioneered by Yule (1926) and re-emphasized by Granger and Newbold (1974).

$$\Delta X_t = a_0 + \gamma X_{t-1} + a_2 t + \sum_{i=2}^{p} \beta_i \Delta X_{t-i+1} + \varepsilon_t \tag{5.5}$$

where t = Time trend

ε_t = Disturbance terms

p = Lag length on the lagged dependent variable

The terms a_0 and a_2 are dropped from the regression if they are statistically insignificant.[5] The lag length (p) is determined by the Atiken Information Criterion (AIC) to ensure residual whiteness.

Table 5.3 reports the unit root tests of all variables. It indicates that all variables to be used in equation (5.3) are integrated processes of order 1 or I (1). That is, the data series in level accepted the null hypothesis at the 5 per cent level of statistic significance or better. The series are non-stationary. But the first difference of all these variables rejected the null hypothesis at the 5 per cent level of statistic significance. All data series are integrated processes of order 1 or I (1). This set of variables, which is taken together on the basis of economic theory, has the potential to form a co-integrating vector. The coefficient from the co-integration relationship can directly be interpreted as the equilibrium (long-term steady-state) relationship. Therefore, the model is estimated using the co-integration technique.

Table 5.3
Dickey-Fuller Test for Unit Roots, 1970–2002

Variables	t-statistics for *I(0)*	t-statistics for *I(1)*
Y	-3.06(4)	-3.76 (0)
L	-2.94(0)	-3.78 (0)
K_F	-2.04(0)	-3.33 (3)
K_D	-1.72 (0)	-5.40 (0)

(contd.)

[5]See Chapter 4 of Enders (1995) for a comprehensive discussion.

Table 5.3 (contd.)

Variables	t-statistics for *I(0)*	t-statistics for *I(1)*
H	-1.23 (0)	-4.92 (0)
OPEN1	-1.23 (4)	-3.60 (1)
OPEN2	-2.69 (3)	-6.58 (0)
OPEN3	-3.10 (0)	-5.16 (0)

Notes: (1) The t-statistic reported is the t-ratio on γ in equation (5.5) in text.
(2) The null hypothesis of non-stationary *I(1)* is accepted for all variables at the 5 per cent level of significance.
(3) Figures in parentheses indicate the order of augmentation required to obtain residual whiteness.
Source: Author's calculation

Two alternative co-integration methods are used in this study, i.e. the Engle-Granger (EG) method and the fully modified OLS estimator proposed by Phillips and Hansen (1990). On the one hand, Engle and Granger (1987) propose a constructive two-stage approach to modeling economic relationships involving non-stationary variables. The first stage involves modeling the long-run or co-integrating relationship. All the data are estimated by OLS. If the residual of this estimated regression is found to be stationary (in terms of the DF test without a constant term and time trend in equation 5.5 above), then the coefficients of the regression can be interpreted as representing a long-run (steady-state) relationship. The OLS estimator of these non-stationary variables possesses the large sample property of consistency and is highly efficient, i.e. super consistent.[6] In the second stage, the short-run relationship, error-correction mechanism, is modeled. First differences of all variables and the lagged residuals of the first stage (co-integrating) regression are estimated by OLS. Since all variables are *I (1)*, the first differences are stationary and the standard tests are applicable.

Although the EG method from the co-integrating regression possesses the large sample property of consistency and is highly efficient, they are still biased in small samples. Particularly, in the small sample, omitted dynamic terms are captured in the

[6]The estimator converges to the true value at a rate faster than in normal asymptotics (Engle and Granger, 1987).

residual, which will consequently be serially correlated for the OLS estimate (Harris, 1995). In this case, the OLS estimator has an asymptotic distribution, which is non-normal and is affected by nuisance parameters. This makes statistical inference difficult since the standard t-statistics will not be valid asymptotically (Phillips and Durlarf, 1986). Therefore, in this study, the fully modified OLS estimator proposed by Phillips and Hansen (1990) is employed.

The fully modified OLS estimator or Phillips-Hansen (PH) procedure is an optimal single-equation technique, which is asymptotically equivalent to maximum likelihood. It applies a semi-parametric correction to the standard OLS procedure to avoid estimation of nuisance parameters and to give median-unbiased t-statistics, which asymptotically follow a standard normal distribution. Interestingly, comparative Monte Carlo studies of co-integrating techniques have found the PH procedure an appropriate estimation procedure in dealing with small data samples (Phillips and Loretan, 1991; and Inder, 1993).

In theory, the maximum likelihood method (a full parametric correction) proposed by Johansen (1988) is superior to the PH procedure because, under the Johansen method, the unit roots are explicitly incorporated in the specification. It also takes into account short-run dynamics in estimating the co-integrating vector, and additionally provides for testing for the existence of more than one co-integrating vector. Meanwhile, the PH procedure yields little improvement on the precision as well as the bias of the estimator, particularly when the lagged dependent variables are included. Moreover, in the large sample, the t-statistics perform poorly (Inder, 1993).

However, the small-sample properties of the Johansen method are still unknown. Moreover, recent applications of this technique have encountered some practical difficulties (Hall, 1991). The first problem is that the criteria to determine the number of co-integration relations, such as trace, determinant, and eigen value, are very sensitive to the choice of lag length for the VAR (Vector Autoregressive). The results are also highly sensitive to the VAR orders selected. Severe collinearity may emerge between some of the regressors, particularly when dealing with VARs of reasonable size. This in turn renders the point estimates of the long-run elasticities even more sensitive to the choice of lag specification. Finally, there are no economic reasons to suggest more than one co-integration vector for the variables under study. With these reasons, the PH procedure is preferred in this study. Note that, since the main interest here is in the long-run relationship postulated by the 'Bhagwati hypothesis', estimating short-run dynamics is not intended.

5.4 Results

The regression results are reported in Table 5.4. Note that the model has been estimated for the entire sample period (1970–2002) as well as for the pre-crisis period (1970–96). This was done in order to examine the sensitivity of the results to economic disturbances created by the crisis. The results are similar, apart from minor differences relating to the size of some coefficients. The discussion in this section focuses on the estimate for the entire period. The three alternative measures of *TP* yielded basically comparable results. The following discussion focuses on the results based on the export-output ratio in manufacturing (*OPEN2*). This choice was made on the basis of the superior stationary property of the regression residual.

Results based on the two alternative estimation methods (EG and PH procedures) are reported with the corresponding unit root tests for the residuals (Table 5.4). In terms of the DF test, the residuals are stationary in both cases and therefore the estimated equations can be interpreted as long-run relationships. The coefficient estimates from both methods are strikingly similar. The following discussion focuses only on the equation estimated using the methodologically more robust PH procedure.

The estimate of β_5 (the coefficient attached to *TP*FDI*) is significantly different from zero with the theoretically expected sign, providing support for the 'Bhagwati hypothesis'. That is, the growth impact of FDI on the Thai manufacturing sector seems to have been significantly enhanced as the country's trade policy regime shifted the emphasis from an IS to an EP regime. Moreover, the significant and negative sign of β_4 implies the FDI inflows could have even generated a negative effect on the growth performance of the economy under an IS regime. Evaluating the average value of *OPEN2* (20.65 per cent) over the past three decades, the contribution of FDI impacted positively on the growth performance of Thai manufacturing. The positive effect amounted to about 0.4 per cent of average annual growth during this period.

The results are consistent with the general inference of previous studies that the contribution of FDI to the overall performance of the Thai manufacturing sector was not significant during the 1970s and early 1980s (e.g. Tambunlerchai, 1975; Santikarn 1981; Pongpisanupichit, 1985; Akira, 1989). Under an IS regime, high domestic trade protection attracted foreign investors mostly to share economic rents with local firms. Manufacturing FDI inflows during the 1970s and early 1980s were mostly involved with import-substituting industries such as finished consumer goods, textiles, automobiles, and chemicals. The nature of manufacturing FDI during this period was typical market-seeking FDI. Foreign investors established affiliates to enjoy the domestic market growth under tariff protection as well as investment promotion privileges. In such industries, local firms were unlikely to participate equally in the market (Akira, 1989).

Furthermore, the highly-protected domestic market encouraged local firms to produce products not directly competitive with those produced by foreign affiliates. In such an environment, foreign affiliates may operate in 'enclaves' in isolation from local firms (Kokko, 1994). This was evident in the textile and tyre industries (Akira, 1989: p.185; Jongwanich, 1999).

Table 5.4
Long-run Determinants of Manufacturing Growth, 1970–2002

(A) Estimation Period 1970–2002

	TP = OPEN 1		TP = OPEN 2		TP = OPEN 3	
	EG	PH	EG	PH	EG	PH
INTP	3.56 (5.89)	3.29 (7.58)	3.38 (5.79)	3.22 (8.07)	3.85 (5.55)	3.75 (7.86)
L	0.99 (8.41)	1.05 (12.67)	1.03 (9.06)	1.09 (14.29)	0.97 (7.78)	1.01 (11.80)
K_D	3.09 (3.49)	3.46 (5.89)	3.08 (3.38)	3.62 (6.40)	3.35 (3.37)	3.87 (5.93)
H	0.35 (2.35)	0.26 (2.60)	0.29 (1.91)	0.16 (1.64)	0.29 (1.87)	0.17 (1.68)
K_F	-12.85 (-1.90)	-15.12 (-1.82)	-3.64 (-0.89)	-5.80. (-2.21)	17.62 (3.84)	20.67 (6.69)
K_F*TP	0.12 (2.97)	0.13 (4.94)	0.2 (2.82)	0.3 (5.71)	-1.25 (-2.77)	-1.50 (-4.99)
DF	-4.64	-5.48	-5.09	-6.11	-4.76	-5.80

(B) Estimated Period 1970–96

	TP = OPEN 1		TP = OPEN 2		TP = OPEN 3	
	EG	PH	EG	PH	EG	PH
INTP	5.85 (6.96)	5.88 (14.83)	4.68 (6.33)	4.47 (9.53)	5.18 (4.71)	5.13 (6.89)
L	0.69 (5.32)	0.70 (11.35)	0.86 (7.22)	0.92 (12.07)	0.78 (4.80)	0.81 (7.29)
K_D	3.50 (3.36)	3.63 (7.23)	3.34 (2.80)	3.42 (4.72)	4.09 (3.39)	4.54 (5.47)
H	0.36 (2.88)	0.34 (5.84)	0.27 (2.00)	0.17 (2.13)	0.27 (1.89)	0.21 (2.16)
K_F	-44.02 (-3.79)	-57.19 (-9.63)	-7.73 (-1.94)	-10.68 (-4.29)	32.25 (2.24)	35.52 (-3.54)

(contd.)

Table 5.4 (contd.)

	TP = OPEN 1		TP = OPEN 2		TP = OPEN 3	
	EG	PH	EG	PH	EG	PH
K_F*TP	0.38 (3.93)	0.46 (9.60)	0.6 (2.95)	0.7 (5.74)	-2.25 (-2.25)	-2.64 (-3.71)
DF	-3.35	-4.57	-3.59	-4.01	-3.86	-4.55

Notes: (1) EG = Engle-Granger estimation and PH = Phillip Hansen estimation
(2) Number in parenthesis is the corresponding *t*-statistics.
(3) DF is the corresponding t-statistics of lagged residuals from testing DF unit roots on residuals. 95 per cent and 90 per cent critical value for rejecting the hypothesis that residual is characterized as I (0) is -4.48 and -4.09, respectively. This critical value is from the table of response surface developed by McKinnon (1991).
Source: Author's estimation.

From the late 1980s, FDI inflows gradually shifted to light manufacturing industries, particularly labour-intensive assembly activities in electronic and electrical goods where the country has a comparative advantage in international production. The new FDI firms are more export oriented relative to those of the 1970s, as indicated in Chapter 4. With a relatively smaller technology gap, the presence of such foreign affiliates likely demonstrates managerial as well as international marketing know-how and has consequently enhanced the export propensity of local firms.

5.5 Conclusions

This chapter has conducted a broad evaluation of the impact of FDI on the Thai manufacturing sector, and the relationship between growth of manufacturing output and manufacturing FDI inflows, over the period 1970–2002. The key hypothesis is built around the 'Bhagwati hypothesis' emphasizing the role of the trade policy regime. An EP regime is more conducive than an IS regime for host countries to maximize the growth-enhancing effect of FDI. Based on the co-integration estimation, the key findings are consistent with this hypothesis. While alternative measures of trade policy regimes are used, the results seem to be insensitive to these measures. Excluding the crisis-affected period from the estimation, the results still favour an EP regime over an IS regime.

Appendix 10

Data used in Regression Analysis of FDI-growth Nexus

	Y	L	K_F	GCF	H	$OPEN1$	$OPEN2$	$OPEN3$
1970	81	0.7	26	14	2.3	65.0	0.9	19.9
1971	90	0.7	14	15	2.5	62.5	1.3	20.6
1972	102	1.3	20	17	2.5	64.4	2.3	19.8
1973	118	1.2	34	23	2.5	65.1	3.8	19.1
1974	125	1.7	57	15	2.5	80.5	4.1	16.2
1975	132	1.4	37	15	2.6	72.0	4.0	15.3
1976	152	1.1	30	27	2.5	75.7	5.2	17.3
1977	174	1.6	48	26	2.5	83.5	3.6	18.3
1978	189	1.6	39	26	2.5	82.0	6.6	18.3
1979	205	2.0	41	30	2.5	92.3	7.7	16.3
1980	211	1.8	55	25	2.4	93.6	6.8	14.6
1981	224	1.9	132	31	2.9	94.7	6.5	14.5
1982	230	2.0	119	25	3	88.1	6.8	13.6
1983	256	2.2	121	43	3.1	82.1	5.2	12.4
1984	272	2.1	182	40	3.2	86.0	6.0	14.9
1985	268	2.3	78	33	3.3	88.3	17.0	15.6
1986	295	2.4	109	42	3.2	85.9	20.1	15.4
1987	342	2.7	218	65	3	99.5	23.9	14.2
1988	403	2.6	732	94	2.7	115.8	26.4	12.6
1989	468	3.0	1014	114	2.8	123.6	16.6	13.3
1990	541	3.1	1309	132	3	133.0	17.8	13.2
1991	604	3.7	1035	155	2.9	131.0	17.7	10.2
1992	673	3.9	806	163	3.2	130.4	23.2	10.1
1993	782	4.2	981	176	3.4	134.4	24.5	10.0
1994	857	4.2	875	193	3.1	138.5	34.5	10.9
1995	958	4.6	1185	195	3.2	150.2	41.0	9.0
1996	1,021	4.7	1662	236	3.5	139.1	36.3	9.5
1997	1,036	4.6	2302	186	3.5	159.7	45.2	6.3
1998	924	4.6	2963	86	3.5	172.4	57.0	4.5
1999	1,033	4.6	2260	91	3.5	176.5	46.8	5.0
2000	1,096	5.0	3156	83	3.5	211.0	55.9	4.5
2001	1,111	4.9	3972	112	3.5	212.0	55.0	4.5
2002	1,196	5.1	1973	119	3.5	201.9	51.9	4.8

Notations:

Y	= Manufacturing value added at 1988 prices (billion baht)
L	= Manufacturing labour (million workers)
K_F	= Manufacturing FDI inflows ($million)
GCF	= Manufacturing gross capital formation at 1988 prices (billion baht)
H	= Education expenditure to gross national investment (per cent)
OPEN1	= Trade to goods GDP (per cent)
OPEN2	= Export-gross output ratio (per cent)
OPEN3	= Average manufacturing tariff (per cent)

Sources: as discussed in the text.

Chapter 6: FDI and the Technological Benefit to Thai Manufacturing: A Cross-industry Analysis

This chapter examines the technological benefit to Thai manufacturing from FDI that is often argued to be the most desirable benefit any host country can anticipate. In general, the entry of MNE affiliates could affect technological capability in two broad ways. Their entry implies there are new enterprises in the host economies. Their level of technology directly affects the overall technological capability of the host country. In addition, due to the fact that technology is partially a public good, MNE affiliates are unlikely to fully internalize all benefits from associated technology. Hence, it could create positive externalities to locally non-affiliated firms, thereby raising technological capability. The latter is referred to as FDI technology spillover. While previous studies emphasize FDI technology spillover, its overall effect on Thai manufacturing (i.e. the sum of direct impacts and FDI technology spillover) has been ignored. MNE affiliates might not generate any technological benefits to locally owned enterprises but they might be more efficient and directly contribute to the overall capability of the manufacturing sector. Hence in this chapter, both FDI technology spillover and the overall impact on Thai manufacturing are examined.

As discussed in Chapter 2, technological benefits from FDI are conditioned by the nature of the trade policy regime according to the 'Bhagwati hypothesis'. Thus, the key hypothesis focuses on the role of the trade policy regime. That is, technological benefits from FDI are likely to be far less or even negative under an IS regime, compared with a policy regime geared to EP.

To examine the technological benefit from FDI, an inter-industry cross-sectional econometric analysis is undertaken, using the unpublished returns to the Industrial Census 1997 (data for 1996). Two alternative measures, i.e. *NRP* and *ERP*, are used to proxy the nature of the trade policy regime that varies across industries. Both productivity and FDI determinants equations are estimated simultaneously in order to guard against any potential simultaneity problem. By the single-equation estimation, i.e. productivity determinant, the estimated positive relationship between FDI and the productivity of domestic manufacturing might simply reflect the fact that foreign investment gravitates towards more productive industries rather than representing any technology spillover from FDI.

The expected outcome from this chapter complements the findings of the previous chapter. While, in the previous chapter, we examine the FDI-growth nexus for total manufacturing, this chapter concentrates on technological benefits from FDI. Over and above the outcome from this chapter, it could contribute to the general literature on FDI technology spillover. Despite policy relevance, empirical studies to test the role of the trade policy regime are sparse. The only published empirical study, which has explicitly tested the 'Bhagwati hypothesis' in analyzing the spillover effects of FDI is Kokko *et al.* (2001). This study focuses on technology spillover conditioned by the country's trade policy regime, based on Uruguayan firm-level inter-industry analysis. In the study, the year 1973 where Uruguay embarked on trade liberalization reform is used as a benchmark in separating EP FDI from IS FDI. Foreign firms set up before 1973 were classified as IS firms and those set up after 1973 were classified as EP firms. In general, the findings support the 'Bhagwati hypothesis'. There are, however, two major caveats that need to be attached to this study. Firstly, the classification of EP and IS firms using 1973 as the base year is problematic because the liberalization reforms implemented in that year were partial and some manufacturing sectors continued to remain under heavy protection (Favaro and Spiller, 1991). Secondly, the analysis suffers from a failure to address the possible simultaneity involved in the relationship between productivity and the presence of foreign affiliate. The positive relationship between the foreign presence and productivity of local firms uncovered by the single-equation model might simply reflect the fact that foreign investment gravitates towards more productive industries rather than representing any technology spillover from FDI (Aitken and Harrison,1999).

The remainder of this chapter is structured as follows. Section 6.1 presents the model of productivity and FDI determinants used to examine technology spillover. It is followed by a discussion of the data and econometric methods in Sections 6.2 and 6.3. The results are presented and discussed in Section 6.4. Section 6.5 extends the model developed in Section 6.1 to examine the total effect of FDI on technological capacity in host countries. Results are presented in the following section. The final section presents key inferences and policy implications.

6.1. The Model

6.1.1 Productivity Determinants

To examine factors determining industry productivity, we start with the Cobb-Douglas production function of the locally owned industry specified as equation (6.1);[1]

$$Y_j^d = A_j^d \left(L_j^d\right)^{\alpha_1} \left(K_j^d\right)^{\alpha_2} e^{\varepsilon_j} \tag{6.1}$$

where Y_j^d = Output (value added) for the locally owned j^{th} industry.

L_j^d = Number of workers of the locally owned j^{th} industry

K_j^d = Value of capital stocks of the locally owned j^{th} industry

A_j^d = Total factor productivity (TFP) of the locally owned j^{th} industry

ε_j = Random disturbance term, capturing stochastic variations in the technical or productive capabilities, measurement error or missing variables of the locally owned j^{th} industry.

The production function in equation (6.1) is transformed into the intensive form to reduce the problem of heteroscedasticity, which may arise from cross-sectional data.

[1]There are several alternative functional forms such as translog, and constant-elasticity-of-substitution (CES). Choices of the function forms are selected according to the empirical estimates based on the Thai manufacturing data. Based on the diagnostic tests, i.e. functional form and residual normality, the Cobb-Douglas form performs better than the others.

Other possible econometric problems, such as simultaneity arising from having endogenous explanatory variables (the inputs L and K), or multicollinearity arising from the interdependence of the two inputs, are further reduced by using the intensive form of production (Intriligator *et al.* 1996: p.289).

Dividing equation (6.1) by L_j^d,

$$\frac{Y_j^d}{L_j^d} = A_j^d \frac{\left(K_j^d\right)^{\alpha_2}}{\left(L_j^d\right)^{1-\alpha_1}} e^{\varepsilon_j} = A_j^d \left(\frac{K_j^d}{L_j^d}\right)^{(1-\alpha_1)} \left(K_j^d\right)^{(\alpha_1+\alpha_2-1)} e^{\varepsilon_j} \tag{6.2}$$

Take natural logarithm in equation (6.2)

$$\ln\left(\frac{Y_j^d}{L_j^d}\right) = \ln A_j^d + \beta_1 \ln\left(\frac{K_j^d}{L_j^d}\right) + \beta_2 \ln K_j^d + \varepsilon_j$$

$$LP_j^d = TFP_j^d + \beta_1 \left(\frac{k_j^d}{l_j^d}\right) + \beta_2 k_j^d + \varepsilon_j \tag{6.3}$$

where LP_j^d = the value added per worker or labour productivity of the locally owned j^{th} industry, $\ln\left(\frac{Y_j^d}{L_j^d}\right)$

$TFP_j^d = \ln A_j^d$

$\frac{k_j^d}{l_j^d} = \ln\left(\frac{K_j^d}{L_j^d}\right)$

$k_j^d = \ln K_j^d$

$\beta_1 = 1 - \alpha_1$

$\beta_2 = 1 - \alpha_1 - \alpha_2$

Equation (6.3) represents the intensive form of Cobb-Douglas production function. Note that in equation (6.3), the capital stock (k^d) is included as an additional variable in order to relax the constant-return-to-scale assumption.

According to equation (2.23) in Chapter 2, the level of technology represented by *TFP* is influenced by the level of foreign presence and the nature of the trade policy regime in host countries. To capture the effect of the trade policy regime, an interaction variable of foreign presence (FOR) and trade policy proxy (TP) is added to the model. Moreover, as argued by a number of empirical studies (e.g. Sachs and Warner, 1995; Edwards, 1998), *TP* itself could also have an impact on *TFP*. Hence,

$$TFP_j^d = \beta_0 + \beta_3 FOR_j + \beta_4 FOR_j * TP_j + \beta_5 TP_j \tag{6.4}$$

where FOR_j = foreign presence in the j^{th} industry

TP_j = proxy of the trade policy regime in the j^{th} industry

By substitution equation (6.4) in (6.3), we obtain

$$LP_j^d = \beta_0 + \beta_1 \left(\frac{k_j^d}{l_j^d} \right) + \beta_2 k_j^d + \beta_3 FOR_j + \beta_4 FOR_j * TP_j + \beta_5 TP_j + \gamma X_j + \varepsilon_j \tag{6.5}$$

where X_j = a set (matrix) of explanatory variables containing industry-specific factors of the j^{th} industry .

Note that the specification in equation (6.5) does not imply that all industries must have the same capital-labour ratio. Rather we draw an inference of the impact of capital-labour ratio on the industry's productivity across industries. These industries must exhibit a significant level of variation in their capital-labour ratio from each other. Otherwise, the coefficient associated with the capital-labour ratio variable is not likely to be obtained. This functional form is widely used in previous studies using industry-level data (e.g. Blomström and Persson, 1983; Kokko, 1994).[2]

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[2] One alternative is to use the firm-level data to examine the 'Bhagwati hypothesis'. The estimation of equation (6.5) can be undertaken into 2 steps. Firstly, we estimate production

The impact of FDI on the industry's productivity is given by the partial derivative of LP^d with respect to FOR.

$$\frac{\partial LP_j^d}{\partial FOR_j} = \beta_3 + \beta_4 TP_j \tag{6.6}$$

$$(+/-) \quad (-)$$

To test the role of the trade policy regime, i.e. 'Bhagwati hypothesis', the statistical significance of β_4 is examined. Under the 'Bhagwati hypothesis', the sign of β_4 is expected to be negative. That is, technology spillover from FDI to the industry's productivity will be a decreasing function of the level of trade restrictiveness. The sign of β_3 is ambiguous, depending on the nature of the trade policy bias over the whole manufacturing sector.

Foreign presence, FOR, is measured by the output share of foreign firms to total industry. In some previous empirical studies, employment or capital shares have been used to measure the foreign presence. Expressing foreign presence as an employment share tends to underestimate the actual role of foreign affiliates because MNE affiliates tend to be more capital intensive than locally non-affiliated firms. On the other hand, the capital share can easily be distorted by the presence of foreign ownership restrictions. Such a restriction was in effect in Thailand during the study period.[3] The capital share would not be a good proxy for the foreign presence in a country as in Thailand where there is a foreign ownership restriction. Hence, the output share is the preferred proxy.

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function for each industry separately. The estimated intercept from the industry's production function can be regarded as its *TFP*. The second step is to examine the relationship between *TFP* and other explanatory variables as in equation (6.5) (i.e. *FOR, FOR*TP, TP* and *X*).

However, the estimated intercept from the above estimation procedure can represent the industry's *TFP if and only if* the industry exhibits the constant-return-to-scale assumption. Such an assumption seems to be restrictive at the firm level. For example, Bloch and Tang (2000), who estimated the return to scale of Singaporean manufacturing firms during the period 1975–94 find that there are only five out of 22 Singaporean industries that exhibit constant-return-to-scale. Hence, it does not appear to pursue this alternative.

[3] See details in Chapter 3.

The trade policy regime (TP) is proxied using two alternative measures, namely NRP and ERP. These two measures have been used in previous empirical analysis. However, there is no consensus amongst economists as to choice of one over the other. ERP is obviously theoretically superior to NRP since it measures "true" net pulls on resource allocation and true proportional inflation of payments to factors by the overall tariff structure (Corden, 1966). On the other hand, NRP is presumably a more visible indicator of protection to interest groups, which generally tend to demand changes in protection on nominal rates on their outputs rather than seeking changes in the rates of tariffs on inputs (Cheh, 1974).

In addition, as guided by the theory and previous empirical works on the determinants of inter-industry changes in productivity, three additional explanatory variables are used. Firstly, this study takes into account the role of labour quality (QL) in determining productivity. A high quality of labour is likely to contribute to an increase in value added per worker. The ratio of supervisory and management workers to total employment is used here to proxy the quality of labour. The rationale of this proxy regards supervisory and management workers as skilled labour. Thus, the higher the ratio, the higher the labour quality. A positive sign to the associated coefficient is expected.

Secondly, the technology gap ($TECH$) between foreign and local firms is another key determinant of the degree of technology spillover. $TECH$ is proxied by the ratio of average value added per worker between foreign and local firms net of capital intensity and firm size. While the ratio of average labour productivity of foreign firms to that of locally owned ones has been widely used in previous studies, this measure suffers from the possibility that the larger labour productivity is due to the greater degree of capital intensities and/or the larger scale of production rather than differences in technologies, i.e. the ability to transform inputs into outputs.[4] Differences in capital intensity and/or sales could be due to several factors that might not be directly related to technological capability. For example, foreign and local firms would face different relative costs of labour and capital because of their different ability to access factor inputs. This would differ their capital intensity from one another and not necessarily imply different technological capability. Moreover, a firm with a longer period of operation in a given country could well be larger in size, compared to a new firm even if they have the same level of technology. Therefore, to guard against these possibilities, the effects of capital intensity as well as size would be excluded when measuring the technology gap. Using the plant-level data, the difference in labour productivity between domestic and foreign establishments is estimated for each industry, after accounting for capital intensities and scale of production based on equation (6.7).

$$LP_{ij} = a_{ij} + b_{1ij}\left(\frac{k}{l}\right)_{ij} + b_{2ij}sale_{ij} + b_{3j}foreign \tag{6.7}$$

where LP_{ij} = Labour productivity of the i^{th} firm in the j^{th} industry (in log)

$\left(\frac{k}{l}\right)_{ij}$ = Capital-labour ratio of the i^{th} firm in the j^{th} industry (in log)

$sale_{ij}$ = Value of total sales of the i^{th} firm in the j^{th} industry (in log)

foreign= Dummy variable, which equals to 0 if the share of foreign ownership is zero and 1 otherwise.

According to equation (6.7), the coefficient b_{3j} is a measure of the difference in technology after taking into account capital intensity and firm size. The larger the coefficient b_{3j}, the more the technology gap of foreign firms is superior to the local ones. The lower the technological gap between the foreign affiliate and a local firm in a given industry, the easier the latter will be able to emulate the technology brought in by the

[4] See the full definition of technology used in this study in Chapter 2. The approach to measure the technology gap between foreign and local firms is previously used in Sjöholm (1999a: p.61)

former. For this reason, a negative relationship is hypothesized between *TECH* and LP^d across industries.

Thirdly, market concentration (*CON*) is included as an explanatory variable because two industries with the same technical efficiency may show a different value added per worker because of different domestic market concentration. In addition as argued by Hall (1988), the impact of any possible exogenous factors on industry productivity would be conditioned by the degree of market competition. Hence, the market concentration is needed to be incorporated into the model. Two widely-used proxies are chosen for market concentration, market share of the five largest firms (*CR5*) and the Herfindahl-Hirshman index of concentration (*HHI*). The formulae to calculate both proxies for market concentration are in equations (6.8) and (6.9), respectively. Hence, a positive sign is expected for the corresponding coefficient.

$$CR5_j = \frac{\sum_{i=1}^{5} s_i}{\sum_{i=1}^{n} s_i} \tag{6.8}$$

$$HHI_j = \sum_i \left(\frac{s_i}{\sum s_i} \right)^2 \tag{6.9}$$

where s_i = Total sales of the i^{th} firm in the j^{th} industry.

6.1.2 Foreign Presence

In order to redress the problem of simultaneity involved in the relationship between *FOR* and LP^d, equation (6.5) is estimated together with a separate equation to explain the FDI determinants at industry level. The specification of the second equation is discussed below before presenting the two-equation model. In addition to a potential relationship with LP^d, *FOR* is a function of market size, tariff barriers, and labour quality. These three variables have been widely used in previous empirical studies on FDI determinants.

TP is included as an explanatory variable to examine the validity of the 'tariff hopping' hypothesis that protective tariff barriers stimulate IS FDI. This hypothesis has been supported by various empirical studies (e.g. Lim, 2001; Jun and Singh, 1997). The size of the domestic market would be one of the relevant factors for MNEs when deciding modes of entry, i.e. either producing at and exporting from the home country, or locating and producing within the host country. The size of the domestic market (*MSIZE*) is measured by the sum of gross output and (net) import at the 4-digit ISIC level, averaging over the period 1986–94. MNEs are more likely to establish affiliates in large domestic markets.

In a small open economy like Thailand, *TP* or *MSIZE* alone might not be significant enough to attract FDI. It would be more appropriate to add the interaction term to capture the impact of both *TP* and *MSIZE*. The interaction between *TP* and *MSIZE* implies the impact of *TP* in stimulating FDI is likely to depend on *MSIZE*. At a given level of tariff protection, a larger market size enhances the stimulating impact of tariff barriers on a foreign presence. Similarly, in Thailand, market size *per se* might not be large enough to attract a MNE to locate its affiliate and to substitute international trade for investment. In other words, the impact of market size on FDI determinants depends positively on tariff barriers. Hence, the coefficient of interaction term is expected to be positive while the coefficients associated with *TP* and *MSIZE* could be either positive or negative. Even though the coefficients associated with both these variables turn out to be negative, it is not possible to conclude tariff barriers or market size exhibit a negative relationship with the foreign presence, as it also depends on the interaction effect.

Finally, the standard hypothesis that quality of labour will encourage 'efficiency-seeking' FDI inflows is incorporated in the analysis by taking the variable labour quality (*QL*) into account. Some foreign investors locate entrepreneurial activities across countries in order to access cheaper and/or better quality raw material and/or labour to enhance productivity. This hypothesis is in evidence to explain the behaviour of FDI inflows in the late 1980s, especially in developing countries like Thailand and Malaysia.

6.1.3 The Model

Based on the above discussion, the estimating equations are specified as follows;

$$LP_j^d = \beta_0 + \beta_1\left(\frac{k_j^d}{l_j^d}\right) + \beta_2 k_j^d + \beta_3 FOR_j + \beta_4 FOR_j * TP_j + \beta_5 TP_j + \beta_6 CON_j + \beta_7 TECH_j + \beta_8 QL_j + \varepsilon_j \quad (6.10)$$

$$FOR_j = \varphi_j + \gamma_1 TP_j + \gamma_2 MSIZE_j + \gamma_3 TP_j * MSIZE_j + \gamma_4 LP_j^d + \gamma_5 QL_j + \mu_j \quad (6.11)$$

where LP_j^d = Labor productivity of locally owned j^{th} industry (in log)

$\left(\frac{k_j^d}{l_j^d}\right)$ = Capital-labor ratio of locally owned j^{th} industry (in log)

k_j^d = Capital stocks of locally owned firm j^{th} industry (in log)

FOR_j = Foreign presence proxied by the share of foreign output to the j^{th} industry (in log)

TP_j = Trade policy regime proxied alternatively by (in log)

1. NRP_j = Nominal rate of protection of the j^{th} industry
2. ERP_j = Effective rate of protection of the j^{th} industry

CON_j = Market concentration index of the j^{th} industry alternatively proxied by (in log)

1. $CR5_j$ = Sum of market share of the first five largest firm in the j^{th} industry
2. HHI_j = Herfindahl-Hirshman index of concentration of the j^{th} industry

$TECH_j$ = Technology gap between local and foreign firms in the j^{th} industry proxied by estimation using equation (6.7)

QL_j = Labour quality of the j^{th} industry proxied by the ratio of supervisory and management workers to total industry employment (in log)

$MSIZE_j$ = Market size of the j^{th} industry measured by the sum of gross output and (net) import at the 4-digit ISIC level(in log).

6.2. Data Description

Data for the study are compiled from unpublished returns to the Industrial Census 1997 (data for 1996) conducted by the National Statistics Office (NSO). A well-known limitation of the cross-sectional data set with each industry representing a single data point is that they make it difficult to control for unobserved industry specific differences. Long-term averages tend to ignore changes that may have occurred over time in the same country. These limitations can be avoided by using the panel data set compiled by pooling cross-industry and time-series data. Particularly, in the nature of technology spillover that involves a time-consuming process, panel data is more appropriate. Unfortunately, given the nature of data availability in this case, this preferred data choice is not possible. Data are available electronically for all years from 1993–9. The year 1996 is chosen for the study because 1997–9 data are not 'normal' years, compared to the 1996 ones. The firm coverage of the survey for 1993–5 is rather incomplete.

The census covers 32,489 plants, belonging to 126 four-digit industries of TSIC. As a result of the data cleaning fully described in Chapter 4, the final sample drop to 15,624 plants (1,510 foreign-owned and 14,114 domestic-owned plants) across 105 industries. These plants accounted for 61.5 per cent of the Thailand's manufacturing value added and 36.5 per cent of manufacturing labour force in 1996.

The analysis can be undertaken either at a plant or industry level. This study pursues at the industry level because it allows us to use a simultaneous-equation approach where both technology spillover and FDI determinant equations are brought together to rectify the simultaneity problem. In addition, several plant characteristics in the Industrial Census are rather incomplete. For example, information on market orientation is reported approximately, divided into four-wide bands, i.e. less than 50 per cent, 50 per cent, greater than 50 per cent and 100 per cent. Information on foreign equity holding and local content is more or less similar to that on market orientation. Such incomplete information seems to be highly relevant in explaining firms' productivity. For example, plants, which export almost 50 per cent of total sales tend to be more efficient than those whose export-sale ratio is less than 10 per cent. The information available at the plant level is not able to distinguish these two types of plants. Nevertheless, this problem tends to be less severe at the industry level. There are several proxies for the industry's market orientation such as export-output ratio, *NRP* and *ERP*.

To estimate the foreign presence, the ratio of sales of foreign firms to total sales (local and foreign) is measured. All firms with FDI (regardless of the magnitude of the foreign share in capital stock) are considered to be foreign firms for the identification of local firms. LP^d, $\left(\frac{k^d}{l^d}\right)$ and k^d are the result of the sum of locally owned firms within the j^{th} industry. Value added is defined as the difference between gross output and raw materials net of changes in inventories, whereas capital stock is represented by the value of fixed assets at the initial period. *CR5, HHI* and *TECH* are constructed from data for all plants as formulae discussed above. For measuring labour quality, the supervisory and management workers are defined as employees not directly engaged in production or other related activities. The actual number of supervisors and management workers are not available in the census. So the number of non-production workers reported would also include clerical and administrative staff. Nevertheless, the number of non-production workers could still to some extent be a reasonable proxy of that of available supervisors because the number of support staff is likely to go hand in hand with that of supervisors and management workers.

Data on *ERP* and *NRP* are from Athukorala, Jongwanich and Kohpaiboon (2004). They reflect the protection structure in 1997. Even though the *NRP* and *ERP* estimates mainly capture the only tariff protection, this is not a major limitation because there are not many quantitative restrictions (QRs) and subsidies in Thai manufacturing. In addition, the ERP series used is the weighted average of import-competing and export-oriented *ERP*, so that the impact of various tariff rebate programs is incorporated in *ERP* estimates.[5] Data for the gross output, export and import on 4-digit ISIC industries are obtained from UNIDO series held at the International Economic Data Bank of the

[5]See a full discussion in Chapter 3.

Australian National University. Tables 6.1 and 6.2 provide a statistical summary as well as a correlation matrix of all relevant variables in this analysis.

Table 6.1
A Statistical Summary of the Key Variables

		Mean	S.D.	Min	Max
LP_j^d	(log) thousand baht/worker	5.34	0.77	3.87	9.04
$\left(\frac{k_j^d}{l_j^d}\right)$	(log) thousand baht/worker	5.86	0.94	3.93	10.69
k_j^d	(log) thousand baht	14.36	1.55	10.65	18.45
LP_j	(log) thousand baht/worker	5.94	0.68	4.77	9.32
$\left(\frac{k_j}{l_j}\right)$	(log) thousand baht/worker	6.10	0.93	3.93	10.61
k_j	(log) thousand baht	14.93	1.49	11.42	18.45
FOR_j	(log) proportion	0.37	0.20	0.00	0.69
NRP_j	(log) proportion	0.14	0.07	0	0.47
ERP_j	(log) proportion	0.13	0.19	-1.28	0.69
$CR5_j$	(log) proportion	0.42	0.13	0.14	0.68
QL_j	(log) proportion	0.22	0.10	0.07	0.54
$TECH_j$	none	-0.12	0.46	-1.42	1.31
$MSIZE_j$	(log) $million	6.23	1.67	1.39	8.94
HHI_j	proportion squared	0.12	0.11	0.01	0.63

Notes: (1) Mean = simple average; Min = minimum; Max = maximum; SD = standard deviation

(2) Estimates of LP_j, LP_j^d, $\left(\frac{k_j}{l_j}\right)$, $\left(\frac{k_j^d}{l_j^d}\right)$, k_j and k_j^d are the logarithmic transformation of their value. The other variables are converted into logarithmic form as log(1+x) where x is the variable

Source: Author's computations based on data sources described in the text.

6.3 Econometric Procedure

Initially the equations are estimated using the ordinary least squares (OLS) method while paying attention to the possible presence of outliers as well as their performance in terms of standard diagnostic tests relevant for cross-sectional regression

Table 6.2

Correlation Matrix of the Variables

	LP_j^d	$\left(\frac{k}{l}\right)_j^d$	k_j^d	LP_j	$\left(\frac{k}{l}\right)_j$	k_j	FOR_j	NRP_j	ERP_j	$CR5_j$	HHI_j	QL_j	$TECH_j$
LP_j^d	1												
$\left(\frac{k}{l}\right)_j^d$	0.65	1											
k_j^d	0.47	0.59	1										
LP_j	0.87	0.68	0.45	1									
$\left(\frac{k}{l}\right)_j$	0.59	0.87	0.45	0.74	1								
k_j	0.44	0.53	0.93	0.50	0.58	1							
FOR_j	-0.23	-0.11	-0.33	-0.07	-0.01	-0.26	1						
NRP_j	-0.21	-0.27	-0.01	-0.25	-0.27	-0.03	-0.07	1					
ERP_j	-0.09	-0.11	0.01	-0.14	-0.11	0.01	-0.07	0.55	1				
$CR5_j$	0.16	0.23	-0.34	0.23	0.26	-0.32	0.35	-0.04	0.05	1			
HHI_j	0.29	0.31	-0.08	0.31	0.27	-0.11	0.21	0.07	0.11	0.80	1		
QL_j	0.11	0.21	-0.05	0.16	0.25	-0.01	0.08	-0.09	0.04	0.29	0.19	1	
$TECH_j$	-0.33	0.04	0.01	-0.27	0.03	0.03	-0.15	-0.06	-0.04	-0.20	-0.27	0.09	1.00
$MSIZE_j$	0.19	0.26	0.18	0.30	0.33	0.25	-0.09	-0.08	0.02	-0.01	-0.02	0.29	0.09

Source: Author's computations based on data sources described in the text.

analysis of this nature (i.e. functional form, heteroscedasticity, and residual normality). Due to the nature of cross-sectional data, it is likely the outliers could impact on and mislead the estimated parameters and therefore careful treatment of outliers is needed. Cook's Distance[6] is used to identify suspected outliers. To accommodate the outliers, intercept dummies are introduced and estimated to test both changes in estimated parameters and significance of the interested dummy. Having decided upon the basic form of equations (6.10) and (6.11), which contain current endogenous variables as explanatory variables, they are re-estimated using the two-stage least squares (2SLS) method.

Unbiasedness and consistency of OLS estimates rest on the assumption that the explanatory variables are uncorrelated with the stochastic disturbance terms. This assumption becomes invalid for any individual equation in a system of equations whenever at least one of the explanatory variables of that equation is jointly-determined, making the use of OLS inappropriate. The alternative estimators devised to be used in this situation fall into two main categories: system methods and single-equation methods. The system methods, of which three-stage least squares (3SLS) and full-information maximum likelihood (FIML) are best known, are superior to the single-equation methods in terms of efficiency of the estimates. However, in using 3SLS or FIML, all equations in the system must be properly specified. Since these methods utilize information on the interconnection among all the equations in the system, what is happening elsewhere in the system will be transmitted throughout the whole system, causing biases and distortions. Based on a Monte Carlo experiment of a finite sample, 2SLS has emerged as a good compromise choice among available alternatives. 2SLS generally performs well in terms of both bias and mean-squared error, shows a relatively higher degree of stability and is not greatly affected by specification (Intriligator *et al.* 1996: p.389). Moreover, 2SLS and 3SLS estimates are equivalent asymptotically (Wooldridge 2002: p.199).

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[6]Cook's distance is the 'influence statistic' developed by Cook (1977). The statistics take into account both the studentized residuals (i.e. the residual divided by its standard error) as well as the estimated variances of the residuals to identify outliers. For details see Belsley *et al.* (1980) and Barnett and Lewis (1994).

2SLS involves applying OLS in two stages. The first stage involves regressing each of the explanatory endogenous variables on all the pre-determined variables. In the second stage, the fitted values of the explanatory endogenous variables, obtained from the first regression, are used in place of their observed values to estimate the structural form coefficients. This two-stage procedure avoids the simple one-stage least square bias and inconsistency in the estimates by eliminating from the explanatory endogenous variables that part of the variation that is due to the disturbance.

6.4. Results of FDI Technology Spillover

The regression results relating to determinants of productivity are reported in Table 6.3. All equations in Table 6.3 included intercept dummies for four observations (industries) which were found to be outliers in terms of the Cook's Distance test. [7] Equation 6.3.1 represents the OLS estimating results, where *FOR, TP* proxied by *ERP* and their interaction term are included. The estimated equation passes the *F*- test for overall statistical significance at the one per cent level and performs very well by the standard diagnostic tests. Despite obtaining theoretical expected sign, these three key variables in interest are not significantly different from zero. This would be due to the presence of the multicollinearity problem that occurs among them. In the absence of a strong theoretical reason in favour of dropping one variable over the other, two alternative functional forms are estimated. On the one hand, the interaction term is dropped from equation 6.3.1 and the equation is re-estimated as reported in equation 6.3.2. On the other hand, equation 6.3.3 is the OLS estimating result of equation 6.3.1, from which *ERP* is dropped. The OLS estimating results of both equations perform equally well in terms of the overall fit and the standard diagnostic tests, especially the functional form test. Nevertheless, only the interaction term between ERP and FOR in equation 6.3.3 is statistically significant with the theoretically expected sign. Hence, the

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[7] These are manufacture of other special purpose machinery, manufacture of accumulators, primary cells and primary batteries, manufacture of office accounting and computing machinery, and manufacture of insulated wire and cable. In the first two industries foreign investors play a very limited role. By contrast, shares of foreign presence in the last two industries are very large.

functional form in equation 6.3.3 is the preferred choice. This function form is also applied when *TP* is proxied by *NRP* as in equation 6.3.5

The 2SLS estimates of equations 6.3.3 and 6.3.5 are reported as equations 6.3.4 and 6.3.6, respectively. Even though two alternative estimation methods provide remarkably similar, the equations estimated by 2SLS are our preferred estimation.[8] The reason is what there would be an endogeneity problem between the productivity of locally owned industry and the foreign presence.

Regression estimates turn out to be remarkably resilient to the use of the two alternative trade policy variables. As discussed in Chapter 2, there was a significant impact of various tax rebate schemes on incentive structure, so *ERP* estimates would be a better indicator to reflect the nature of trade policy regime across industries. Hence, the following discussion focuses on the equation estimated using the 2SLS regression with the *ERP* as the trade policy measure. The concentration indices, *CR5* and *HHI*, yielded similar results. Based on the overall statistical significance (F-test), only the *CR5*-based estimates are reported. Most of the estimates except *FOR* and *QL* are significantly different from zero with the theoretically expected signs.

Despite the mild statistical significance (i.e. 10 per cent level), the negative coefficient of *FOR*ERP* fails to reject the 'Bhagwati hypothesis' that industries with trade policy regimes characterized by greater outward orientation tend to yield more benefits in the form of technology spillover from foreign affiliates. The evidence that the coefficient of *FOR* is not statistically different from zero points out that foreign presence could either negatively or positively affect the productivity of locally owned industry, depending on the nature of trade policy regime, i.e. *ERP* greater or less than zero. This finding is in line with previous studies that have examined the more aggregated data, e.g. Balasubramanyam *et al.* (1996); Athukorala and Chand (2000) and the finding in the previous chapter. At the mean level of *ERP* (i.e. 16 per cent), the foreign presence

[8] 3SLS estimation does not alter the estimated results apart from some minor changes.

generates the net negative impact on the productivity of locally owned industry. A percentage increase in *FOR* reduces the labour productivity by 0.15 per cent.

The coefficient of *TECH* is significantly different from zero at 1 per cent level with the theoretically expected (negative) sign. This suggests that, given the level of foreign presence and degree of trade restrictiveness, a locally owned industry that exhibits laggard technology capability relative to a foreign firm tends to exhibit lower labour productivity.

For the impact of competition, the coefficient β_6 for *CR5* reaches a positive sign and is statistically different from zero. This suggests a highly concentrated market structure significantly impacts on the value added per worker. The coefficient associated with *QL* is not statistically significant.

Table 6.4 presents the regression results relating to determinants of foreign presence in Thai manufacturing. All equations in Table 6.4 included intercept dummies for four observations (industries) which were found to be outliers in terms of the Cook's Distance test.[9] Equations 6.4.1 and 6.4.4 represent the OLS results based on *ERP* and *NRP,* respectively, as a proxy of *TP.* While *MSIZE, TP* and their interaction are all in both equations and it is likely the estimates are affected by the multicollinearity problem, all estimated coefficients still obtain the theoretically expected sign and are statistically significant at the 10 per cent level. As argued by Gujarati (1999: p.327), the multicollinearity problem would be acceptable as long as most individual regression coefficients are statistically significant. In addition, if the objective of the study is to estimate a group of coefficients (e.g. the sum or difference of two coefficients) fairly accurately, this can be done even in the presence of multicollinearity.

[9] Based on *ERP* as *TP*, they are manufacture of grain mill products, manufacture of builders' carpentry and joinery, manufacture of tobacco products, and manufacture of machinery for mining, quarrying and construction. Regarding the equations based on *NRP*, there are manufacture of grain mill products, manufacture of builders' carpentry and joinery (same as in the ERP case) and manufacture of refined petroleum products.

Table 6.3

Determinants of Labour Productivity in Locally Owned Industry (LP_j^d): Regression Results with Alternative Measures of Trade Policy Regime

	TP=ERP				TP=NRP	
	6.3.1	**6.3.2**	**6.3.3**	**6.3.4**	**6.3.5**	**6.3.6**
	OLS	**OLS**	**OLS**	**2SLS**[1]	**OLS**	**2SLS**[1]
INTERCEPT	3.84 (4.23)*	3.88 (4.31)*	3.81 (4.24)*	4.25 (3.03)*	3.97 (4.44)*	4.19 (3.55)*
$\left(\frac{k}{l}\right)^d j$	0.49 (6.08)*	0.49 (6.13)*	0.49 (6.15)*	0.47 (5.30)*	0.47 (5.84)*	0.47 (5.53)*
k_j^d	0.10 (1.91)**	0.09 (1.90)**	0.10 (1.92)**	0.09 (1.66)**	0.10 (2.03)**	0.10 (1.82)**
FOR_j	-0.81 (-2.23)*	-0.91 (3.44)*	-0.74 (-2.55)*	-1.14 (-1.03)	-0.46 (-1.27)***	-0.68 (-0.78)
FOR_j*TP_j	-0.59 (-0.35)		-1.03 (-1.55)***	-1.74 (-1.25)***	-2.92 (-1.62)***	-3.05 (-1.45)***
TP_j	-0.14 (-0.33)	-0.26 (-1.04)				
$TECH_j$	-0.52 (-4.54)*	-0.53 (-4.82)*	-0.51 (-4.60)*	-0.51 (-4.45)*	-0.51 (-4.62)*	-0.51 (-4.56)*
$CR5_j$	0.83 (1.62)***	0.83 (1.62)***	0.82 (1.60)***	1.07 (1.43)***	0.81 (1.61)***	0.91 (1.49)***
QL_j	-0.03 (0.06)	-0.003 (-0.01)	-0.06 (-0.11)	-0.08 (-0.14)	-0.13 (-0.25)	-0.14 (-0.25)
Adjusted-R-squared	0.63	0.63	0.63	0.61	0.64	0.63
F-statistics	15.5*	17.1*	17.2*	16.0*	17.5*	17.3*
Number of outliers	4	4	4	4	4	4
Diagnostic Tests[2]						
Functional form	2.10 (p=0.15)	2.04 (p=0.15)	2.13 (p=0.14)	1.32 (p=0.25)	1.93 (p=0.17)	1.54 (p=0.22)
Residual normality	5.27 (p=0.07)	5.46 (p=0.07)	5.16 (p=0.08)	3.27 (p=0.20)	6.40 (p=0.05)	5.25 (p=0.73)
Heteroscedasticity	0.69 (p=0.41)	0.64 (p=0.42)	0.71 (p=0.40)	0.15 (p=0.70)	0.84 (p=0.36)	0.17 (p=0.68)
Overidentification				2.31 (p=0.29)		1.26 (p=0.32)

Notes: Numbers in parentheses are t-statistics and *, **, and *** indicate the level of statistical significance at 1, 5, and 10 per cent, respectively.

[1]The instrument variables are *MSIZE* and *ERP* as well as their interaction with *TP*.

[2]See details of diagnostic tests in Appendix 12.

Source: Author's estimates based on data series discussed in the text.

Hence, the functional form where three variables in the equations are incorporated is the preferable choice.

The equation passes the F- test for overall statistical significance at the five per cent and performs well in terms of the standard diagnostic tests. The 2SLS estimates of equations 6.4.1 and 6.4.3 are reported in equations 6.4.2 and 6.4.4, respectively. Due to the presence of endogeneity problem, the 2SLS estimates are preferable. The regression estimates turn out to be insensitive to the use of the two alternative trade policy variables (*NRP* and *ERP*) except LP^d. For the purpose of estimate comparison, the following discussion focuses on the equation estimated using the 2SLS estimation with *ERP* as the trade policy measure.

The coefficient associated with LP^d in equation 6.4.2 is negative and statistically insignificant. Interestingly, the estimated coefficient also attains the negative sign and is statistically significant in equation 6.4.4 where *NRP* is a proxy of *TP*.[10] The results of negative coefficient of LP^d from both equations reject the comment made on previous single-equation-approach studies that FDI likely gravitates to the highly productive domestic sector. The positive and significant estimate of *QL* suggests there exists evidence that labour quality is one of several factors attracting flows of FDI into Thai manufacturing. This evidence is widely cited by previous studies, e.g. Ramstetter (1997); Tambulertchai and Ramstetter (1991). Low-cost and high-quality workers in Thailand have attracted foreign investors, especially from East Asian countries, to transplant and use the country as their export base from the late 1980s onward. Nevertheless, the inference drawn from this estimated coefficient must be interpreted with caution because the proxy used is to some extent approximate.

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[10] Perhaps the negative coefficient found here reflects a pattern of FDI allocation across industries because the value added per worker to some extent could reflect the capital intensity feature of industry. The higher the value added per worker, the more the degree of capital intensity. That is, based on Thai manufacturing across industries, foreign investors tend to participate more in labour-intensive export-oriented industries.

Table 6.4
Determinants of Foreign Presence in Thai Manufacturing:
Regression Results with Alternative Measures of Trade Policy Regime

	TP=ERP		*TP=NRP*	
	6.4.1	**6.42**	**6.43**	**6.44**
	OLS	**2SLS**[1]	**OLS**	**2SLS**[1]
INTERCEPT	1.06 (3.26)*	0.95 (2.00)**	1.77 (4.41)*	1.90 (2.74)*
LP_j	-0.05 (-1.73)**	-0.04 (-0.89)	-0.07 (-2.63)*	-0.08 (-1.52)**
$MSIZE_j$	-0.03 (-1.60)***	-0.03 (-1.63)**	-0.08 (-2.28)*	-0.08 (-2.24)*
TP_j	-0.76 (-1.23)***	-0.78 (-1.25)***	-2.86 (-2.15)**	-2.86 (-2.15)**
$TP_j * MSIZE_j$	0.11 (1.28)***	0.11 (1.27)***	0.38 (1.93)**	0.38 (1.92)**
QL_j	0.41 (1.99)**	0.41 (1.98)**	0.27 (1.36)***	0.27 (1.37)**
Adjusted R-squared	0.07	0.08	0.11	0.11
F-statistics	2.00**	2.00**	2.56*	2.54*
Number of Outliers	4	4	3	3
Diagonostic tests[2]				
Functional form	2.53 (p=0.11)	2.03 (p=0.16)	0.03 (p=0.85)	1.46 (p=0.23)
Residual normality	3.89 (p=0.14)	4.11 (p=0.13)	4.22 (p=0.12)	3.93 (p=0.14)
Heteroscedasticity	0.42 (0.52)	1.50 (p=0.22)	1.68 (p=0.20)	2.60 (0.11)

Notes: Numbers in parentheses are t-statistics. *, **, and *** indicate the level of statistical significance at 1, 5, and 10 per cent, respectively.

[1]The instrument variables are $\left(\frac{k^d}{l^d}\right)_j$

[2]See details of diagnostic tests in Appendix 12.

Source: Author's estimates based on data series discussed in the text.

Another interesting result from the FDI determinants equation relates to the degree of protection and size of the domestic market as well as their interaction. Despite the mild level of statistical significance (i.e. at the 10 per cent), the positive and significant coefficient of the interaction term between *ERP* and *MSIZE* supports the hypothesis that, in a small-open economy like Thailand, neither protection nor the size of the domestic market individually is enough to explain FDI determinants.[11] At the given level of *MSIZE*, any increase in the tariff rate invites additional foreign investment to locate and establish plants in order to share the economic rents created by the tariff increase. Similarly, over and above the impact of trade barriers in attracting foreign investors, the larger the domestic market size, the greater the direct investment from abroad.

6.5 FDI and Technological Capability in Host Countries

In addition to FDI technology spillover, FDI itself could affect technological capability in the host country. This is due to the general belief that MNE affiliates are more productive than local firms, so that their entry means there are new and more productive firms in the host country economy, thereby raising overall industry productivity. However, empirical results do not always support this general belief. For example, Ramstetter (2004) finds there is no significant difference in productivity between locally owned and foreign firms in Thailand. Hence, it is worthwhile to explicitly examine the total impact on the manufacturing sector. To evaluate such an impact, equation (6.10) is re-estimated by using the whole sample covering both foreign and locally owned firms. That is,

$$LP_j = \overline{\beta_0} + \overline{\beta_1}\left(\frac{k_j}{l_j}\right) + \overline{\beta_2}k_j + \overline{\beta_3}FOR_j + \overline{\beta_4}FOR_j * TP_j + \overline{\beta_5}TP_j + \overline{\beta_6}CON_j + \overline{\beta_7}TECH_j + \overline{\beta_8}QL_j + \varepsilon_j \qquad (6.12)$$

where LP_j = the labor productivity of the whole j^{th} industry (in log)

[11] The NRP-based estimate of the interaction is statistically significant with the positive sign at the five per cent level.

$\left(\frac{k_j}{l_j}\right)$ = the capital-labor ratio of the whole j^{th} industry (in log)

k_j = the capital stocks of the whole j^{th} industry (in log)

Other variables are the same as in equation (6.10)

The key hypothesis still focuses on the role of the trade policy regime. The impact of the foreign presence on the whole industry's productivity is given by the partial derivative of LP with respect to FOR.

$$\frac{\partial LP_j}{\partial FOR_j} = \overline{\beta_3} + \overline{\beta_4} TP_j$$

$$(+/-) \quad (-)$$

Note that the partial derivation of LP with respect to FOR in equation (6.12) is different from that in equation (6.10). The partial derivation here captures both the direct impact of the presence of MNE affiliates on productivity and its technology spillover to locally owned firms. In particular, $\overline{\beta_3}$ represents both the advanced technology associated with MNE affiliates and a part of FDI technology spillover.

The econometric procedure used to estimate equation (6.12) is similar to that applied to equation (6.10). That is, equations are estimated using the ordinary least squares (OLS) method while paying attention to the possible presence of outliers as well as their performance in terms of the standard diagnostic tests. The functional forms that perform well in the standard diagnostic tests for cross-section analysis are re-estimated by 2SLS in order to take into account the presence of an endogeneity problem. Where the FDI determinants equation is concerned, we do not re-estimate equation (6.11) by using $LP_{,}$, the productivity of total industry to address the possibility that foreign investment gravitates towards more productive industries. It is more appropriate to use the productivity of locally owned industry (LP^d) only to address such a possibility rather than using the productivity of industry as a whole, where foreign firms are also included.

6.6 Results of FDI and Technological Capability in Host Countries

The regression results relating to determinants of productivity of the manufacturing sector are reported in Table 6.5. All equations in Table 6.5 included intercept dummies for four observations (industries) which were found to be outliers in terms of the Cook's Distance test.[12] Equation 6.5.1 is the OLS estimating results, using *ERP* as a proxy of *TP*. In this equation, *FOR*, *TP* and their interaction term are all included. Similar to the productivity determinant equation of locally owned industries, the presence of multicollinearity problem causes all estimated coefficients corresponding to these three variables to be statistically insignificant. To solve the multicollinearity problem, the same econometric procedure used in Section 6.4 is also applied here. Equations 6.5.2 and 6.5.3 are the *OLS* estimating results after dropping the interaction term and *TP*, respectively, from equation 6.5.1. While the estimates corresponding to *TP* and its interaction with *FOR* in equations 6.5.2 and 6.5.3, respectively, are both statistically significant, equation 6.5.3 is chosen because the latter is slightly better in terms of the overall fit (*F*-test). The 2SLS estimates of equation 6.5.3 are reported as equation 6.5.4. Equations 6.5.5 and 6.5.6 are the OLS and 2SLS estimating results, respectively, using *NRP* as a proxy of *TP*. As discussed earlier, the equations estimated by 2SLS are our preferred estimation.

There is no significant difference between the two alternative trade policy measures, *NRP* and *ERP*. The following discussion focuses on the equation estimated using the 2SLS regression with *ERP* as the trade policy measure and *CR5* as the concentration index for the purpose of estimate comparison. Most of the estimates except *QL* and *FOR* are significantly different from zero with the theoretically expected signs.

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[12] They are manufacture of refined petroleum products, manufacture of other special purpose machinery, manufacture of office accounting and computing machinery, and manufacture of tobacco products.

Table 6.5

Determinants of Labour Productivity in Thai Manufacturing:

Regression Results with Alternative Measures of Trade Policy Regime

	TP=ERP				*TP=NRP*	
	6.5.1	**6.5.2**	**6.5.3**	**6.5.4**	**6.5.5**	**6.5.6**
	OLS	**OLS**	**OLS**	**2SLS**	**OLS**	**2SLS**
INTERCEPT	3.95 (5.54)*	4.03 (5.68)*	3.90 (5.52)*	4.12 (5.14)*	4.04 (5.81)*	4.07 (5.20)*
$\left(\frac{k}{l}\right)_j$	0.53 (8.33)*	0.53 (8.41)*	0.53 (8.41)*	0.52 (7.84)*	0.51 (8.25)*	0.51 (8.09)*
k_j	0.08 (2.47)*	0.08 (2.37)*	0.09 (2.49)*	0.09 (2.32)*	0.09 (2.63)*	0.10 (2.53)*
FOR_j	-0.05 (-0.22)	-0.22 (-1.17)***	0.32 (0.16)	-0.38 (-0.56)	0.34 (-1.35)***	0.39 (0.43)
FOR_j*TP_j	-1.15 (-0.97)		-1.75 (-2.56)*	-2.18 (-2.48)*	-3.75 (-3.14)*	-4.28 (-2.98)*
TP_j	-0.19 (-0.61)	-0.43 (-2.44)*				
$TECH_j$	-0.27 (-3.24)*	-0.29 (-3.55)*	-0.26 (-3.20)*	-0.28 (-3.06)*	-0.27 (-3.39)*	-0.27 (-2.84)*
$CR5_j$	0.41 (1.03)	0.40 (1.07)	0.40 (1.08)	0.68 (1.24)***	0.33 (0.91)	0.35 (0.64)
QL_j	-0.07 (-0.19)	-0.02 (-0.05)	-0.09 (-0.28)	-0.08 (-0.22)	-0.12 (-0.34)	-0.13 (-0.36)
Adjusted-R-squared	0.76	0.76	0.76	0.75	0.77	0.77
F-statistics	15.5*	31.3*	31.6*	28.9*	32.9*	32.8*
Number of outliers	4	4	4	4	4	4
Diagnostic Tests[2]						
Functional form	2.84 (p=0.09)	2.28 (p=0.13)	3.12 (p=0.08)	1.17 (p=0.28)	2.57 (p=0.11)	2.38 (p=0.12)
Residual normality	3.73 (p=0.16)	4.60 (p=0.10)	3.30 (p=0.19)	3.47 (p=0.18)	2.66 (p=0.27)	2.33 (p=0.31)
Heteroscedasticity	0.24 (p=0.62)	0.15 (p=0.70)	0.27 (p=0.60)	1.70 (p=0.19)	0.12 (p=0.73)	0.25 (p=0.62)
Overidentification				0.11 (p=0.30)		1.68 (p=0.31)

Notes: Numbers in parentheses are *t*-statistics.

*, **, and *** indicate the level of statistical significance at 1, 5, and 10 per cent, respectively.

[1]The instrument variables are *MSIZE* and *ERP* as well as their interaction with *TP*.

[2]See details of diagnostic tests in Appendix 12.

Source: Author's estimates based on data series discussed in the text.

The overall results are similar to the estimates of FDI technology spillover. The negative coefficient of *FOR*ERP also* supports the overall hypothesis that industries with trade regimes characterized by greater outward orientation tend to yield more the technological benefit from foreign presence. The coefficient of *FOR*, that is not significantly different from zero, indicates that the entry of MNE affiliates does not always have significant contribution to industry productivity. The impact is mainly conditioned by the nature of the trade regime. Evaluating at the mean level of *ERP* (16 per cent), the foreign presence generates a net negative impact. A percentage increase in *FOR* reduced the labour productivity by 0.26 per cent for the overall manufacturing sector. This finding is consistent with previous studies of Thai manufacturing e.g. Khanthachai *et al.* (1987); Akira (1989); Tambunlertchai and Ramstetter (1991); Ramstetter (2004). In particular, Akira (1989: p. 185, 198) argues that the technology associated with FDI in the Thai manufacturing sector under an IS regime usually belongs to simple, standardized processes, rather than advanced methods. The evidence found here is also in line with general findings in host developing countries pursuing an IS regime (Moran, 2001).

6.7. Conclusions

This chapter examines the effect of FDI on technological capability in host countries based on a cross-industry analysis of Thai manufacturing. The prime objective has been to test the 'Bhagwati hypothesis' that technological benefit is unlikely to take place in highly trade-restricted industries, compared with more export-oriented ones. Two key aspects of the effect on technological capability in host countries are examined. Firstly, FDI technology spillover is examined, i.e. whether foreign presence affects the productivity of locally owned industry. In order to allow for the simultaneity between sectoral productivity and foreign presence, this study uses a system of two equations (productivity determinants and FDI determinants) to test the key hypothesis. The regression results support the 'Bhagwati hypothesis'. Technology spillover tends to be far less or even negative under an IS regime, compared to policy regime geared toward

EP. There is also evidence that trade barriers as well as the size of the domestic market play an important role in determining inter-industry differences in FDI participation.

Secondly, the analysis is extended to test whether the foreign presence affects industry productivity. The sample covers both foreign and locally owned firms. In circumstances where there is no FDI technology spillover, MNE affiliates themselves could still positively enhance productivity of the industry because they are associated with advanced technology. The empirical evidence suggests the trade policy regime still plays a pivotal role in determining the technological benefit from MNE affiliates. In circumstances where the trade policy regime is restrictive, the entry of MNE affiliates does not contribute significantly to technological capability.

Appendix 11

Data Used in Regression Analysis of FDI and the Technological Benefit

IND	Description	LP_j^d	$\left(\frac{k}{l}\right)_j^d$	k_j^d	LP_j	$\left(\frac{k}{l}\right)_j$	k_j	FOR_j
1511	Production of meat and meat products	177	296	3,630	245	277	5,227	46.75
1512	Processing and preserving of fish and fish products	251	194	9,840	356	275	19,263	38.55
1513	Processing of fruit and vegetables	874	251	5,160	680	275	8,971	26.73
1514	Manufacture of vegetable and animal oils and fats	383	553	4,010	667	596	4,844	14.08
1520	Manufacture of diary products	263	590	5,030	427	521	6,343	18.78
1531	Manufacture of grain mill products	548	537	9,280	718	683	16,042	9.58
1532	Manufacture of starches and starch products	242	471	950	483	547	1,412	33.06
1533	Manufacture of prepared animal feeds	488	585	5,120	722	678	8,172	23.50
1541	Manufacture of bakery products	135	227	2,340	252	296	4,220	10.55
1542	Manufacture of sugar	372	1264	12,200	797	1109	26,001	26.74
1543	Manufacture of cocoa, chocolate and sugar confectionery	143	265	373	290	598	1,798	55.66
1544	Manufacture of macaroni, noodles, couscous, and similar farinaceous products	150	267	1,830	273	282	2,094	26.00
1549	Manufacture of other food products	169	467	6,290	297	567	9,872	70.21
1554	Manufacture of soft drink; bottling of mineral waters	198	1303	8,230	913	1132	10,169	70.52
1600	Manufacture of tobacco products	1191	320	4,360	2245	319	4,405	4.64
1711	Preparation and spinning of textile fibres; weaving of textiles	178	390	21,700	303	486	33,706	44.36

(contd.)

Appendix 11.(contd.)

IND	Description	LP_j^d	$\left(\frac{k}{l}\right)_j^d$	k_j^d	LP_j	$\left(\frac{k}{l}\right)_j$	k_j	FOR_j
1712	Finishing of textiles	134	349	4,540	216	491	8,450	21.81
1721	Manufacture of made-up textile articles, except apparel	117	143	1,130	194	218	2,515	73.39
1722	Manufacture of carpets and rugs	108	104	42	209	234	130	88.32
1723	Manufacture of cordage, rope, twine and netting	64	122	1,800	118	146	2,394	30.29
1729	Manufacture of other textiles n.e.c.	264	318	991	313	334	1,349	84.72
1730	Manufacture of knitted and crocheted fabrics and articles	100	230	1,380	195	313	2,716	55.53
1810	Manufacture of wearing apparel, except fur apparel	105	136	13,400	188	138	16,425	35.47
1820	Dressing and dyeing of fur manufacture of articles of fur	94	367	263	275	404	312	45.65
1911	Tanning and dressing of leather	217	459	2,160	289	460	3,554	19.76
1912	Manufacture of luggage, handbags and the like, saddlery and harness	134	169	1,610	198	172	1,874	39.95
1920	Manufacture of footwear	131	131	5,040	202	136	6,119	18.41
2010	Sawmilling and planning of wood	168	228	3,030	276	268	4,957	18.52
2021	Manufacture of veneer sheets, manufacture of plywood, laminboard, partic board and other panels and boards	328	360	2,130	491	799	7,388	51.81
2022	Manufacture of builders' carpentry and joinery	291	274	1,730	380	302	2,513	7.71
2023	Manufacture of wooden containers	182	173	289	230	197	443	2.80

(contd.)

Appendix 11 (contd.)

IND	Description	LP_j^d	$\left(\frac{k}{l}\right)_j^d$	k_j^d	LP_j	$\left(\frac{k}{l}\right)_j$	k_j	FOR_j
2029	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials	116	103	1,040	175	116	1,350	19.89
2101	Manufacture of pulp, paper and paper board	331	1139	6,190	1131	1704	19,519	82.62
2102	Manufacture of corrugated paper and paperboard and of containers of paper and paperboard	297	476	5,890	908	1146	20,025	21.16
2109	Manufacture of other articles of paper and paperboard	239	307	1,280	429	574	3,134	56.03
2211	Publishing of books, brochures, musical books and other publications	206	376	603	291	446	1,138	25.92
2212	Publishing of newspapers, journals and periodicals	332	347	1,040	768	1002	6,491	47.49
2219	Other publishing	330	1220	1,750	438	958	2,186	0.00
2221	Printing	908	381	5,830	908	451	10,903	3.90
2222	Service activities related to printing	178	463	1,320	383	470	1,442	0.10
2230	Reproduction of recorded media	48	99	47	152	131	106	45.40
2320	Manufacture of refined petroleum products	8454	43980	103,000	11158	40459	102,928	49.21
2411	Manufacture of basic chemicals, except fertilizers nitrogen compounds	1766	2725	15,200	1868	3258	24,751	42.82
2412	Manufacture of fertilizers and nitrogen compounds	214	482	439	438	1032	2,168	38.54
2413	Manufacture of plastics in primary forms and of synthetic rubber	110	146	515	1072	4940	26,478	74.32

(contd.)

Appendix 11 (contd.)

IND	Description	LP_j^d	$\left(\frac{k}{l}\right)_j^d$	k_j^d	LP_j	$\left(\frac{k}{l}\right)_j$	k_j	FOR_j
2421	Manufacture of pesticides and other agro-chemical products	144	674	374	811	587	687	66.85
2422	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	195	318	861	369	394	1,724	85.39
2423	Manufacture of pharmaceuticals, medicinal chemicals and botanical products	133	250	3,060	464	337	6,249	36.04
2424	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	94	249	2,100	282	319	3,161	69.08
2429	Manufacture of other chemical products n.e.c.	178	181	1,120	316	306	2,134	57.93
2430	Manufacture of man-made fibres	251	167	241	369	276	440	68.91
2511	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres	167	1251	10,700	273	801	12,152	73.86
2519	Manufacture of other rubber products	630	259	5,630	660	355	11,852	36.81
2520	Manufacture of plastic products	144	286	16,100	300	426	33,806	40.37
2610	Manufacture of glass and glass products	201	364	1,900	469	546	3,885	76.20
2691	Manufacture of non-structural non-refractory ceramic ware	136	432	7,170	397	442	8,519	28.91
2692	Manufacture of refractory ceramic products	102	383	960	137	324	1,320	9.64
2693	Manufacture of structural non-refractory clay products	316	222	2,130	352	238	2,746	1.31
2694	Manufacture of cement, lime, and plaster	2805	4715	46,400	3450	4611	47,860	22.59

(contd.)

Appendix 11 (contd.)

IND	Description	LP_j^d	$\left(\frac{k}{l}\right)_j^d$	k_j^d	LP_j	$\left(\frac{k}{l}\right)_j$	k_j	FOR_j
2695	Manufacture of other non-metallic mineral products n.e.c.	382	641	31,700	533	658	42,226	23.77
2696	Cutting, shaping and finishing of stone	248	416	1,280	293	580	3,126	5.70
2699	Manufacture of other non-metallic mineral products n.e.c.	402	714	3,340	730	942	5,331	5.67
2710	Manufacture of basic iron and steel	346	713	8,020	794	785	13,484	29.21
2720	Manufacture of basic precious and non-ferrous metals	200	486	1,300	313	490	1,822	17.91
2731	Casting of iron and steel	368	247	925	452	329	1,412	55.09
2732	Casting of non-ferrous metals	352	671	2,800	521	655	3,369	16.84
2811	Manufacture of structural metal products	165	385	5,790	324	386	8,352	43.21
2812	Manufacture of tanks, reservoirs and containers of metal	221	270	1,220	394	263	1,442	50.49
2891	Forging, pressing, stamping and roll-forming of metal; powder metallurgy	120	264	3,130	217	301	4,500	54.61
2892	Treatment and coating of metals; general mechanical engineering on a fee or contract basis	93	298	946	164	328	1,905	91.06
2893	Manufacture of cutlery, hand tools and general hardware	115	284	1,010	204	326	1,480	40.13
2899	Manufacture of other fabricated metal products n.e.c.	136	222	6,180	220	282	9,695	51.39
2912	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines	140	219	527	231	207	696	41.41

(contd.)

Appendix 11 (contd.)

IND	Description	LP_j^d	$\left(\frac{k}{l}\right)_j^d$	k_j^d	LP_j	$\left(\frac{k}{l}\right)_j$	k_j	FOR_j
2913	Manufacture of bearings, gears, gearing and driving elements	552	1552	489	673	1154	691	95.88
2915	Manufacture of lifting and handling equipment	88	315	394	216	275	547	88.50
2919	Manufacture of other general purpose machinery	292	279	2,350	447	304	3,342	75.20
2921	Manufacture of agricultural and forestry machinery	107	242	1,310	201	296	2,122	5.50
2922	Manufacture of machine-tools	134	229	211	209	278	385	74.54
2924	Manufacture of machinery for mining, quarrying and constructions	162	1152	1,360	318	986	1,481	23.55
2925	Manufacture of machinery for food, beverage and tobacco processing	194	329	183	298	594	450	2.36
2926	Manufacture of machinery for textile, apparel and leather production	114	348	111	254	347	166	76.03
2929	Manufacture of other special purpose machinery	687	19151	102,000	864	14700	102,534	73.51
2930	Manufacture of domestic appliances n.e.c.	112	454	2,960	314	502	4,198	88.25
3000	Manufacture of office, accounting and computing machinery	403	51	91	592	51	91	98.61
3110	Manufacture of electric motors, generators, and transformers	272	259	842	426	450	2,392	71.28
3120	Manufacture of electricity distribution and control apparatus	187	211	982	363	236	1,488	87.82
3130	Manufacture of insulated wire and cable	300	191	76	570	1318	897	91.01

(contd.)

Appendix 11(contd.)

IND	Description	LP_j^d	$\left(\frac{k}{l}\right)_j^d$	k_j^d	LP_j	$\left(\frac{k}{l}\right)_j$	k_j	FOR_j
3140	Manufacture of accumulators, primary cells and primary batteries	94	297	65	215	624	272	83.40
3150	Manufacture of electric lamps	180	585	2,260	334	551	2,369	46.64
3190	Manufacture of other electrical equipment n.e.c.	127	203	787	295	409	2,656	91.04
3210	Manufacture of electronic valves and tubes and other electronic components	84	250	1,080	246	242	1,342	97.25
3220	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy	165	134	206	256	173	669	93.48
3230	Manufacture of television and radio receivers and associated consumer goods	199	569	2,890	762	527	3,026	89.24
3311	Manufacture of medical and surgical equipment and or orthopaedic appliances	242	125	261	303	134	313	54.86
3320	Manufacture of optical instruments and photographic equipment	267	154	246	410	146	270	91.89
3330	Manufacture of watches and clocks	125	149	118	195	159	145	91.83
3410	Manufacture of motor vehicles	98	275	716	430	1508	8,173	99.50
3420	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	283	319	4,810	412	477	8,816	68.55
3430	Manufacture of parts and accessories for motor vehicles and their engines	154	342	7,990	370	474	15,397	64.91
3591	Manufacture of motorcycles	90	290	2,760	219	312	3,326	52.41
3610	Manufacture of furniture	109	145	7,210	197	182	11,939	34.12

(contd.)

Appendix 11 (contd.)

IND	Description	LP_j^d	$\left(\frac{k}{l}\right)_j^d$	k_j^d	LP_j	$\left(\frac{k}{l}\right)_j$	k_j	FOR_j
3691	Manufacture of jewellery and related articles	183	152	1,460	333	179	2,453	64.61
3693	Manufacture of sports goods	89	195	141	193	185	147	93.87
3694	Manufacture of games and toys	137	221	1,360	197	206	2,247	23.86
3699	Other manufacturing n.e.c.	84	226	4,850	240	283	6,998	61.58

IND	Description	NRP_j	ERP_j	$CR5_j$	HHI_j	QL_j	$TECH_j$	$MSIZE_j$
1511	Production of meat and meat products	40.00	19.19	37.50	0.05	22.30	-0.59	486
1512	Processing and preserving of fish and fish products	2.91	-7.45	17.61	0.01	13.54	-1.42	1275
1513	Processing of fruit and vegetables	18.14	8.77	49.00	0.13	12.18	-0.29	18
1514	Manufacture of vegetable and animal oils and fats	8.50	-72.24	44.20	0.06	20.79	0.00	928
1520	Manufacture of diary products	10.31	4.88	39.70	0.05	26.70	0.00	597
1531	Manufacture of grain mill products	15.84	87.57	41.60	0.06	35.40	-0.96	2003
1532	Manufacture of starches and starch products	30.12	9.39	32.60	0.05	17.25	0.00	939
1533	Manufacture of prepared animal feeds	6.63	-11.18	29.10	0.03	27.64	0.00	939
1541	Manufacture of bakery products	27.32	31.58	34.12	0.04	28.87	-0.26	273
1542	Manufacture of sugar	16.11	18.17	31.70	0.04	21.26	0.58	786
1543	Manufacture of cocoa, chocolate and sugar confectionery	22.27	20.96	62.50	0.11	16.01	0.00	212

(contd.)

Appendix 11 (contd.)

IND	Description	NRP_j	ERP_j	$CR5_j$	HHI_j	QL_j	$TECH_j$	$MSIZE_j$
1544	Manufacture of macaroni, noodles, couscous, and similar farinaceous products	30.00	46.78	60.20	0.11	13.27	-0.41	115
1549	Manufacture of other food products	21.50	14.02	49.20	0.07	34.59	-0.43	115
1554	Manufacture of soft drink; bottling of mineral waters	7.84	3.52	75.80	0.16	28.94	-0.51	1119
1600	Manufacture of tobacco products	60.00	73.27	97.90	0.63	36.72	-1.30	1237
1711	Preparation and spinning of textile fibres; weaving of textiles	11.95	12.45	19.70	0.02	14.08	0.00	7611
1712	Finishing of textiles	12.67	22.66	35.30	0.04	14.61	0.37	7611
1721	Manufacture of made-up textile articles, except apparel	20.55	31.96	62.90	0.28	16.16	0.00	147
1722	Manufacture of carpets and rugs	18.82	7.88	66.60	0.11	12.87	-0.47	69
1723	Manufacture of cordage, rope, twine and netting	13.87	5.12	56.30	0.08	12.09	0.00	186
1729	Manufacture of other textiles n.e.c.	16.36	17.79	62.80	0.16	20.66	0.00	31
1730	Manufacture of knitted and crocheted fabrics and articles	28.60	13.78	50.50	0.10	11.64	0.00	418
1810	Manufacture of wearing apparel, except fur apparel	32.88	51.42	17.70	0.01	17.61	-0.31	4553
1820	Dressing and dyeing of fur manufacture of articles of fur	12.67	22.66	87.41	0.21	10.20	0.36	333
1911	Tanning and dressing of leather	5.17	-2.45	36.50	0.05	12.28	0.00	226

(contd.)

Appendix 11 (contd.)

IND	Description	NRP_j	ERP_j	$CR5_j$	HHI_j	QL_j	$TECH_j$	$MSIZE_j$
1912	Manufacture of luggage, handbags and the like, saddlery and harness	29.77	39.78	36.00	0.04	18.14	-0.47	5
1920	Manufacture of footwear	21.38	5.96	34.30	0.03	12.33	0.25	4
2010	Sawmilling and planning of wood	4.44	3.99	29.20	0.03	13.99	0.00	834
2021	Manufacture of veneer sheets, manufacture of plywood, laminboard, partic board and other panels and boards	16.74	18.41	57.00	0.15	15.29	0.52	18
2022	Manufacture of builders' carpentry and joinery	4.44	3.99	56.90	0.09	29.69	0.00	18
2023	Manufacture of wooden containers	20.00	20.72	45.50	0.06	19.84	0.00	535
2029	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials	16.74	18.41	32.90	0.04	12.50	0.00	381
2101	Manufacture of pulp, paper and paper board	5.79	3.84	76.30	0.32	19.01	0.00	723
2102	Manufacture of corrugated paper and paperboard and of containers of paper and paperboard	5.79	3.84	48.90	0.06	21.61	0.00	381
2109	Manufacture of other articles of paper and paperboard	25.27	100.10	46.30	0.08	22.05	0.00	381
2211	Publishing of books, brochures, musical books and other publications	12.13	18.52	40.30	0.05	28.84	0.00	4721
2212	Publishing of newspapers, journals and periodicals	12.13	18.52	77.50	0.15	38.12	-0.98	4721

(contd.)

Appendix 11 (contd.)

IND	Description	NRP_j	ERP_j	$CR5_j$	HHI_j	QL_j	$TECH_j$	$MSIZE_j$
2219	Other publishing	12.13	18.52	88.10	0.41	48.01	0.00	4721
2221	Printing	12.13	18.52	60.20	0.21	26.14	0.00	4721
2222	Service activities related to printing	12.13	18.52	59.20	0.10	16.60	0.00	4721
2230	Reproduction of recorded media	16.36	17.79	80.60	0.21	41.18	0.00	4721
2320	Manufacture of refined petroleum products	4.58	8.98	96.30	0.45	36.04	-1.19	7441
2411	Manufacture of basic chemicals, except fertilizers nitrogen compounds	2.55	0.06	50.00	0.10	27.59	0.00	1613
2412	Manufacture of fertilizers and nitrogen compounds	6.22	6.66	67.80	0.11	25.82	0.00	1001
2413	Manufacture of plastics in primary forms and of synthetic rubber	15.34	15.53	63.80	0.10	20.10	0.00	1086
2421	Manufacture of pesticides and other agro-chemical products	6.22	6.66	51.00	0.07	24.68	0.60	1001
2422	Manufacture of paints, varnishes and similar coatings, printing ink and mastics	8.71	8.85	64.40	0.14	45.44	0.00	235
2423	Manufacture of pharmaceuticals, medicinal chemicals and botanical products	6.17	-2.00	44.50	0.11	35.59	0.00	826
2424	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	20.67	25.23	65.20	0.12	35.21	0.44	375
2429	Manufacture of other chemical products n.e.c.	9.01	1.45	48.10	0.06	13.57	0.00	473
2430	Manufacture of man-made fibres	15.34	15.53	85.70	0.22	12.22	-0.63	7611

(contd.)

Appendix 11 (contd.)

IND	Description	NRP_j	ERP_j	$CR5_j$	HHI_j	QL_j	$TECH_j$	$MSIZE_j$
2511	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres	27.22	37.31	63.20	0.12	11.59	0.41	833
2519	Manufacture of other rubber products	28.95	11.10	32.90	0.03	14.83	-0.24	2563
2520	Manufacture of plastic products	16.07	13.09	15.50	0.01	13.89	0.00	652
2610	Manufacture of glass and glass products	15.80	14.56	65.50	0.12	12.18	0.00	456
2691	Manufacture of non-structural non-refractory ceramic ware	19.82	8.38	45.60	0.06	8.15	-0.81	51
2692	Manufacture of refractory ceramic products	20.04	53.68	76.70	0.26	26.63	0.66	51
2693	Manufacture of structural non-refractory clay products	20.04	53.68	73.50	0.16	19.65	-1.03	741
2694	Manufacture of cement, lime, and plaster	1.10	-0.45	76.30	0.14	40.67	-0.45	1707
2695	Manufacture of other non-metallic mineral products n.e.c.	19.38	42.15	30.00	0.04	28.39	0.49	1707
2696	Cutting, shaping and finishing of stone	12.71	22.49	26.90	0.03	19.35	0.00	1140
2699	Manufacture of other non-metallic mineral products n.e.c.	12.71	22.49	38.10	0.06	33.87	0.00	1140
2710	Manufacture of basic iron and steel	1.00	1.14	30.80	0.03	23.30	0.48	5393
2720	Manufacture of basic precious and non-ferrous metals	16.36	17.79	49.40	0.07	27.58	0.00	923
2731	Casting of iron and steel	9.15	9.82	68.10	0.14	39.13	-0.68	157
2732	Casting of non-ferrous metals	8.66	1.75	65.70	0.10	24.91	-0.38	157
2811	Manufacture of structural metal products	15.62	15.75	35.80	0.04	36.43	0.18	480

(contd.)

Appendix 11 (contd.)

IND	Description	NRP_j	ERP_j	$CR5_j$	HHI_j	QL_j	$TECH_j$	$MSIZE_j$
2812	Manufacture of tanks, reservoirs and containers of metal	18.05	21.86	59.80	0.09	38.17	0.00	2290
2891	Forging, pressing, stamping and roll-forming of metal; powder metallurgy	19.66	18.28	78.00	0.19	40.89	0.30	1140
2892	Treatment and coating of metals; general mechanical engineering on a fee or contract basis	19.66	18.28	84.20	0.30	34.80	0.00	157
2893	Manufacture of cutlery, hand tools and general hardware	20.08	23.47	38.90	0.04	27.05	0.29	1250
2899	Manufacture of other fabricated metal products n.e.c.	19.66	18.28	21.40	0.02	19.55	-0.16	157
2912	Manufacture of engines and turbines, except aircraft, vehicle and cycle engines	16.36	17.79	56.70	0.09	33.19	-0.48	469
2913	Manufacture of bearings, gears, gearing and driving elements	16.36	17.79	84.80	0.19	14.60	-0.90	469
2915	Manufacture of lifting and handling equipment	16.36	17.79	80.90	0.28	57.25	0.00	469
2919	Manufacture of other general purpose machinery	16.36	17.79	57.10	0.11	37.79	0.22	469
2921	Manufacture of agricultural and forestry machinery	5.45	-0.76	31.40	0.03	23.72	0.65	256
2922	Manufacture of machine-tools	4.14	-1.96	62.30	0.14	62.91	0.00	836

(contd.)

Appendix 11 (contd.)

IND	Description	NRP_j	ERP_j	$CR5_j$	HHI_j	QL_j	$TECH_j$	$MSIZE_j$
2924	Manufacture of machinery for mining, quarrying and constructions	16.36	17.79	57.10	0.09	63.51	1.31	825
2925	Manufacture of machinery for food, beverage and tobacco processing	16.36	17.79	54.10	0.08	44.70	0.82	825
2926	Manufacture of machinery for textile, apparel and leather production	16.36	17.79	77.00	0.20	42.32	-0.33	825
2929	Manufacture of other special purpose machinery	4.34	-1.19	89.20	0.44	31.39	-0.21	157
2930	Manufacture of domestic appliances n.e.c.	5.80	-0.35	62.60	0.13	39.84	0.00	825
3000	Manufacture of office, accounting and computing machinery	5.80	-0.35	48.30	0.07	14.89	-0.92	234
3110	Manufacture of electric motors, generators, and transformers	16.36	17.79	42.90	0.05	24.93	0.00	825
3120	Manufacture of electricity distribution and control apparatus	16.36	17.79	74.60	0.15	27.91	-0.87	825
3130	Manufacture of insulated wire and cable	13.18	5.25	70.00	0.13	71.28	-0.83	825
3140	Manufacture of accumulators, primary cells and primary batteries	3.67	-10.15	82.40	0.29	9.55	0.00	825
3150	Manufacture of electric lamps	16.36	17.79	43.60	0.05	23.53	0.00	825
3190	Manufacture of other electrical equipment n.e.c.	19.39	13.82	43.90	0.05	26.35	0.00	825
3210	Manufacture of electronic valves and tubes and other electronic components	16.36	17.79	36.00	0.04	30.00	0.00	825

(contd.)

Appendix 11 (contd.)

IND	Description	NRP_j	ERP_j	$CR5_j$	HHI_j	QL_j	$TECH_j$	$MSIZE_j$
3220	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy	7.45	-0.11	78.00	0.22	32.16	0.00	469
3230	Manufacture of television and radio receivers and associated consumer goods	7.45	-0.11	45.00	0.06	22.47	0.00	469
3311	Manufacture of medical and surgical equipment and or orthopaedic appliances	16.36	17.79	57.00	0.13	20.39	0.00	211
3320	Manufacture of optical instruments and photographic equipment	16.36	17.79	85.80	0.48	6.77	-1.06	7
3330	Manufacture of watches and clocks	8.92	4.26	82.30	0.15	11.01	-0.48	211
3410	Manufacture of motor vehicles	27.74	25.80	67.50	0.11	47.56	0.00	4220
3420	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	16.36	17.79	71.10	0.11	57.27	0.00	4220
3430	Manufacture of parts and accessories for motor vehicles and their engines	16.36	17.79	37.70	0.04	21.31	0.00	4220
3591	Manufacture of motorcycles	44.79	46.84	43.00	0.06	12.70	0.42	1417
3610	Manufacture of furniture	20.00	20.72	16.20	0.01	32.41	-0.43	417
3691	Manufacture of jewellery and related articles	1.21	-3.11	29.10	0.03	17.46	-0.17	770
3693	Manufacture of sports goods	10.30	2.16	48.60	0.07	21.02	-0.79	4
3694	Manufacture of games and toys	16.36	17.79	36.20	0.04	16.24	-0.41	4
3699	Other manufacturing n.e.c.	16.36	17.79	52.40	0.16	16.99	0.00	285

Notations:

LP_j^d	= Value added per worker for locally owned industry (1,000 baht)
$\left(\frac{k}{l}\right)_j^d$	= Capital-labour ratio for locally owned industry (1,000 baht)
k_j^d	= Capital stock for locally owned industry (million baht)
LP_j	= Value added per worker for both foreign and locally owned industry (1,000 baht)
$\left(\frac{k}{l}\right)_j$	= Capital-labour ratio for both foreign and locally owned industry (1,000 baht)
k_j	= Capital stock for both foreign and locally owned industry (million baht)
FOR_j	= Output share of foreign firms (per cent)
NRP_j	= Nominal rate of protection (per cent)
ERP_j	= Effective rate of protection (per cent)
$CR5_j$	= Sum of market share of the first five largest firms in the industry (per cent)
HHI_j	= Herfindahl-Hirshman index of concentration of the industry
QL_j	= Percentage share of supervisory and management workers to total industry employment
$TECH_j$	= Technology gap index
$MSIZE_j$	= Market size ($million)

Source: See the text.

Appendix 12

Diagnostic Tests of Cross-sectional Regression Analysis

1. Functional form

A test of functional form is based the well-known RESET test developed by Ramsey (1969). In this test, a comparison is made between our preferred structural model and an alternative model involving a higher order polynomial, used to represent a different functional form. The RESET test in its most common form consists of the following regression:

$$Y_{n\times 1} = X_{n\times m}\beta_{m\times 1} + \hat{Y}_{n\times r}\gamma_{r\times 1} \qquad \text{(A.13.1)}$$

where $Y_{n\times 1} = \begin{bmatrix} Y_1 & \cdots & Y_n \end{bmatrix}^T$

$$X_{n\times m} = \begin{bmatrix} X_{11} & \cdots & X_{1m} \\ \vdots & \ddots & \\ X_{n1} & & X_{nm} \end{bmatrix}$$

$$\beta_{m\times 1} = \begin{bmatrix} \beta_1 & \beta_2 & \cdots & \beta_m \end{bmatrix}$$

$$\hat{Y}_{n\times r} = \begin{bmatrix} \hat{Y}^2{}_{n\times 1} & \cdots & \hat{Y}^r{}_{n\times 1} \end{bmatrix}^T$$

$$\gamma_{r\times 1} = \begin{bmatrix} \gamma_1 & \cdots & \gamma_r \end{bmatrix}^T$$

n = Number of observations

m = Number of explanatory variables including intercept of the preferred structural model.

$\hat{Y}^j{}_{n\times 1}$ = Predicted value jth powered from the preferred structural model (i.e. $Y_{n\times 1} = X_{n\times m}\hat{\beta}_{m\times 1}$).

Subtracting $X_{n\times m}\hat{\beta}_{m\times 1}$ from both sides of equation (A.13.1), we obtain

$$\hat{u}_{n\times 1} = X_{n\times m}\left[\beta_{m\times 1} - \hat{\beta}_{m\times 1}\right] + \hat{Y}_{n\times r}\gamma_{r\times 1}$$

The null hypothesis that $\gamma_{r\times 1}=0$ is tested using the F-distribution.

2. Heteroscedasticity Test

The simple test of the (unconditional) homoscedasticity assumption proposed by Koenker (1981) is used in this study. The test is by running the following regression:

$$\hat{u}_t^2 = \alpha + \beta \hat{Y}_t^2 \tag{A.13.2}$$

where $\hat{u}_t$ = Residual from the preferred structural model at time t

i.e. $Y_{n\times 1} = X_{n\times m}\hat{\beta}_{m\times 1}$.

$\hat{Y}_t$ = Predicted value of dependent variable at time t.

The test is conducted with the null hypothesis, $\alpha = 0$, using the standard F-test.

3. Residual Normality Test

Normality test pursued in this study is based on Bera-Jarque test proposed by Bera and Jarque (1982). The test is conducted as follows:

$$\text{BJ} = \left[\frac{n}{6}SK^2 + \frac{n}{24}(EK-3)^2\right] \tag{A.13.3}$$

where SK = skewness

$$= \frac{\left[\frac{1}{n}\sum_{t=1}^{n}\hat{u}_t^3\right]}{\left[\frac{1}{n}\sum_{t=1}^{n}\hat{u}_t^2\right]^{\frac{3}{2}}}$$

EK = kurtosis

$$= \frac{\left[\frac{1}{n}\sum_{t=1}^{n}\hat{u}_t^4\right]}{\left[\frac{1}{n}\sum_{t=1}^{n}\hat{u}_t^2\right]^2}$$

n = number of observations

$\hat{u}_t$ = residual at time t

Under the null hypothesis that the error term is normally distributed, BJ will be distributed as $\chi^2(2)$.

4. Over-identification Test

There is a possibility that we have more instrumental variables than we need to identify the equation, hence the over-identification test is needed to ensure whether the additional instruments are valid. As proposed by Hausman (1978), the test is obtained the product of number of observation (n) and R_ε^2 from running the following regression;

$$\hat{\varepsilon}_{n\times 1} = Z_{n\times r}\hat{\gamma}_{r\times 1} \qquad \text{(A.13.4)}$$

$\hat{\varepsilon}$ =the 2SLS residuals of the2SLS estimations

NR_ε^2 is distributed as χ_Q^2 where Q is the number of over-identifying restrictions, i.e. the difference between number of instrumental variables and the endogenous variables. If the null hypothesis is rejected, the logic for choosing the instrumental variables must be re-examined and vice versa.

Chapter 7: An Industry Study of the Thai Processed Food and Automotive Industries

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This chapter surveys the development of the processed food and automotive industries over the past three decades. This is to lay the foundation for probing the mechanisms of MNE involvement and its contribution in the following chapter. Both industries are successful cases, but the trade policy regime toward them seems to be strikingly different. On the one hand, in the processed food industry, where four major export products, i.e. canned pineapple, canned tuna, processed chicken, and processed shrimp (together henceforth referred to as PF4s) are emphasized, Thailand is one of the major world exporters. The trade policy regime related to these products is to some extent neutral. In addition, the industry is typically export oriented.

On the other hand, in the automotive industry, covering car and component manufacturing, Thailand has recently successfully developed to become the regional hub in Southeast Asia for several leading MNE car manufacturers. Interestingly, the Thai government has long attempted to influence economic incentives by providing protection for vehicle manufacture, as well as imposing local-content requirements (LCRs) to promote local parts manufacture. These incentives tend to be biased in favour of the domestic market as opposed to export. This is because the car assembly industry has a high potential to promote linkages to the rest of economy. Promoting the car assembly industry could lead to the development of supporting industries. Nevertheless, since the early 1990s, selective policies for the automotive industry have noticeably liberalized. Thus, examining the automotive industry could address the role of backward linkages and gains from FDI. This also provides an opportunity to look at the role of MNE involvement within a specific industry under a different policy environment. Over and above their individual contribution to the existing literature, the comparison between these two successful industries can provide evidence of the role of trade policy regimes in regulating gains from MNE involvement.

This chapter is composed of three sections. The first two sections are devoted to the processed food and automotive industries and begin with an examination of domestic policy regimes, especially trade and investment policies over the past three decades. This is followed by the performance of these two industries in terms of output growth, employment and foreign exchange earnings, and an inter-country comparison. The last subsection illustrates the role of MNE involvement. Finally, Section 7.3 provides an inter-industry comparison.

7.1 The Processed Food Industry

7.1.1 Trade and Investment Policy

Trade and investment policies related to these PF4 products are relatively open. Almost all commercial transactions in PF4s are operated by the private sector, with a few exceptions where regional trade is conducted on a state-to-state basis (Jaffee and Gorden, 1993; p.45). Investment policy is liberal and there is no restriction on foreign investment producing PF4 products. PF4 industries are listed in the export-oriented promoted activities of the Thai Board of Investment (BOI) where foreign ownership restrictions (less than 49 per cent) do not apply.

Concerning trade policy, tariffs on finished PF4 products are high but this has no effect on consumption patterns over time (Table 7.1). Even though the high tariffs may lead to the perception that the trade policy regime involved in PF4 products is in line with an IS regime, indeed, such high tariffs are redundant for two reasons. Firstly, Thailand has been the world's major exporter of PF4 (see below). Furthermore, there has not been a large domestic demand for these PF4 products. Local consumers prefer fresh to processed products, i.e. canned/ frozen. Hence, the presence of PF4 tariffs has not effectively been able to encourage enterprises to shift their resources toward the highly protected domestic market. The high tariffs are also found in other major primary exports such as rice and cassava. In particular, while Thailand is both one of the most efficient rice producers and largest exporters in the world, the Thai government still maintains high level of protection (Warr, 2000: p1228–9).

The canned pineapple and processed shrimp industries are reliant on locally-produced primary products. Hence, the existing tariff on these raw materials seems to be redundant. By contrast, production of canned tuna relies heavily on imports of raw fish. In 2002, while the scheduled tariff rates are extremely high at 60 per cent, the applied tariff rate was only 30 per cent (Table 7.1). Taking into account the presence of various tax rebate schemes for export-oriented industries, the incidence of applied tariffs would be far lower.[1]

Table 7.1
Statutory and Applied Tariff Rates (per cent) of the PF4s, 2002

	Scheduled tariff rates	Applied rates
Canned pineapple (HS2008.20)	60	30
Canned tuna (HS1604)	60	30
Raw fish (HS0302)	60	5
Processed chicken (HS0207)	60	30
Processed shrimp (HS1605)	60	20
Agricultural products (average HS 01–24)	44.7	23.5

Source: Ministry of Finance

The only exceptional case is processed chicken, where inputs are subject to high levels of trade protection. In particular, chicken feed ingredients, i.e. soybean, minced fish, and maize, have been subject to both tariff and non-tariff measures.[2] Three of these ingredients accounted for around 70 per cent of the total cost of chicken meat. The high

[1]For example, data complied from the Ministry of Commerce sources indicate that the incidence of applied tariff rate for raw fish was a mere 0.2 per cent in 1993. During firm interviews, no reference was made to any adverse impact from the tariff on raw fish (see details of interviews in Chapter 8).

[2] Recently, the import restriction imposed on these three ingredients of chicken feed was replaced by the quota tariff, i.e. a lower tariff rate for import quantities under the quota. All details are available at http://www.dft.moc.go.th/import_index.htm. as well as WTO (1995) AIV5.

protection on these inputs has adversely affected the industry's international competitiveness (Suphachalasai *et al.*, 1999).

Quality and factory inspection has been another area where the government has been involved. Such regulations are general procedure and sometimes are due to a request by importing countries. Where some products are concerned, importing raw materials and exporting these products needs government permission. For example, importers of yellow fin tuna must show an import certificate for environmental conservation and dolphin preservation.[3] This permission is pursued for health, safety and environmental concerns rather than with the intention of creating any import and export transaction barriers. Several government agencies such as the Department of Fisheries, Ministry of Agriculture and Agricultural Cooperatives, and the Department of Industry Standards, Ministry of Industry, play a role in quality and factory inspection, which have to be undertaken before export certification is issued.

In addition, the Thai government has been actively involved in R&D activities, especially at the farm level. Several government agencies, especially the Ministry of Agriculture and Agricultural Cooperatives, have undertaken R&D activities involved with enhancing production efficiency at the farm level, such as post-harvest, feed technology, and disease control.[4] Apart from the farm R&D activities, the Office of Export Promotion, Ministry of Commerce regularly arranges an international trade fair that provides opportunities for potential local exporters to meet their potential customers, and advertises products from Thailand. While a consensus could not be reached on the significance of the contribution these activities make to private sector competitiveness, they are unlikely to create any adverse effect on the industry's international competitiveness.

[3] See detail in WTO (1995) in Table AIV5 and AIV8.

[4] For example, see lists of R&D activities for shrimp farming in Suphachalasai *et al.* (1999: p.2-44-5).

Table 7.2
Thai Processed Food and PF4 Exports, 1970–2003

	1970–5	1976–80	1981–5	1986–90	1991–5	1996–2000	2001–3
Processed foods ($million)	237	781	1,414	3,108	6,495	7,615	8,257
Processed food composition (per cent)							
(1) PF4s[1]	24.6	30.8	31.1	38.9	45.3	37.4	41
Canned pineapple	2.9	6.8	6.8	5.6	4.5	3.1	3
Canned tuna	3.6	1.9	2.7	4.2	5.4	5.2	5
Processed chicken	0.1	2.2	3.9	6.8	6.4	5.3	7
Processed shrimp	18.0	19.8	17.6	22.3	29.0	23.8	26
(2) Other processed foods[2]	75.4	69.2	68.9	61.1	54.7	62.6	59.2
Comparative aspects (per cent)							
(3) Share of processed foods to agricultural products[3]	22.5	27.4	33.4	47.7	60.3	61.8	67
(4) Share of processed foods to manufacturing products[4]	131.0	82.6	66.8	35.1	23.1	17.7	14
(5) Share of processed foods to total exports	15.0	16.0	19.5	19.3	16.2	12.9	12
(6) Share of PF4 to agricultural products	6	8	10	19	27	23	27
(7) Share of PF4 to manufacturing products	32	25	21	14	10	7	6
(8) Share of PF4 to total exports	4	5	6	8	7	5	5

Notes: [1]PF4s refer to four major export items of processed foods, i.e. canned pineapple, canned tuna, processed chicken, and processed shrimp.

[2] Other processed foods cover diary products, flour and cereals, other preserved fruit, fresh fruit and vegetables, preserved vegetable, sugar and molasses, coffee extracts, cocoa, and chocolates, preserved animal feeds, margarine and food preparations, beverages (alcoholic and non-alcoholic), tobacco products, animal oils and vegetable oils.

[3]Agricultural exports are the sum of SITC 0, 1, and 4 minus 27 and 28.

[4]Manufacturing exports are the sum of SITC 5 to 8 minus SITC 68.

Sources: Author's computations based on UN trade data (SITC version 1) held in the International Economic Data Base of the Australian National University for 1970–2000. Data for 2001–2003 are from the World Trade Atlas database.

7.1.2 Economic Performances of the PF4 Industries

Over the past three decades, the processed food industry has become increasingly important to the Thai economy as a major exporter. Table 7.2 illustrates the export performance of the processed food industry during the period 1970–2003. The export value of processed foods began exhibiting rapid growth from the mid 1970s, increasing from $237 million over the period 1970–5 to $3,108 million and $7,615 million, respectively, over the periods 1986–90 and 1996–2000. From 2001–3, the export value reached $8,257 million. The annual growth rate was 18 per cent during the period 1970–2003.

Compared with agricultural products, the growth performance of processed food has been outstanding. The export share of processed foods in agricultural exports increased to 61.8 and 67 per cent, respectively, during the period 1996–2000 and 2001–3, from around 22.5 per cent during the period 1970–5. In 2003, its share was almost 80 per cent. Nevertheless, this rapid growth of processed food exports lags behind that of labour-intensive manufacturing, such as garments, electrical appliances, electronics, jewelry and gems, etc. The latter's export value began to take off around the mid–1980s, with growth rates much faster than those of traditional export products and processed foods. The share of processed food exports to total exports increased until the mid–1980s, from 15 per cent in the period 1970–5 to around 19.0 per cent in the 1980s. From 1990 onward, its share steadily dropped because labour-intensive manufacturing export grew even faster. In 2001–3, the share of processed food exports accounted for 12 per cent (Table 7.2).

The rapid export growth of processed foods has been driven by the export boom in PF4 products. The share of PF4s to processed food exports increased from 24.6 per cent in 1970–5 to 45.3 per cent in 1991–5. From 1996 to the present, PF4 exports accounted for around 40 per cent, of which processed shrimp is the biggest export item. Processed shrimp accounted for 64 per cent of total PF4 exports during the period 1990–

2003, followed by processed chicken (15.1 per cent), canned tuna (12.6 per cent) and canned pineapple (8.6 per cent) (Table 7.2).

In general, as indicated by the value added per worker figure,[5] the processed food industry is labour intensive. The value added per worker from 1970–2000 was around B0.24 million a worker with a steadily increase from B0.13 million a worker from 1970–80 to B0.34 million a worker from 1991–2000. The value added per worker figure is always far lower than the average of the manufacturing sector at B0.34 million per worker from 1970–2000 (Table 7.3). Hence, an expansion of the processed food industry also contributed to employment. Its employment share in the manufacturing sector was around 23 per cent from 1970–2000. Nevertheless, its share of manufacturing employment declined slightly to 24.5 per cent in 1981–90 and 17.1 per cent in 1991–2000. The slight decline was a result of the boom in labour-intensive manufacturing exports e.g. clothing and electronics, which have taken off since the mid–1980s (Table 7.3).[6]

PF4 exports have exhibited rapid growth since the mid–1970s. The export take-off began with canned pineapple, with an export value of less than $4 million before 1973, increasing to $69 million by 1980. During the period 1981–2003, exports continued to grow steadily at a rate of 9 per cent per annum (Figure 7.1). The steady growth of canned pineapple exports is due to the fact that pineapples must be cultivated in coastal areas and require a certain type of soil. In the case of Thailand, such areas are limited to a few provinces around the western, eastern and some parts of the southern coast, mainly Prachuab Kiri Khan (which has 50 per cent of the total harvested area), and Rayong, Pethchburi, Chonburi and Chumphon, thereby constraining harvested output.

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[5]The value added per workers to some extent can be regarded as a broad indicator of the degree of capital intensity. The greater the value added per worker, the higher the capital intensity.

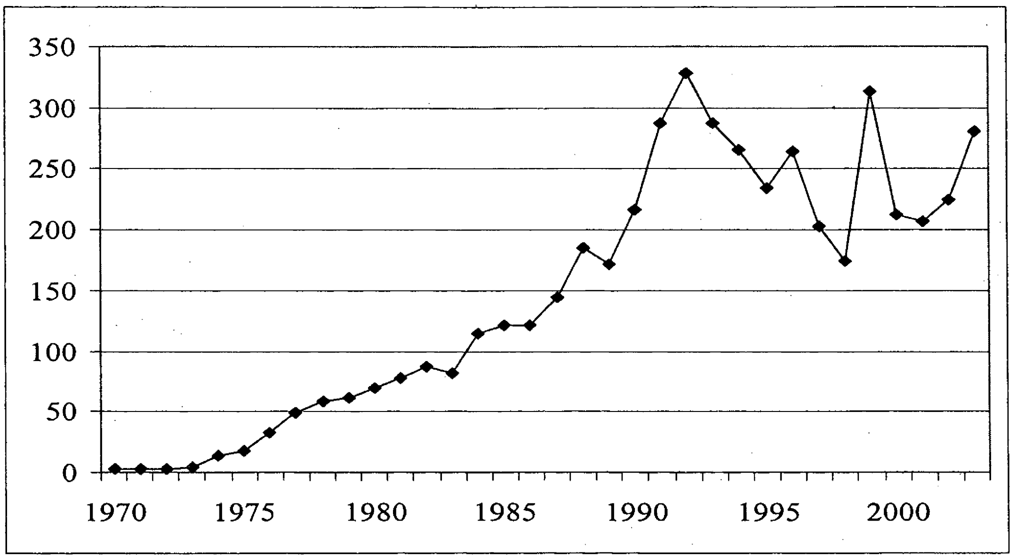
[6] For example, the employment share of the clothing industry increased from 1.1 per cent in 1970-80 to 10 and 18.5 per cent in 1986-90 and 1991-2000, respectively. Data are from UNIDO, *Industrial Statistics* (CD-ROM).

Table 7.3
Performances of Processed Food and Automotive Industries, 1970–2001 (Output Growth, Employment Absorption and Value Added per Worker)

	Processed foods	Automotive Industry
Annual growth of output (per cent)		
1970–80	7.1	14.2
1981–90	7.4	13.3
1991–2001	5.1	11.3
1970–2001	6.5	12.9
Share of Manufacturing Output (per cent)		
1970–80	23.4	9.7
1981–90	19.2	7.9
1991–2001	14.5	7.8
1970–2001	19.1	8.5
Share of Manufacturing Employment (per cent)		
1970–80	26.3	3.1
1981–90	24.5	3.2
1991–2000	17.1	4.0
1970–2000	23.0	3.4
Value added per worker (1,000 baht/worker)		
1970–80	133.7	350.6
1981–90	265.7	439.6
1991–2000	335.5	1008.8
1970–2000	239.6	575.6

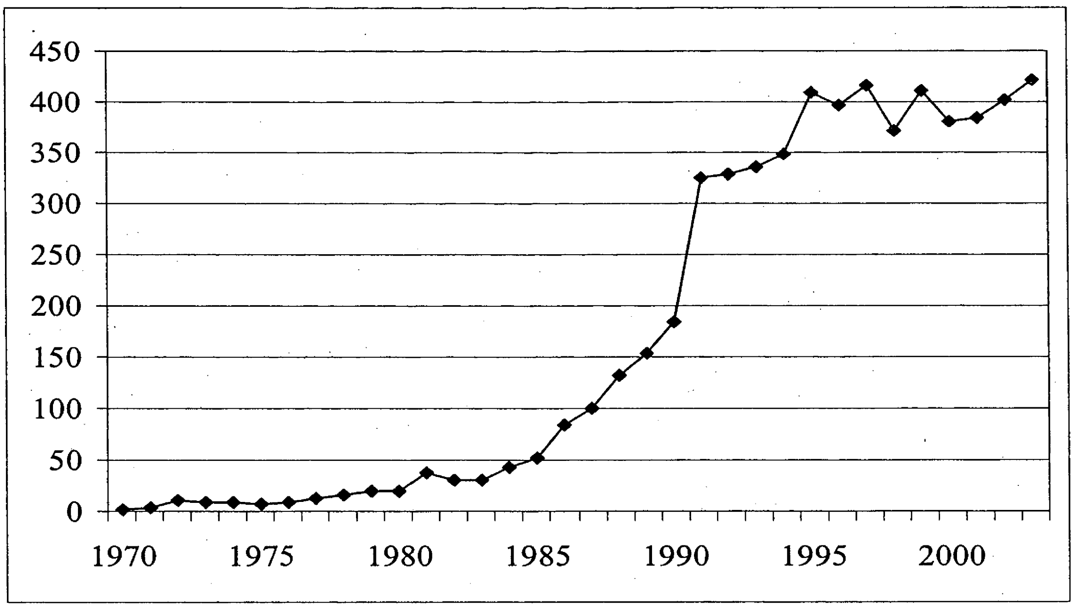
Notes: 1. Output growth data for 2001 are preliminary.
2.Output is measured by value added at 1988 prices.
3. Data for employment are rather incomplete. Data in some years are missing. The figures above are the average over the available data.
4. Value added per worker for processed foods is the data for the food industry excluding tobacco and beverages. Since tobacco and beverage industries are very capital intensive, inclusion of these two industries might mislead as to the degree of capital intensity of the processed food industry.
Sources: Value added is from National Economic and Social Development Board available at www.nesdb.go.th and data for employment are from UNIDO, *Industrial Statistics*, (CD ROM).

Figure 7.1
Export Value ($million) of Canned Pineapple, 1970–2003



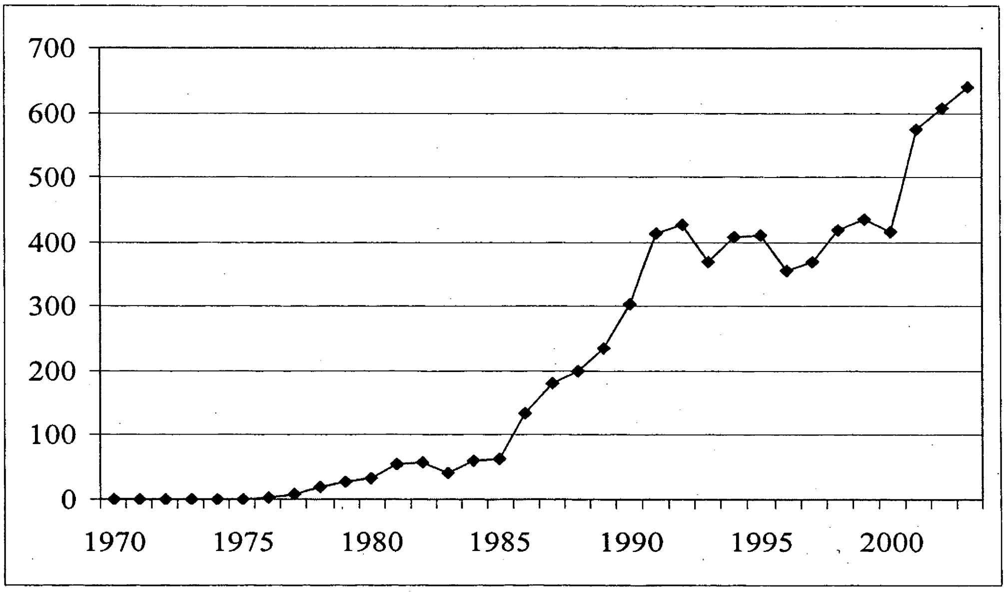
Sources: Compiled from the UN COMTRADE database available at International Economic Data Bank (IEDB), the Australian National University for 1970–2000. Data for 2001–3 are from the World Trade Atlas database.

Figure 7.2
Export Value ($million) of Canned Tuna, 1970–2003



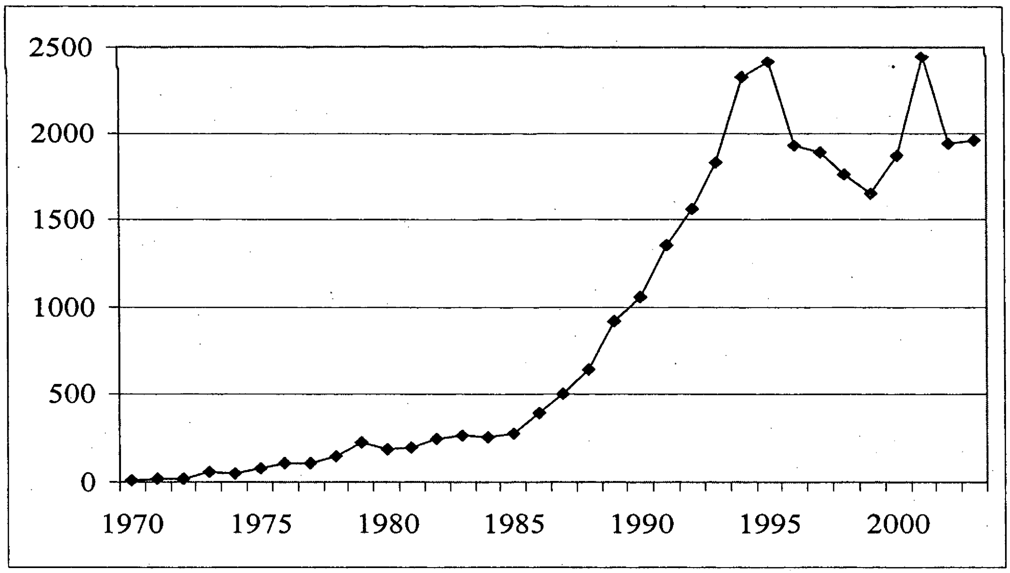
Source: See Figure 7.1.

Figure 7.3
Export Value ($million) of Processed Chicken, 1970–2003



Source: See Figure 7.1.

Figure 7.4
Export Value ($million) of Processed Shrimp, 1970–2003



Source: See Figure 7.1.

Similarly, the export boom in canned tuna took place in the late 1970s. Its export value reached \$20 million by 1980, from only \$6.7 million during the period 1970–5. The rapid growth in the export value of canned tuna during the period 1980–2003 remained at around 22.4 per cent a year (Figure 7.2). The export patterns for processed chicken and shrimp are similar to those for canned pineapple and tuna. As in Figure 7.3, the export value of processed chicken took off during the late 1970s. Export value in 1975 was only around \$0.5 million but had increased to \$33 million by 1980. Its export growth rate was around 17 per cent during the period 1980–2000. Despite a later take-off in the mid–1980s, the export value of processed shrimp rapidly increased from \$273 million in 1985 to \$508 million and to over \$1 billion, respectively, in 1987 and 1990 (Figure 7.4).

Nevertheless, the production process of PF4s transcends general agricultural and/or primary products. They need further processing before they reach the consumer. This additional processing consists of several complementary and value added activities, ranging from articulating consumer demand and designing the products, transforming raw agricultural materials into semi-cooked/cooked food, disease control, packaging, storing and transporting to consumers (Breimyer, 1976). For example, the production process of canned tuna starts from the selection of species and size. Frozen fish are then stocked in the cold store according to size, species, and incoming date. Frozen fish are thawed in water to an internal temperature of 0 to 5 degree Celsius, eviscerated by hand, sorted by size, loaded onto trays stacked on movable shelf racks and transported to a pre-cooker. Pre-cooked fish is cooled by water spray and later air-cooled. After cooling, fish are transferred to a cleaning area for loin cleaning. The head and skin are removed and the loin fillet is separated from the skeleton. This is one of the most important parts of the production process for determining the end competitiveness of the product. White (light) meat that is used for human consumption is further separated from the red (black) meat used for pet food. Meat is packed in water, brine or oil in hermetically sealed tin cans. The cans are then subjected to a heating process in a stream retort, water-cooled, stacked and labeled.[7]

While the production technology involved in further processing is not complicated in itself, the key to success in international marketing is how to combine all these value added activities. In addition, bad product quality can adversely affect consumers' health. Such an adverse effect on consumers might not be immediately observed, but its effect will persist for a longer time. As a result, many importing countries impose several Sanitary and Phytosanitary (SPS) regulations on imported processed foods including PF4s. In many cases, food safety regulations frequently change according to new scientific discoveries. As a result, even though PF4 products as well as other processed foods exhibit several favourable economic advantages such as lucrative global demand, high unit value, product differentiation, and high income elasticities, only a limited number of developing countries export them successfully (Jaffee and Gorden, 1993; Athukorala and Jayasuriya, 2003).

In terms of export value, Thailand has gained prominence in world markets in these processed food products (Table 7.4). During the period 1999–2001, Thailand was the world's largest exporter of canned pineapple (43 per cent of world exports), canned tuna (31 per cent) and processed shrimp (16 per cent). In the case of processed chicken, the export value for Thailand accounted for 5.7 per cent. However, the major role of France, the Netherlands, Hong Kong and Switzerland in the world export of processed chicken is most likely due to the re-export phenomenon. Their export values were associated with the greater value of chicken meat imports.[8] Excluding these countries, Thailand was the world's fourth largest exporter.

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[7]The information is summarized from data available at www.foodmarketexchange.com/datacenter/product/seafood/tuna/dc_pi_sf_tuna03.htm

[8] These four countries imported considerable amounts of processed chicken from the US, Brazil, China and Thailand. Hong Kong and the Netherlands imported considerable amounts of chicken from the US, Brazil, China and Thailand. In contrast, France and Switzerland imported heavily from The Netherlands and China.

Table 7.4

World Market Shares (per cent) of Selected Countries in the PF4s, 1999–2001

Canned Pineapple[1]			Canned Tuna[2]		
Rank	Country	Share	Rank	Country	Share
1	Thailand	43.1	1	Thailand	30.6
2	The Philippines	15.5	2	Spain	13.1
3	Indonesia	12.2	3	Cote d' Ivoire	6.8
4	Kenya	5.9	4	Ecuador	6.5
5	The Netherlands	3.7	5	Seychelles	6.1
	sum	80.5		sum	63.0
Processed Chicken[1]			**Processed Shrimp[2]**		
Rank	Country	Share	Rank	Country	Share
1	The United States	21.6	1	Thailand	16.3
2	Brazil	12.7	2	Indonesia	10.7
3	France*	13.3	3	India	10.3
4	The Netherlands*	10.5	4	Vietnam	8.0
5	China, PRC.	6.8	5	Mexico	5.5
6	Thailand	5.7	6	Argentina	3.0
7	China, Hong Kong*	6.2	7	China	3.3
8	Switzerland*	2.6	8	Ecuador	4.8
9	Denmark	2.1	9	Bangladesh	3.3
	sum	81.5		sum	65.4

Notes: * refers to countries that exhibited very high import values of frozen chickens. Their import values were even higher than their corresponding export values. Also, see footnote 8 for more detail.

Sources: [1]Food and Agriculture Organization (FAO), Fishery Yearbook Statistics, 2001.
[2]Food and Agriculture Organization (FAO), Commodities Yearbook Statistics, 2001.

Thailand has done well to comply with the SPS standard. Data from US Food and Drug Administration (FDA) records[9] on detention of import shipments following border inspection, could to some extent illustrate the high capability of Thai exporters in terms of product quality and hygiene in the US market. The level of rejections for a given country depends not only on its ability to meet SPS standards but also on the overall export volume. The export value per detention is a better measure of the volume effect,

[9] This information is provided by the US Food and Drug Administration (FDA). The information, for each shipment detained, includes the name/address of the exporter, the product, and the reason for detention, and is available on a monthly basis (with a time lag of about two weeks) for the given month and preceding eleven months. Data are available at www.fda.gov.oasis

demonstrating competitiveness in the processed food industry. The higher the export value per detention, the higher the capability of exporters for a given country.

Table 7.5 indicates the performance of developing countries according to export value i.e. \$0–500 million and greater than \$500 million. Controlling the export value range is necessary to make a reasonable comparison because, all other things being equal, a country with a large export value is more likely to be subject to export detention. Figures in Table 7.5 clearly reveal the superior performance of Thai exporters in the US market, compared with other developing countries. Firstly, Thailand was the largest individual exporter of PF4 products in the US market during the period May 2001–April 2002.[10] The export value was \$1,782 million, accounting for 18 per cent of total exports from developing countries to the US market. This value was comparable to Chile and Mexico, which are geographically close to the US market, thereby making it more advantageous to export perishable foods. Secondly, the export value per detention for Thailand is \$2.6 million, far greater than the average level of developing countries, i.e. \$1.5 million per detention. That is, the likelihood a PF4 shipment from Thailand was detained at the US border was far lower than other developing countries. Even considering countries whose export values were greater than \$500 million, Thailand was ranked second after Chile.

7.1.3 MNE Involvement in the Thai PF4 Industries

Measured by FDI inflow, the foreign presence in the processed food industry seems small, compared with other industries. FDI inflows to the food and sugar industries were steady during the period 1970–85, at around \$6 million annually (Table 7.6). From then on, a considerable increase in FDI inflows took place. The annual average of FDI inflows increased to \$59 million and \$124 million, respectively, during the first and second half of the 1990s. In 2003, the value of FDI inflows was \$123 million. The growth of FDI inflows is still relatively small, compared with some other industries, especially the electronics and electrical appliances industries. Thus, the share

[10]Processed chicken is not included in the US FDA records.

Table 7.5
Import Detention by the US Food and Drugs Administration: Number of Detentions, Total Value of Food Exports to the US and Export per Detention between May 2001 and April 2002

	No. of cases	Total Export to US ($million)	Export per detention (1,000$ per case)
Export value 0–500 $million			
Ghana	8	0.4	51
Senegal	4	0.7	185
Tunisia	6	0.7	111
Nigeria	18	1.8	102
Sri Lanka	46	11	247
Pakistan	65	15	223
El Salvador	15	17	1,103
Uruguay	7	23	3,250
Malaysia	32	38	1,189
Dominican Republic	579	59	102
Peru	82	74	907
Turkey	138	91	660
Bangladesh	84	101	1,206
Korea, Republic Of (South)	314	108	343
Taiwan, Republic Of China	392	205	523
Colombia	75	282	3,757
Argentina	138	332	2,405
Honduras	41	341	8,314
Philippines	421	399	948
Brazil	150	406	2,708
Guatemala	696	418	601
Export value greater than 500 $mil			
Indonesia	415	500	1,205
India	461	605	1,313
Costa Rica	85	773	9,091
Chile	154	1,597	10,372
Mexico	1,325	1,620	1,222
Thailand	695	1,782	2,564
Developing countries	**6,446**	**9,800**	**1,520**

Notes: (1) the PF4s consist of fish and shellfish (No.16), vegetables (No. 20–22) and fruit (No. 24–25)
(2) Developing countries are classified by the level of income according to the World Bank Classification.

Source: Complied using data from import detention from the US Food and Drugs Administration available at (www.fda.gov.oasis) and data for export to the US from the US International Trade Commissions, USITC website (www.usitc.gov) of capital inflow into the food and sugar industries as a share of the total industrial sector dropped from 14 per cent in the period 1970–5 to 5 per cent in the period 1996–2000, further reducing to 3 per cent from 2001–3.

Table 7.6
Annual Inflows of FDI in the Processed Food and Automotive Industries, 1970–2003

	Processed Foods		Automotive	
	Value ($million)	Share of Manufacturing (per cent)	Value ($million)	Share of Manufacturing (per cent)
1970–5	4	14.0	1	3.9
1976–80	4	8.9	4	8.7
1981–5	12	9.4	10	7.7
1986–90	47	7.0	37	5.4
1991–5	59	6.1	87	8.9
1996–2000	124	5.0	545	22.1
2001	114	2.9	646	16.3
2002p	38	1.9	393	19.9
2003p	123	6.2	582	29.2

Notes: p = preliminary data
Data on FDI inflows into the processed food and automotive industries are from the food and sugar, and machinery and transport equipment industries, respectively.
Source: Bank of Thailand, online-data-base available at www.bot.or.th.

The production technology for the PF4s is mainly involved with sterilization or freezing. It is rather simple and mature and generally available for arm's length purchase. It becomes of less concern to be linked with MNEs through the FDI channel in order to access advanced production technology. Instead, in such industries, the likelihood of global market penetration is reliant on accessing knowledge of international marketing. Hence, local firms tend to acquire such knowledge from MNEs through non-FDI channels. As discussed in Chapter 4, during the period 1986–98, the foreign equity share of PF4 firms was 30.7 per cent for the export-oriented BOI-promoted projects, well below the average of export-oriented industries at 62.4 per cent. The low level of foreign equity shares rather suggests the presence of MNE involvement through non-FDI channels.

7.2 The Automotive industry

7.2.1 Trade and Investment Policies

The automotive industry is one of the few industries where the Thai government has been involved in creating a policy-induced incentive structure to promote local assembly activities. Trade policy plays a pivotal role in influencing private sector decisions and performance. Trade policy concerning the automotive industry initially involved imposing high tariff rates on vehicles to promote local assembly activities. The government also imposed LCRs on vehicle assemblers in order to promote local policy-induced backward linkages. The presence of high tariffs and LCRs is in line with the 'infant industry' argument that promotion of the automotive industry can lead to the expansion of numerous complementary investments by auto parts firms, thereby laying down the basis for broad-based industrial growth. Initial assistance in terms of protection is needed for these parts manufacturers, so the argument goes, to grow and benefit from dynamic economies (i.e. falling costs as in the length of time over which output has proceeded) which occurs in the following period. When manufacturers gain these economies, protection is no longer needed.

In Thailand, an IS strategy began in the early 1960s with high tariff rates on completely built-up (CBU) vehicles together with the provision of investment incentives to entice MNE car manufacturers to Thailand. During 1960–70, tariffs were 60, 40 and 20 per cent, respectively, for CBU passenger cars, vans and pick-up trucks. Tariffs for completely knocked-down (CKD) vehicles were 50 per cent lower than those for all categories of CBU vehicles. These tariff rates were among the highest applied during this period. While they provided protection to locally assembled vehicles against imports, the tariffs that discriminated between CBU and CKD vehicles created policy-induced economic incentives for local assembly activities.

During the first decade of automotive industry development, however, the expectation that the localization of assembly activities would create vast backward linkages and build broad-based industrial growth in Thailand was not met. In the 1960s, MNE car makers in Thailand were unlikely to be able to procure locally produced parts because the domestic market was very small and it was unlikely any parts manufacturers could achieve scale economies in their production. In addition, Thailand was in the early stages of industry development, and technological capability of indigenous firms was very limited.

The government imposed LCR measures under the presumption that, regardless of the existing level of technological capability of local firms, LCR measures would give an opportunity for local parts suppliers to engage with MNE car makers. Beginning in 1971, domestically assembled cars, vans and pick-up trucks had to use locally produced parts to at least 25 per cent of the total value of the vehicle, in dollars, in order to qualify for CKD import duty. Such policy-induced backward linkages took effect in early 1975.

As argued in Chapter 2, the imposition of LCR measures can, to some extent, be regarded as a protection for local parts manufacturers, thereby creating policy-induced incentives for them. LCR measures imposed additional costs on locally assembled vehicles. Hence, in 1970, tariff rates on both CBU and CKD vehicles were increased to compensate for the expected additional costs arising from LCR measures. Tariff rates on passenger cars, vans and pick-up trucks were raised by 20 per cent for all CBU and CKD vehicles. As a result, tariff rates on CBU vehicles increased to 80, 60 and 40 per cent, respectively, whereas imports of CKD kits were subject to an import duty of 50, 40 and 30 per cent, respectively.[11]

From 1975–90, protection on vehicles was strengthened and the target of local content of locally assembled vehicles was raised. In 1978, high tariffs were replaced with an import ban on CBU passenger vehicles, and import tariffs on CKD kits were raised to 80 per cent. Vans and pick-up trucks, which had not yet been banned, also faced higher tariff rates. The tariffs for these CBU and CKD vehicles were at 80 and 60 per cent, respectively. Increases in production of passenger car series and the establishment of new assembly plants were simultaneously prohibited. In 1984, the government limited the domestic assembly of passenger cars to 42 series, each limited to two models.

The LCR system was also changed slightly between 1975 and 2000. From 1975–81, the LCR system at 25 per cent was based on the percentage of vehicle values. The greater the vehicle value, the greater the dollar amount of parts car assemblers had to buy locally to fulfill the 25 per cent LCR target. This obviously caused an uneven, adverse effect on car assemblers between large and small engine vehicles. The former seemed to find it more difficult than the latter to comply with the same LCR target.

After 1981, the government replaced the value-based system with a point system. Every part was assigned points. Auto assemblers were required to use locally produced parts up until the total points earned had achieved the government target.[12] For example, the LCR target in 1984 was 45 per cent (or points) and the total score of all items in the auto body was 23 points. If a car maker procured all these items locally, it automatically earned 23 per cent. To fulfill the LCR target, car makers needed to procure an additional 22 points. However, the 23 points assigned to all items of the auto body did not necessarily reflect relative production costs. Relative points were assigned with consideration given to existing and expected technical capability. They were not

[11]During the early 1970s, the government also rationalized the models and engine sizes as well as minimum capacity and investment. However, this rationalization policy lasted only 6 months (Nawadhinsukh, 1983).

[12] See full details of list of auto parts and their points assigned in Buranathanun (1995).

intended to reflect relative production costs of parts (Nawadhinsukh, 1983: p.190). Hence, caution is needed in any simple comparison of LCR targets over periods in drawing inferences on protection for locally manufactured parts. The double LCR target did not necessarily mean double the protection impact of LCR. Similarly, the comparison of LCR measures by focusing on the LC target across countries is even more difficult.

The LCR system was again modified in 1986 and applied throughout 1986–2000. The government changed the local-content usage programme for passenger cars to a mandatory account A and selective account B. Passenger cars must abide strictly by account A (27 points) and can choose to use more items from account B. The total percentage of LCR in compliance with both lists was to be at least 54 points for passenger vehicles.[13] For pick-up trucks, LCR measures were more or less the same. There were two lists: compulsory and selective lists without the assigned points. Assemblers had to procure all items on the compulsory lists. If there was no local production in some of the items in the compulsory lists, assemblers had to select substitutes from the selective lists to fulfill the requirement. In 1989, the government also began requiring assembly plants for one-ton pick-up trucks to fit locally produced diesel engines and the local-content requirements were up to 70 per cent in 1991.

Interestingly, some studies argued that the real value added of vehicles assembled in Thailand was far lower than the official target (Doner *et al.*, 2004: p.191). In particular, Veloso *et al.* (1998: p.17) estimated the actual local content was closer to 20 per cent. While the evidence from interviews[14] suggests the 20 per cent estimates seem to be unrealistically low, it nevertheless seems clear that LCR measures were unlikely to create a prohibitive adverse impact on car makers. Indeed, auto assemblers were involved in the design of the LCR formula (Doner, 1991: p.200; and interview with car assemblers). Hence, the measures were practical and acceptable in terms of the existing technological capability of indigenous parts suppliers. The words 'practical and

[13] See full details of list of auto parts and their points assigned in Buranathanun (1995).
[14] See the firm interviews in Chapter 8.

acceptable' in this context refer to a circumstance where car assemblers can still benefit from the protection on CBU imported vehicles. In the LCR formula, quasi non-traded parts, as well as parts that car makers used before the introduction of the LCR, accounted for a sizable number of points in both 1981–5 and 1986–2000 LCR formulas. The presence of quasi non-traded parts such as auto bodies,[15] tyres, batteries, exhaust systems, suspension systems, and radiators implies that regardless of the presence of LCR measures, car makers tended to procure them locally. For example, in the 1981–5 LCR formula, the auto body accounted for 23 per cent. Thus, it meant car assemblers had already achieved half of the total required score, i.e. the LCR target was 45 per cent. For other quasi non-traded parts like paint, fuel tanks, seat assemblies, glasses, carpets, and wiring harnesses, car makers procured locally before the local-content requirements were affected (Nawadhinsukh, 1983). Similarly, in the 1986–2000 LCR formula, parts lists in account A were all items assemblers had used previously. In addition, the total score for 3 main items i.e. trim panels, auto bodies and accessories was 20 out of the 27 additional points required from account B.

During the economic boom between 1986 and 1996, the policy towards the automotive industry became more liberal as opposed to earlier periods. The economic boom caused a rapid growth in domestic demand, causing a shortage of locally assembled vehicles (Poapongsakorn and Wangdee, 2000 and see below in Section 7.2.2). In 1990, the limitation on the number of allowed series was repealed. Meanwhile, the Ministry of Commerce replaced passenger-car import restrictions with tariff measures.[16] Tariff rates for CBU passenger vehicles over 2,400 cc. were reduced to 68.5 per cent in 1992, from 300 per cent before 1991. Similarly, for CKD kits of passenger cars with 2,400 cc. engines and below, the tariff was reduced to 42 per cent (Table7.7). Nonetheless, tariff rates for the automotive industries were still relatively high, compared to other industries.

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[15] Bulky external body parts related to vehicle appearance (e.g. bonnets, boots, etc.), are usually integrated into the assembly production line as in-house, thereby already contributing to the LCR requirement. Other auto body parts (e.g. interior soft trim, door-trim panel) were already contracted out to local suppliers. (Evidence from interviews with car assemblers.)

[16] However, imports of used cars were prohibited.

The Thai government also kept its strong commitment to abolishing the LCRs by the year 2000. Despite the 1997 economic crisis, in 1998 the Thai government approved keeping the WTO commitment to abolish LCR policies on schedule in January 2000. To cushion the potential adverse impact of LCR abolition, the tariff rates on CKD vehicles were raised slightly from 20 per cent in 1999 to 33 per cent in 2000. The import duty on CBU vehicles remained at 80 per cent (Table 7.7). Nevertheless, while tariffs for vehicles remain high, compared to other industries, absolute protection was considerably reduced for the auto assembly industry from the early 1990s to the present.

Table 7.7
Tariff and Taxes (per cent) related to Completely Built-up (CBU) and Completely Knocked-down (CKD) Vehicles, before 1991–2000

	Before 1991	1992	1999	2000
Completely built-up (CBU) vehicle				
Passenger cars over 2,400 cc.[1]				
Tariff rate	300	68.5	80	80
Excise tax	44–55	41.8	43–50	41–48
Passenger cars under 2,400 cc.[1]				
Tariff rate	180	42	80	80
Excise tax	44–55	35.75	41.25	38.5
Pick-up truck				
Tariff rate	120	60	60	80
Excise tax	9.9	n.a.	5.5	3.3
Completely knocked-down (CKD) vehicle				
Passenger cars over 2,400 cc.[1]				
Tariff rate	112	42	20	33
Excise tax	44–55	41.8	43–50	41–48
Passenger cars under 2,400 cc.[1]				
Tariff rate	112	42	20	33
Excise tax	44–55	41.8	41.25	38.5
Pick-up truck				
Tariff rate	72	20	20	33
Excise tax[2]	9.9	3	5.5	3.3–19.8[3]

Notes: [1] Before 1992, the classification of a passenger vehicle is 2,300 cc.
[2] Excise tax includes the municipal tax.
[3] Excise tax for one-ton pick-up trucks is 3.3 per cent whereas for the so called 'pick-up passenger vehicle (PPV) it is 19.8 per cent.
Source: Ministry of Finance.

Table 7.8 provides the chronological order of trade and investment policies for the Thai automotive industry. It becomes clear that these policies can be divided into two sub periods: pre– and post–1990. During the pre–1990 period, the government extensively used both tariffs and non-tariff measures (i.e. import ban, and LCRs) to promote the industry. Such measures were significantly reduced from 1990 onwards and the government has become more reliant on market mechanisms. Policy changes to some extent happened when MNE car assemblers changed their production strategy. As can be seen below, both of them played a pivotal role in explaining why Thailand was selected as the regional hub in Southeast Asia.

Table 7.8
A Chronology of Trade and Investment Policies of the Thai Automotive Industry, 1960 -2000

Period	Event
1960s	Increase tariffs of vehicles and apply an escalating tariff structure, i.e. tariffs of CKD vehicles were 50 per cent lower than those of CBU.
1970	Increase tariffs of CKD and CBU vehicles by 20 per cent.
1971	Impose local content requirement (LCR) measures that take effect in 1975. Domestically assembled vehicles had to use locally produced parts to at least 25 per cent of the total dollar value of the vehicle.
1975–90	- Modify the LCR system used from value-based system 1975–81: LCR system was point-based system. 1982–2000: Revise assigned points of individual parts. - Impose import ban on CBU passenger vehicles and raise tariffs rates of CKD passenger vehicles, peaking at 180 per cent. - Raise tariffs of CKD and CBU commercial vehicles, peaking at 72 per cent and 120 per cent, respectively. - Prohibit increases in passenger car series and the establishment of new assembly plants from 1978-90.

(contd.)

Table 7.8 (contd.)

Period	Event
	- Limit domestic assembly of passenger cars to 42 series (each limited to two models) from 1984-90.
1990	- Revoke the limitation on the number of allowed series. - Replace import restrictions of passenger cars with tariff measures.
1991	Lower tariff rates in all types of vehicles considerably.
1999	Raise tariffs of CKD vehicles to cushion the potentially adverse impact of LCR abolition.
2000	Abolish LCR measures.

Source: Author's compilation.

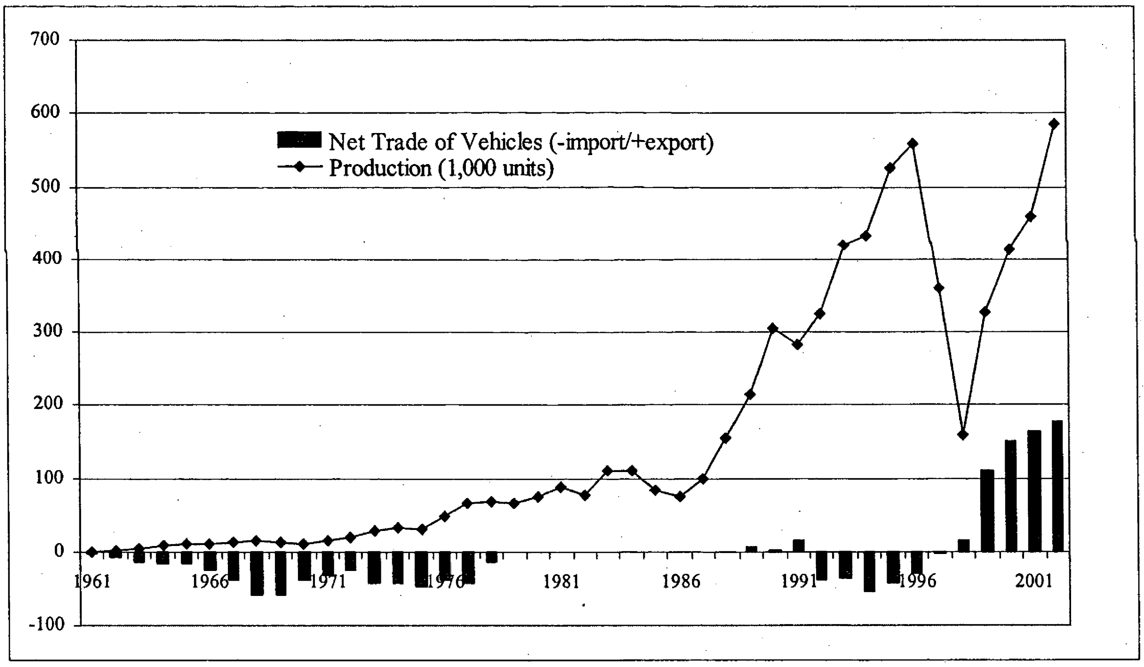
7.2.2 Economic Performances of the Thai Automotive Industry

The automotive industry in Thailand has experienced rapid growth over the past three decades. Between 1970 and 2001, the output value of transport equipment, which was dominated by the automotive industry, grew at a rate of 13 per cent a year in real terms (Table 7.3). This growth performance was more or less comparable to overall economic growth, resulting in a constant share of total manufacturing of 8 per cent.

Industrialization of the automotive industry in Thailand began in the early 1960s as a result of MNE entry. MNE car manufacturers were first enticed to enter by the open-investment regime and the policy-induced economic incentives from trade protection. During the 1960s, nine multinational car manufacturers entered Thailand and assembled vehicles locally for the domestic market. Several world leading car manufacturers from America, Europe and Japan were involved. Many of them, especially Japanese car makers, were linked with large local conglomerates, although foreign ownership restrictions had not yet been implemented. The further increase in vehicle tariff rates enticed more car manufacturers, although the BOI stopped granting investment privileges. As a result, in the mid–1970s, there were 20 assemblers operating in Thailand.

Vehicle production in Thailand rapidly increased from around 500 units in 1960 to 32,000 units by 1974 (Figure 7.5). Nevertheless, around 50 per cent of local demand was still served by imported vehicles until the mid–1970s. In addition, the locally assembled vehicles were highly import-dependent (Nawadhinsukh, 1983; Guiheux and Lecler, 2000: p.210). The technological capability of local suppliers was weak and the domestic market during that period was small. This made it difficult for local producers of auto parts to achieve economies of scale in their production. Only a few auto parts, such as shock absorbers, leaf springs, suspension systems etc., were locally manufactured for the replacement equipment manufacture (REM) market.

Figure 7.5
Production and Net International Trade of Vehicles in the Thai Automotive Industry, 1961–2002



Source: Thai Automotive Industry Association (2003)

As a result of the LCR measures that took effect in 1975, MNE car manufacturers began procuring parts locally from 1970 onward. Car assemblers commenced local procurement in two ways. Firstly, they invited some MNE parts suppliers to establish affiliates in Thailand. A few Japanese MNE parts manufacturers did enter Thailand, such as Cheena Gasket (1973), Art-Serina Piston (1974), Thai Safety-Glass (1974), Thai Arrow (1975), Nippon Denso (1976) etc.[17] However, many others were reluctant to manufacture in Thailand because of the limited domestic market during the 1970s and the lack of infrastructure and manpower. Secondly, car manufacturers searched for potential indigenous parts suppliers and invited them to become original equipment manufacture (OEM) suppliers. Most were medium-size firms in the REM markets. Hence, backward linkages between MNE car manufacturers and parts suppliers began. Before 1970, there were only 20 parts manufacturers, half of which were locally owned firms. The number of parts manufacturers had increased to around 180 enterprises by 1980 (Doner, 1991: p.191) with around 20–30 being foreign parts suppliers (Higashi, 1995; Buranathanung, 1995). The range of locally manufactured auto parts widened and included rubber parts, suspension systems, radiators, inner panel pressed parts, brake drums, gaskets, pistons, safety glass, electrical equipment and wiring harnesses.

Combined with the first oil shock, the introduction of the LCR measures affected the entry-exit pattern of MNE car manufacturers. As mentioned, the LCR system from 1975–80 was a value-based system at 25 per cent. This created an uneven adverse effect on car assemblers, as it implicitly favoured small-engine vehicles where Japanese assemblers had a marked advantage over western firms. The larger the engine, the greater the value of locally produced parts assemblers were required to procure. Considering the still weak technological capability of Thai parts manufacturers, it was harder for larger-engine car assemblers to comply with the LCR measures. Meanwhile, the sharp increase in oil prices during the early 1970s following the first oil shock caused Thais to prefer smaller-engine vehicles to save on energy consumption. All in all, the result was five assemblers ceased to operate, most those linked with non-Japanese MNEs. This was followed by the prohibition of the establishment of new assembly plants in 1978 and an import ban on CBU vehicles. Hence, the number of car makers dropped to 12 and remained unchanged until the early 1990s (Table 7.9).

[17]These examples are drawn from Table 4.3 by Buranathanung (1995).

Table 7.9
Production Capacity of Thai Automotive Assembly, 1989–2002

	Lists of Firms	Type of assembled vehicles	Starting Year of Operation	MNEs Ownership/partnership	Production Capacity			
					1989	1994	1999	2002
1	Toyota Motors Thailand Ltd.	Toyota pick-ups and passenger cars	1962	Japan	24,000	100,000	200,000	240,000
2	Siam Car Industry Co. Ltd.	Nissan pick-ups	1962	Japan	18,000	74,900	81,900	124,000**
3	Siam Motor Co. Ltd.	Nissan passenger cars	1962	Japan	5,520	21,600	31,200	n.a.**
4	Isuzu Motors (Thailand) Ltd	Isuzu pick-ups	1966	Japan	25,000	76,000	131,000	180,000
5	Thai Hino Industry Co. Ltd.	Hino Trucks	1964	Japan	9,600	9,600	9,600	28,800
6	M.M.C. Sitthiphon Motors Ltd.	Mitsubishi pick-ups and passenger cars	1961	Japan	40,000	126,600	160,000	190,200
7	Auto Alliance (Thailand)*	Mazda pick-ups and passenger cars	1974	Japan/US	7,200	8,400	135,000	135,000
8	Bangchan General Assembly Co.Ltd.	Various brands of passenger car (Honda, Holden, Hyundai, Daihatsu)	1970	Japan	8,220	18,000	20,000	20,000
9	Y.M.C. Assembly Ltd.	BMW passenger cars	1973	Thai	12,000	12,000	12,000	12,000
10	Thai Swedish Assembly Co. Ltd.	Volvo and Renault passenger cars	1976	Sweden	6,000	6,000	6,000	6,000
11	Thonburi Automotive Assembly Co. Ltd.	Mercedes Benz passenger cars	1960	Thai	2,340	4,600	14,900	18,100
12	Thai Rung Union Cars Co. Ltd	Isuzu and Shida pick-ups and passenger cars	1973	Thai	2,400	7,200	9,600	9,600
13	Honda Cars Co. Ltd.	Honda passenger cars	1996	Japan	n.a.	21,000	50,000	60,000
14	General Motor		1997	US	n.a.	n.a.	40,000	40,000
					160,280	486,100	901,200	1,063,700

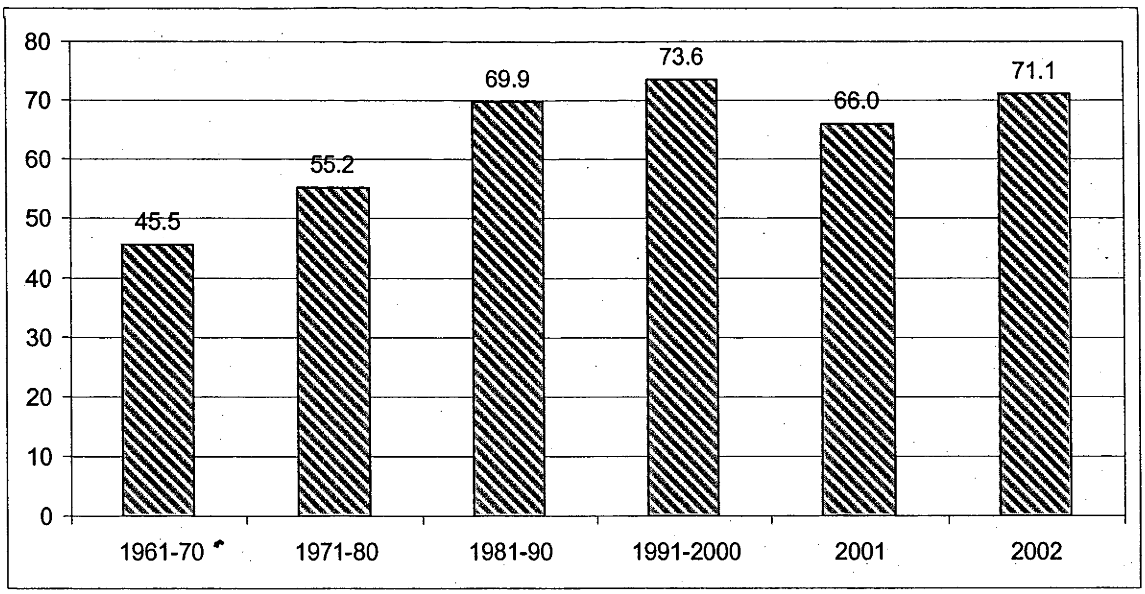
Notes: *Before 1995, this was in the title of Sukosol & Mazda Motor Industry Co Ltd. Ford and Mazda have become two major shareholder since 1995. The former holds 50 percent while the other 45 percent belongs to Mazda (Japan).

**Data in 2002 are not separated for Siam Motors, , Nissan Co Ltd and Siam Automotive Industry Co Ltd.

Source: Data for 1989 are from Bangkok Bank (1988), for 1994 from Buranathanum (1995), for 1999 from Wattanasiritham (2000), and 2002 from Thai Automotive Industry Association (2003).

The volume of vehicle production in Thailand still expanded at a rapid rate, increasing from 31,000 units in 1975 to 110,000 units in 1985 (Figure 7.5). Almost 70 per cent of locally assembled vehicles between 1975 and 1984 were commercial vehicles, in particular one-ton pick-up trucks (Figure 7.6). This was because commercial vehicles tended to be multi-purpose vehicles suitable for both rural and urban areas. There were larger domestic demands for commercial vehicles, especially one-ton pick up trucks, than for passenger vehicles. In addition, commercial vehicles have been subject to lower trade protection and consumption tax (excise tax) than passenger vehicles over the past three decades. Hence, the price of a one-ton pick-up truck was about half that of a mid-size passenger car (Doner *et al.*, 2004: p.188). Nevertheless, with this domestic market size, a single assembler was still unlikely to reach the economies of scale of approximately 40,000–50,000 units per model achieved by the existing assemblers (interview and Abrenica, 1998: p.15).

Figure 7.6
Percentage of Locally Assembled Commercial Vehicles to Total Vehicles, 1961–2002



Source: Thai Automotive Industry Association (2003)

The economic boom caused rapid growth in domestic demand for vehicles between 1986 and 1996 (Figure 7.5). From 1986–91, production volume doubled every two years. The volume of vehicle production increased from 74,000 units in 1986 to 154,000 units in 1988 and 300,000 units in 1990. The rapid expansion of vehicle production continued and the production volumes peaked at almost 600,000 units in 1996. One-ton pick up trucks exhibited the most rapid growth. Production volume increased from 47,000 units in 1986 to 185,000 units by 1990. In 1996, production volume reached 360,000 units (Figure 7.5).

The rapid expansion of domestic demand reduced the gap between capacity and domestic consumption. For example in 1988, the consumption volume was 154,000 units, accounting for 96 per cent of total capacity. This pattern continued until the mid–1990s. The consumption of vehicles was approximately equal to production capacity in 1994. This provided an opportunity for the government to undertake policy reform in the early 1990s. Many car assemblers expanded production capacity rapidly, from 160,280 units in 1988 to 486,100 and 901,200 units in 1994 and 1996–9, respectively (Table 7.10). Incumbent assemblers expanded production capacity and there were also new entrants. Ford, Daimler Chrysler and General Motor (GM) re-entered in the mid–1990s with the export of one-ton pick up trucks as the prime objective. As a result of the 1993 merger with Mazda, Ford became involved with local vehicle assembly in 1995, using Mazda's existing production base in Thailand. Similarly for Daimler Chrysler, the merger agreement with Mitsubishi allows the company to be involved in Thai car manufacture. GM established its new assembly line in 1996.

As a result of the rapid growth in vehicle demand, Thailand has had the largest domestic demand for vehicles among four South East Asian countries (i.e. Indonesia, Malaysia, the Philippines, and Thailand) since 1989, except between 1997 and 1999 (Table 7.10). From 1989–96, the annual vehicle sales of Thailand were 405,800 units, accounting for around 42 per cent of the total sales in these four countries. It was followed by Indonesia (27 per cent), Malaysia (21 per cent) and the Philippines (10 per cent). In addition, for passenger vehicles, the sales volume in Malaysia exceeded that of

Thailand, being dominated by the Malaysian National car, the Proton. For example, in 1995, the total sales of passenger vehicles were around 224,991 units and 163,371 units for Malaysia and Thailand, respectively.[18] For non-Proton vehicles, the sales volume was lower than 15,000 units. It is unlikely any MNE car assembler in Malaysia would achieve the minimum efficient scale. This applies specially to commercial vehicles because Thailand has become the world's second largest production base for one-ton pick-up vehicles (Doner *et al.*, 2004: p.187).

Table 7.10
Vehicle Sales of Indonesia, Malaysia, the Philippines, and Thailand combined and (percentage) Shares of the Total Sales for Each Individual Country, 1980–2005

	Indonesia (per cent)	Malaysia (per cent)	Philippines (per cent)	Thailand (per cent)	Total (per cent)	Total (1,000 units)
1980	41.1	24.2	13.3	21.3	100	418.0
1981	46.3	22.5	11.3	19.9	100	448.8
1982	43.3	23.5	12.3	20.9	100	435.6
1983	34.4	27.7	11.1	26.8	100	441.1
1984	37.6	31.4	3.0	28.0	100	405.1
1985	41.9	31.1	2.0	25.0	100	344.4
1986	50.7	23.4	1.4	24.6	100	319.4
1987	49.3	16.7	2.6	31.3	100	324.2
1988	40.7	17.7	5.0	36.5	100	388.8
1989	32.0	22.1	8.5	37.4	100	556.1
1990	33.4	22.6	7.0	36.9	100	822.9
1991	33.6	25.7	6.2	34.5	100	777.5
1992	23.0	19.7	8.2	49.2	100	738.0
1993	23.3	17.1	9.3	50.4	100	905.1
1994	28.9	18.0	9.3	43.7	100	1111.3
1995	27.8	20.9	9.4	41.9	100	1364.2
1996	22.9	25.2	11.2	40.7	100	1448.0
1997	29.8	31.2	11.1	28.0	100	1299.1
1998	13.1	36.7	18.0	32.3	100	446.1
1999	13.9	42.8	11.0	32.4	100	674.2

(contd.)

[18]Data for Malaysia were from Guiheux and Lecler (2000: p.215) and Sugiyama and Fujimoto (2000: p.191). Data for Thailand are from Thailand's Automotive Industry Directories 2003.

Table 7.10 (contd.)

	Indonesia (per cent)	Malaysia (per cent)	Philippines (per cent)	Thailand (per cent)	Total (per cent)	Total (1,000 units)
2000	15.3	29.1	17.5	38.2	100	687.2
2001	21.0	28.0	16.3	34.7	100	857.8
2002	20.2	29.9	16.0	33.9	100	1002.0
2003	23.5	26.7	14.5	35.3	100	1275.0
2004	21.7	27.3	13.6	37.5	100	1842.0
2005	22.1	26.6	12.8	38.5	100	1920.0

Notes: Total is the sum of vehicle sales of Indonesia, Malaysia, the Philippines, and Thailand. Data for 2000–5 are the forecast except for Thailand in 2000–1.
Source: data for Thailand are from Thailand's Automotive Industry Directory 2003–4, and data for other ASEAN countries from Guilheux and Lecler (2000: p.226) and Standard and Poor (S&P) (2000). The forecasted data are from Fourin (1998).

Having the largest domestic market among these four ASEAN members means that MNE car assemblers operating their assembly in Thailand are more likely to achieve scale economies than those in other ASEAN neighbours. In the case of one-ton pick-up trucks, where there are only four such assemblers, i.e. Isuzu, Toyota, Mitsubishi and Nissan, all of these assemblers are likely to have achieved economies of scale since 1990.

The recent economic crisis dramatically disrupted this rapid growth momentum. Production volume dropped sharply to 144,243 units in 1998, causing an excess capacity for existing car manufacturers. The industry seemed to have fully recovered from the crisis by 2002. Volumes of assembled vehicles had rebounded and reached 584,897 units (Figure 7.5).

However, the relative importance of the industry's output to the manufacturing sector has not gone hand in hand with that of the industry's employment. As indicated by the value added per worker, the automotive industry is capital intensive. The value added per worker in transport equipment manufacture was far greater than the average for the manufacturing sector over the past three decades. As a result, employment in transportation equipment manufacture remained at around 3 per cent of total manufacturing employment (Table 7.3). Over the past three decades, value added per worker, which slightly increased from B0.35 million per worker during 1970–80 to B0.44 million per worker between 1981 and 1990, dramatically increased to B1 million per worker between 1991 and 2000. The dramatic increase in value added per worker was due to changes in the nature of MNE involvement in the Thai automotive industry, from being a highly-protected domestic market to becoming more export-oriented.

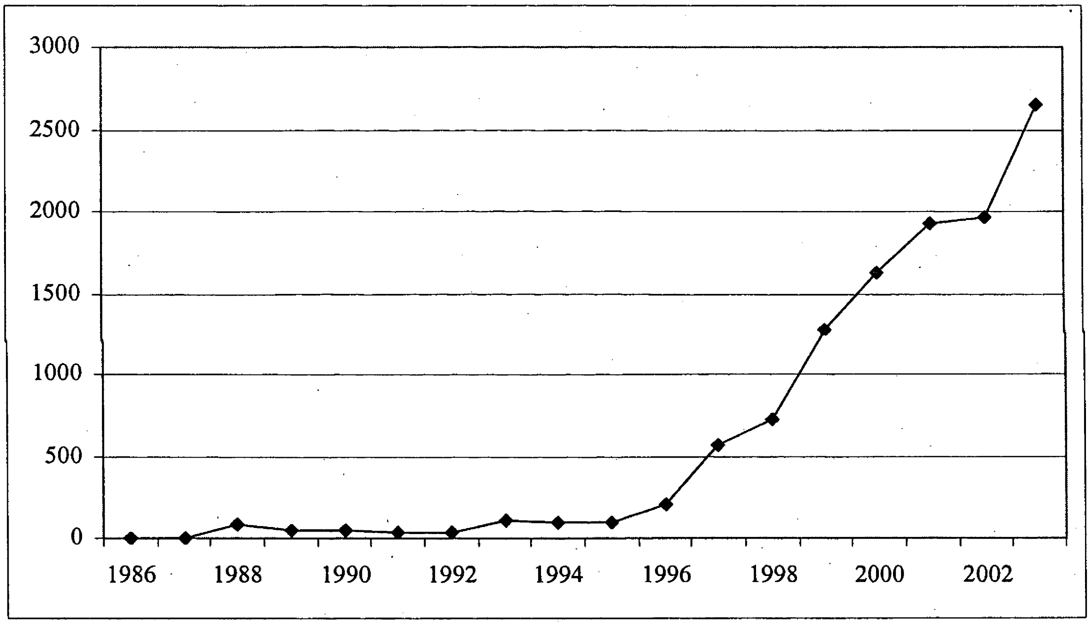
Similar to its employment contribution, the automotive industry did not generate considerable foreign exchange earnings until the early 1990s. Most locally assembled vehicles were domestic-market-oriented. This resulted from an IS strategy. The presence of LCR measures reduced international competitiveness whereas the high protection on CBU vehicles encouraged car makers to produce for the domestic market. Nevertheless, since the early 1990s, there is evidence of structural change in the market orientation of MNE car makers in Thailand. While the first exports of CBU vehicles by MMC Sittipol (MSC), the Mitsubishi Motor Corporation's affiliate, took place between 1988 and 1994, CBU vehicle exports during this period were rather a one-off event. Export values of CBU vehicles increased tremendously from $3 million in 1987 to $80 and $53 million in 1988 and 1989, respectively (Figure 7.7). The export value declined to less than $20 million by 1994.

A structural change in market orientation took place in the mid–1990s. Mitsubishi, Nissan and Isuzu explicitly stressed their export plan for one-ton pick-up trucks in the late 1980s.[19] Pointedly, the decision to export one-ton pick-up trucks occurred after their local assembly activities were likely to attain economies of scale. These companies began their export of one-ton pick-up trucks in the mid–1990s. The structural changes in market orientation were reinforced by another two factors. The first

[19] For example, Nissan's expanded Thai operation planned to export pick-up trucks to South Korea, Malaysia, Australia and New Zealand as part of the company's global plan (Bangkok Post, October 1986 cited in Doner, 1991). As well, Isuzu announced a three-step export plan involving first parts, then engines, and eventually CBUs (Nation, December 1986 cited in Doner, 1991). These Japanese MNE car manufacturers regarded overseas markets as a major channel for overtaking the dominant position of Toyota in Thailand (Doner 1991: p.208).

factor was the relocation of the two US MNEs, Ford and General Motors in the mid–1990s, to use Thailand as a regional export base for one-ton pick-up trucks. Secondly, the onset of the financial crisis caused all MNE car makers in Thailand to experience a huge excess capacity. In addition, the sharp currency depreciation catalyzed the shift in market orientation of these car manufacturers. The export values of CBU vehicles rapidly increased to $567 million and $717 million in 1997 and 1998, respectively. The export value of vehicles dramatically increased to around $ 2 billion from 2001–3 (Figure 7.7).

Figure 7.7
Export Value ($million) of Thai CBU vehicles, 1986–2003



Source: Compiled from the UN COMTRADE database available at the International Economic Data Bank (IEDB), the Australian National University.

As expected, the export of CBU vehicles has been dominated by one-ton pick-up trucks. Between 1997 and 2003, they accounted for almost 70 per cent of total vehicle exports. Passenger cars with engines between 1,500 cc. to 3,000 cc. and those with engines between 1,000 cc to 1,500 cc. registered promising export growth. In 2003, their

Table 7.11
External Trade Value ($million) of Vehicles in Thailand, 1991–2003

	1991–5	1996	1997	1998	1999	2000	2001	2002	2003
1. Vehicle export	**74**	**206**	**567**	**717**	**1,275**	**1,627**	**1,924**	**1,968**	**2,649**
Passengers	22	11	33	71	125	213	671	526	780
Benzene engine (1000 cc. to 1500 cc.)	*12*	*5*	*12*	*22*	*14*	*23*	*23*	*48*	*375*
Benzene engine (1500cc to 3000 cc)	*7*	*4*	*16*	*37*	*97*	*140*	*420*	*292*	*369*
Commercials	*49*	*186*	*529*	*635*	*1,140*	*1,401*	*1,234*	*1,423*	*1,845*
Truck with diesel engine (<5 M. tons)	*46*	*178*	*458*	*521*	*951*	*1,155*	*1,054*	*1,201*	*1,468*
2. Vehicle import	**1,438**	**1,756**	**754**	**204**	**558**	**526**	**382**	**417**	**618**
Passengers	1,201	1,120	539	128	434	286	192	184	390
Benzine engine (1500cc– 3000 cc.)	*794*	*756*	*336*	*94*	*336*	*176*	*148*	*112*	*307*
Benzine engine (>3000 cc.)	*117*	*163*	*78*	*8*	*30*	*46*	*32*	*53*	*61*
Commercials	161	221	72	28	29	61	57	61	41
		-							
3. Trade Balance: (1)–(2)	**-1,364.7**	**1550.2**	**-187.2**	**512.7**	**717.7**	**1,100.8**	**1,542.1**	**1,551.1**	**2,030.2**

Source: Data for 1991-2000 are complied from the UN trade data held in the International Economic Data Base of the Australian National University. Data for 2001-2003 are from the World Trade Atlas database.

export values were $369 million and $375 million, respectively, for small and medium vehicles (Table 7.11).

7.2.3 MNE Involvement in the Thai Automotive Industry

Between 1970 and 2003, there was a considerable change in the pattern of MNE involvement in the Thai automotive industry. MNEs became increasingly involved in the Thai automotive industry from the mid–1980s (Table 7.6). FDI inflows in the industry were more or less unchanged from 1970–85, with annual inflows amounting to less than $5 million. Its share of total manufacturing FDI inflows was around 5 per cent. Following this, the inflows increased dramatically to $37 and $87 million during the periods 1986–90 and 1991–5, respectively. FDI inflows in the Thai automotive industry continued to increase from 1996 to the present, accounting for $545 million from 1996–2000 and remaining more or less at this level until 2003. The dramatic increase in FDI inflows resulted in a share of 19.3 per cent of total FDI inflows for the manufacturing sector between 1990 and 2003.

The huge increase in FDI inflows was a result of the capacity expansion of incumbent car assemblers, the entry of the two US MNEs, and MNE parts manufacturers around the world. As mentioned earlier, the rapid growth of domestic demand for vehicles in Thailand led to rapid capacity expansion of car assemblers, both Japanese incumbents and the US new entrants. In addition, from the late 1980s onward there were a number of MNE parts manufacturers entering and establishing their affiliates in Thailand. During the period 1971–85, there were around 30 MNE parts manufacturers in Thailand, dominated by Japanese MNEs (Buranathanun, 1995; Higashi, 1995). From 1987–2003, an additional 282 foreign parts suppliers entered into Thai auto parts manufacturing.[20] During this period several new parts, such as power steering tanks, air cleaners, wheels, gearboxes, etc. were locally manufactured. In addition, from the mid–1990s, there were several non-Japanese suppliers involved, such as Jason Engineering

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[20]The number of foreign parts suppliers from 1987- 2003 was compiled from the BOI Investment Statistics available at www.boi.or.th.

(UK affiliate), Siam Calsonic Co. Ltd and Visteon and Halla Climate Co. Ltd (Ford Suppliers). By 2002, the number of MNE affiliates in the parts manufacturing industry reached 355 firms, consisting of 287 foreign majority firms (81 per cent of the total number) and 68 joint ventures (Thai Automotive Industry Association, 2003).

Three factors contributed to the huge increase in FDI inflows:

(1) The Japanese Yen Appreciation between 1986 and 1995.

Between 1986 and 1995, the Japanese yen exhibited persistent appreciation. As a result of the Plaza Accord, the exchange rate instantaneously decreased from 238.54 yen/$ in 1985 to 168.52 yen/$ in 1986 and dropped further to 94.06 yen/$ by 1995. Such currency appreciation adversely affected the international competitiveness of Japanese car assemblers and parts manufacturers, which traditionally exhibited a lesser degree of internationalization and preferred to service overseas markets through exports from Japanese not-offshore production.[21] To maintain their international competitiveness, they had to commence relocating their production base abroad.

(2) Global Market Competition

From the late 1980s onward, the global environment for the automotive industry has exhibited intense competition among MNE car assemblers. The principal automobile markets in the Triad regions (North America, Western Europe and Japan), which account for over 90 per cent of global sales of vehicles, are nearly saturated (Abrenica, 1998). In contrast, promising growth perspectives for vehicle sales have been exhibited in emerging market economies. In the meantime, governments in a number of these emerging market economies have moved away from highly protective policies based on quantitative restrictions and prohibitively high tariffs (Takayasu and Mori, 2004:

[21] In 1980, the US Big Three averaged almost 35 per cent of their production abroad, the major European firms almost 19 per cent, and Toyota and Nissan had a combined average of roughly 1 per cent (Doner, 1991: p.64).

p.209).[22] The liberalization approach of their automotive industry takes place faster through a regional rather than a global context (Humphrey and Oeter, 2000: p.42; Humphrey and Memedovic, 2003: p.2).[23] Many countries have formed regional groupings such as the European Union (EU), the ASEAN Free Trade Area (AFTA), the North America Free Trade Area (NAFTA), and regional integration in the Latin American countries (namely Mercosur) to liberalize regional trade in cars and their parts. In several cases, extra efforts have been made in order to accelerate regional liberalization schemes for particular industries. For example, under the AFTA agreement, ASEAN countries strengthened their industrial cooperation program, namely ASEAN Industrial Cooperation (AICO) that would be regarded as a shortcut to benefit ASEAN regional liberalization.[24] This has encouraged MNE car assemblers to become involved with local assembly in these emerging markets.

MNE car assemblers and parts manufacturers changed their strategy as a result of increased global competition. Prior to this, auto assemblers used to allocate assembly facilities in each country to access the highly-protected domestic markets. Their assembly facilities manufactured whatever vehicles they could under these limitations at prices that allowed them to earn a profit in local markets. When the market started to

[22] Two exceptional cases, China and India, should receive special attention. These two countries have gigantic domestic markets as a key to attracting auto maker MNEs to establish affiliates, even though the trade and policy regimes within these two countries are still highly restrictive. See details in Humphrey and Oeter (2000).

[23] Similarly, as argued in Bora (2001, cited in Brooks *et al.* 2004), many developing countries have been reluctant to call off local content requirement measures applied to the automotive industry.

[24] In 1996, the new ASEAN Industrial Cooperation (AICO) scheme was introduced in order to encourage intra-ASEAN trade. Firms, which operated in more than one ASEAN country (defined by the 30 percent or more by the ASEAN equity within a given company) traded goods with lower tariff rates in order to enhance production efficiency and international competitiveness. The AICO is the broader version of the Brand-to-Brand (BBC) scheme, which was limited to the automotive industry. Under the AICO scheme, firms benefit a preferential tariff rate in the range of 0-5 per cent for intra-ASEAN trade. The benefit is immediate upon approval under the Common Effective Preferential Tariff (CEPT) scheme under the ASEAN Free Trade Area (AFTA) that a preferential tariff will take effect in 2003. 90 per cent of these approved applications were related to the automotive and electronic industries. The estimated value of transactions was still low at around $1,173 million or 1.4 percent of intra-ASEAN trade in 2001. Nevertheless, it is too early to make any conclusion on the effectiveness of the AICO scheme.

become more liberal, the excessive investment driven by protectionist barriers resulted in overcapacity problems (Doner *et al.* 2004: p.159). Production capacity in a country might be able to serve demand in other countries within a region or worldwide. All car assemblers compete against each other in order to maximize their market share in the emerging market economies. Hence, assembly facilities in a country must allow them to provide markets with products that meet international standards of quality and price. To mitigate overcapacity problems, assembly facilities that used to be scattered within a region must be consolidated to specialize in certain types of vehicles. Both car assemblers and parts manufacturers tend to utilize resources scattered throughout the world. They must decide which models to produce at which locations, at what prices and quality standards, and for which markets (either region or global) (Takayasu and Mori, 2004).

To select locations to produce certain types of vehicles, size of domestic market and its growth prospects are the most important factors (Doner *et al.*, 2004). Since there are certain scale economies in producing a vehicle model (i.e. 40,000–50,000 units/a model), the greater the market size the more likely MNE car assemblers are to attain them. Besides market size, MNE car assemblers should select a location where the policy environment is relatively more liberal and stable. In such an environment, they are likely to maximize resources scattered throughout the world to strengthen international competitiveness. This is especially true of small-open economies like individual ASEAN countries where assembly facilities are unlikely solely to serve highly-protected domestic markets.

(3) The Favourable Economic and Policy Environment in Thailand

The economic and policy environment in Thailand was relatively more favourable than ASEAN–4 neighbours so that MNEs in the automotive industry relocated their production bases and turned the country into the regional hub of vehicle production. Firstly, as mentioned, Thailand has the largest domestic demand for vehicles in the region (Table 7.10). Thus, there are many vehicle models, especially one-ton pick-up trucks, for which assembly operations are likely to attain the scale economies level. Secondly, during the late 1980s and the early 1990s when MNE car assemblers were searching for production sites, the commercial environment of the automotive industry in Thailand was relatively more liberal and stable than that of other ASEAN-4 neighbours. Thailand did not have an explicit target in nationalizing local parts firms, as was the case in Indonesia and the Philippines (Doner, 1991: p.61). At the same time, Thailand never had an explicit goal to promote a national car, as occurred in Malaysia.[25] Furthermore, the degree of policy uncertainty, i.e. the frequency of reversing policy direction, was relatively higher in Indonesia and the Philippines. This was especially true in Indonesia where modification of its specific objectives occurred more frequently than for any of its three neighbours (Doner, 1991: p.54).

Besides the absence of a national car policy, Thailand was the first country in the ASEAN region to begin liberalizing the automotive industry. As mentioned, protection on vehicles was reduced dramatically in the early 1990s so that import competition increased, in contrast to other ASEAN regions, where the policy regime toward the automotive industry remained more or less unchanged (Doner, 1991).

Even though the Thai government still retained the LCR measures, so did other developing countries, including ASEAN–4 neighbours. Nevertheless, as discussed in Section 7.2.1, car assemblers were significantly involved in designing the LCR system so it was not prohibitive to implement according to the existing capability of parts manufacturing industries. More importantly, when a country is selected as the regional hub, the local content requirement imposed tends to become redundant. Car assemblers tend to increase local procurement, regardless of the presence of LCR measures. The reason is a vehicle consists of numerous parts and components, some of which are quasi nontradable. There are sizable transaction costs involved in procuring all the parts so that the proximity between car manufacturers and parts suppliers saves on the transaction costs. This also allows more efficient cooperation between car manufacturers and parts suppliers to match their production plan and delivery schedule. It also reduces exposure

[25] President of Toyota Motor Thailand argues that ' Thailand is the best candidate for hub status because it has no 'national-car' policy and offers a level of playing field' (Bangkok Post Economic Review, 1999 cited in Techakanont, 2002)

to exchange rate risk if they can source local parts. In addition, car manufacturers can exploit their existing comparative advantage as host countries in manufacturing a vehicle.

Nevertheless, this process took place gradually. Japanese MNE parts suppliers moved in as a result of the appreciation of the yen. In addition, when some Japanese car assemblers commenced their plan of using Thailand as an export base,[26] they first encouraged their suppliers in their keretisu network[27] to enhance their involvement in Thailand. Several new parts, such as power steering tanks, air cleaners, wheels, gear boxes, etc. began to be locally produced. The rapid growth of domestic demand and the further appreciation of the Japanese currency reinforced the relocation of production bases, thereby widening the range of OEM parts available there and raising quality. This motivated the re-entry of the US MNEs, General Motors (GM) and Ford with the prime target of CBU export, which in turn further enticed even more foreign parts suppliers into the Thai automotive industry during the mid–1990s. There were also several non-Japanese suppliers involved, such as Jason Engineering (UK affiliate), Siam Calsonic Co Ltd and Visteon and Halla Climate Co Ltd (Ford Suppliers). Finally, the process of relocation was further stimulated by the sharp currency depreciation during the onset of the Asian financial crisis starting from mid–1997,[28] as well as the abolition of foreign ownership restrictions.

All in all, Thailand has become a regional hub of vehicle production in Southeast Asia, as is indicated in Figure 7.8. A wide range of vehicle models of the US car assembler, Ford, is assembled in Thailand, such as the Ford Ranger, the Ford Everest, and the Mazda Fighter. Similarly, Honda (Thailand) exports the Honda Accord and the

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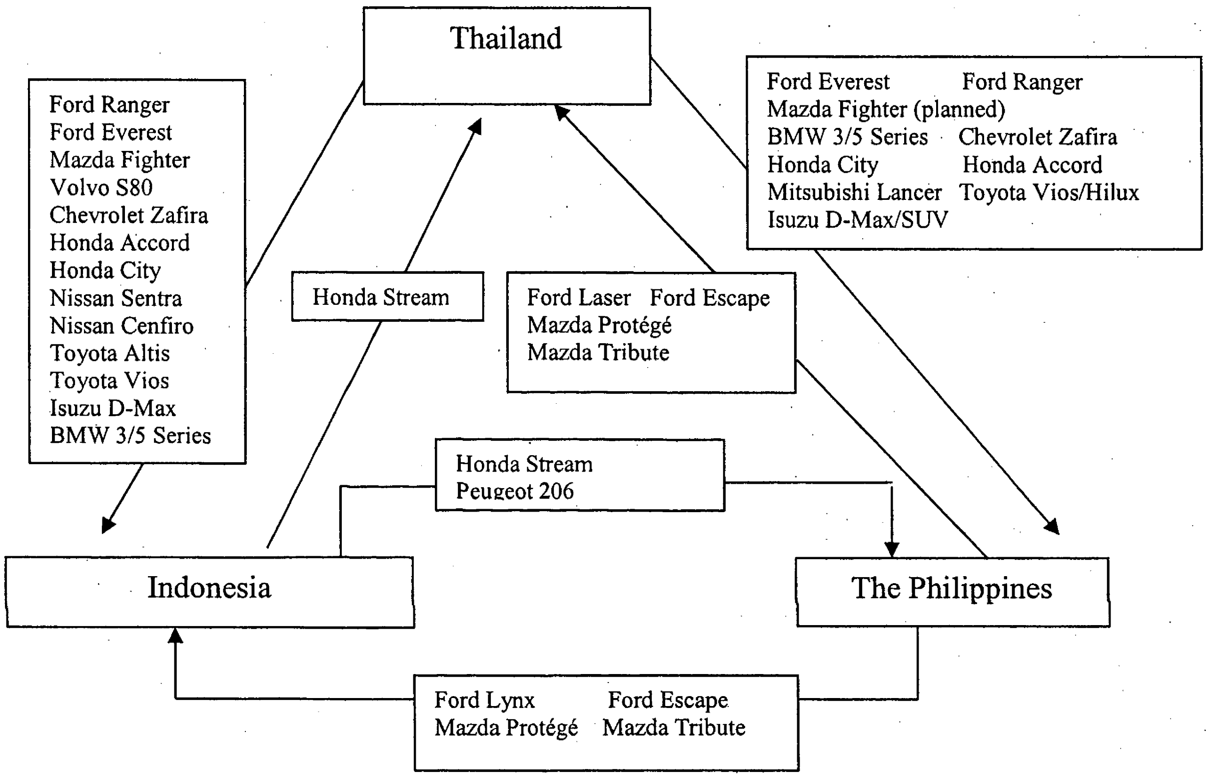
[26] The earlier movement of these car assemblers is a result of oligopolistic reaction among car assemblers in Thailand. Smaller firms want to use the export market to enhance production efficiency and assume the dominant position in the market.

[27] The keiretsu system is deliberately intended to facilitate long-term partnership between large assembly firms and their multiple suppliers. The system emphasizes vertically structured networks among individual firms that concentrate on different tasks in a closely connected production process. Firms specialize in different areas of production while becoming more dependent on each other's activities.

[28] The Thai baht depreciated from around 25 baht/$ in the 1997 to 40 baht/$ by 2002. Data are from IMF, *International Financial Statistics* (CD ROM).

Honda City to Indonesia and the Philippines and imports the Honda Stream from the Honda affiliate in Indonesia.

Figure 7.8
Pattern of Regional Division of Labour in the Automotive Industry: Evidence of Southeast Asian Economies



Source: Firm interviews.

7.3 Conclusions and an Inter-industry Comparison

Table 7.12 provides a comparison between the processed food and automotive industries in five respects; trade policy regime, factory intensity, market orientation, FDI involvement and international position. The first respect is trade policy regime, in which they contrast sharply. On the one hand, enterprises in the processed food industry seem to operate under a distortion-free environment. This environment is to some extent in line with an EP regime as defined in Chapter 2. On the other hand, in the automotive industries the Thai government imposed both tariff and non-tariff measures (i.e. import ban on CBU vehicles and LCR measures on car assemblers) in promoting both car assembling and parts manufacturing industries. Intensive use of these protection measures took place between 1970 and 1990. Trade policy during this period seems to be in line with an IS regime. Nevertheless, from the early 1990s onward, the trade policy regime in the automotive industry has gradually changed, moving toward an EP regime.

The processed food industry is more labour intensive, compared to the automotive industry. Thus, the processed food industry seems to be in areas where Thailand has the comparative advantage, i.e. labour abundance (see Chapter 3). As it conforms with the country's comparative advantage, the market orientation of processed food industry is for export, whereas most locally assembled vehicles are domestic-market oriented. Export values of Thai assembled vehicles gradually gained their relative importance from mid 1997 onward.

FDI inflows into the processed food industry are relatively low, compared to other industries throughout the past three decades. Based on the FDI figures, MNE involvement seems to be limited in the processed food industry. By contrast, until the mid–1980s, the share of FDI inflows into the automotive industry was limited, compared to the total manufacturing FDI inflows. After this, FDI inflows into the automotive industry increased dramatically, accounting for almost one fifth of the total manufacturing FDI from 1995 to the present. The patterns of FDI inflows into the automotive industry corroborates the theoretical postulation by Bhagwati (1978) and empirical findings in cross-sectional inter-country analysis (Balasubramanyam and Salisu, 1991).

Finally, the international position of both industries suggests that they should be regarded as being successful. In the processed food industry, which concentrates on four major export items or PF4s (i.e. canned pineapple, canned tuna, processed chicken, and processed shrimp), Thailand is the world's major exporter. Thai enterprises upgraded their production facilities, successfully penetrated the global market from the late 1970s onwards, and retained their leading position in the global market. On the other hand, Thailand has become the regional hub in Southeast Asia for numerous leading car assemblers worldwide.

In conclusion, their dominant position in the global market makes these two industries interesting in terms of gaining insight into the factors contributing to their success. The preliminary evidence from the survey in this chapter pointed out the role of MNE involvement. It is worth gaining insight into the mechanisms of how MNE involvement contributes to this success and how the role of domestic policy, especially the trade policy regime, conditions gains from MNE involvements.

Table 7.12

A Comparison of Processed Food and Automotive Industries

Aspects	Processed Food	Automotive
Trade policy regime	Always distortion free, i.e. an EP regime	- High protection, both tariffs and non-tariffs (import bans on vehicles and LCRs to promote local parts manufacturing industry, i.e. an IS regime. - Policy has noticeably changed toward liberalization from 1990 onward, i.e. moving toward an EP regime.
Factor intensity	Labour intensive products	Capital intensive products
Market orientation	Export-oriented products	- Domestic-oriented products (1970–97) - Vehicle exports gained their relative importance (1997 to the present).
FDI-involvement	Relative low, compared to other industries	- Limited role during 1970–the mid–1980s. - Dramatic increase from the late 1980s to the present, especially after 1997.
International Position	World leading exporters - Canned pineapple (1st exporter) - Canned tuna (1st exporter) - Processed chicken (4th exporter) - Processed shrimp (1st exporter)	A regional hub of vehicle production in Southeast Asia of world leading car assemblers.

Source: Author's compilation.

Chapter 8: Firm-Level Case Studies: the Processed Food and Automotive Industries

This chapter provides in-depth firm-level case studies of the Thai processed food and automotive industries in order to gain insight into the mechanisms of how MNEs become involved in, and contribute to, the technological capability of indigenous firms. Information in this chapter is mainly gathered by interviewing senior managers of a sample of Thai firms in both industries. As discussed in Chapter 2, MNE involvement can take place through both FDI and non-FDI channels. Nevertheless, the quantitative analyses in Chapter 5 and 6 concentrate on the statistical relationship between FDI channels and economic performance measures such as output growth and valued added per worker. Actual mechanisms of how MNEs affect host countries' economies cannot be revealed, so the statistical relationship uncovered by these quantitative analyses is merely suggestive of the potential FDI has to create a favourable impact on host economies. In reality, MNEs can substantially influence business operations of enterprises in host countries through various non-FDI channels such as technology licensing, international subcontracting, and MNE buyer channels. Most of these non-FDI channels are not quantifiable. All in all, it highlights the need for firm-level case study analysis in order to gain insight into these mechanisms of MNE involvement.

The chapter begins with a description of the research methodology pursued in the firm-level studies, covering the sampling process, characteristics of samples, and the study period. In the following two sections, the evidence of firm-level studies of the processed food and automotive industries are discussed, respectively. Section 8.4 provides an inter-industry comparison between these two industries.

8.1. Research Methodology

This study uses 'purposive' rather than 'probability' sampling techniques (Patton, 1990). The latter refers to the method that achieves samples by random selection amongst all units of the population and permits confident generalization for a larger population. In the former method, samples are purposively chosen from information-rich cases for in-depth analysis related to the central issues under study. The main objective here is to qualitatively examine the behaviour of particular groups of firms, i.e. MNEs and local manufacturers interacting with one another within and/or across industries. Firms with certain characteristics of individual industries were selected to address and examine technology spillover. For example, in the processed food industry, the focus is on export success so that export rather than domestic firms must be selected. Likewise, in the context of this study, auto parts producers should be limited to original equipment manufacture (OEM) suppliers, which are directly engaged with MNE car assemblers, to examine the impact of backward linkages from MNEs on their technological improvement. This cannot be achieved by probability sampling that uses a variety of sample characteristics to draw quantitative inference. Firms, which have not been involved with MNEs and whose products are sold in limited niche markets, might not be relevant to an examination of the issues involved.

In the processed food industry, the samples concentrate on exporting firms because the issue is to examine whether MNEs have contributed to the process of technology acquisition and export success. Among exporting firms, various firm characteristics, i.e. firm sizes, product types, and export destinations are covered to guard against any systematic bias selection. Therefore, this study interviewed 16 PF4 firms composed of 3 canned pineapple producers, 4 canned tuna producers, 5 frozen chicken processors, and 4 frozen shrimp processors. These 16 firms accounted for around 60 percent of the industry's total export value during the period 2000–2.[1]

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[1]The export share would be more appropriate than the population share (the number of interviewed firms to total industry population) to indicate how well the sample coverage in this interview represents the processed food industry. Although there are a large number of small and

The automotive industry covers both car assemblers and parts manufacturers. The aim of interviewing MNE affiliates in the car assembling industry is to examine their efforts in creating linkages and to determine any changes in their efforts. Where parts manufacturers are concerned, samples concentrate on Thai-owned enterprises whose products feed directly into auto assembly plants, to address the role of backward linkages and technology spillover. Because a wide range of auto parts needs to be covered to prevent any possible selection bias, 3 car assemblers, and 8 parts manufacturers were chosen for the study. Samples of car assemblers cover both Japanese and US affiliates. The former have extensive experience in Thailand, whereas the latter entered the industry in the mid–1990s. The spectrum covered by auto parts is wide, including auto bodies, other pressed parts, radiators, rubber parts, exhaust systems, suspension systems (leaf and coil spring), and aluminium die casting. Most of these auto parts enterprises were initially Thai owned. All of them had experience as OEM suppliers for the past thirty years.

Before the firm-level case studies began, the interview guide was pre-tested on several firms between December 2002 and January 2003. Feedback from firm interviews during the pre-testing period was used to improve the final version of the interview questions. The final interviews were conducted from December 2003 to February 2004. They mostly took place at firms' headquarters located in Bangkok. A few firms are in the Eastern provinces, e.g. Rayong province. High-level managerial staff in these Thai enterprises was interviewed in both the processed food and automotive industries. The interview period varied in length from 30 minutes to one and a half hours. Some firms provided second-round interviews by setting up visits to their production site and making different interviewees available. In addition, interviews with high-profile officers of the Board of Investment as well as several industry associates were conducted to obtain

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medium processed food enterprises in Thailand and the number of samples covered here might be low, compared to the total population, the main objective in this study is to understand how local firms successfully penetrate and maintain their position in the global market. Thus, a firm with extensive business experience in the global market would better serve the main objective here, rather than a large number of firms with limited export experience. Thus, instead of using a ratio of the total population, the export share is used as a better indicator.

various viewpoints on industry development. All interviews were conducted by the researcher.

A flexible interview guide was used, requesting respondents to relate their experience in their own words and their own sequence. The main advantage of this flexible approach is that it minimizes the likelihood that important aspects of the story will be missed. The main disadvantage is that some respondents whose experience may be limited to a particular interest cannot always be asked all of the questions in the interview guide (Morawetz, 1981). Second-round interviews with different interviewees could mitigate this disadvantage in several cases.

The guide for these interviews begins with the general company profile, i.e. size, ownership production process, product destination, product covers, etc. A series of opening probes into the process of acquiring technological capability follow. In the processed food industry, this starts with their general perception of industry development, followed by opinions about contributions of FDI and non-FDI channels to their technological capability, especially their export capability. Then questions follow concerning their sources of knowledge and the factors contributing to their export success. Finally, general questions concerning current problems, the role of government and future prospects for the industry are addressed.

In the automotive industry, the interview guide for car assemblers differs from that for parts manufacturers. Where car assemblers are concerned, the questions begin with the general perception of industry development and their involvement in enhancing the capability of local suppliers: how car assemblers contribute to parts suppliers' capabilities, whether the effort to make such a contribution applies to particular auto parts or to auto parts in general, and whether the degree/effort of their involvement in parts suppliers' capabilities changes over time. Then general opinions on current problems, the role of government and industry perspectives are raised. On the other hand, the questions for parts manufacturers relate to building up technological capability to become OEM suppliers, to assistance from car assemblers, to any possible change in the procurement process as well as the level of involvement from car assemblers. Finally, their general perception of institutional factors and the economic environment in promoting or retarding technology spillover are addressed with all the interviewed firms in both industries. Interview guides are detailed in Appendix 13.

Note that since the purpose of the interview is to understand the mechanisms of how MNE involvement affects the technological capability of indigenous firms, most of information is unquantifiable. Specific examples are illustrated to provide insight as well as general inferences are being drawn. Hence, findings from firm interviews are unlikely to be comparable across firms or industries. Appendix 14 summarizes the characteristics and key interview findings of each firm.

8.2 The Processed Food Industry

Even though FDI inflows are low in the processed foods industries, including those involved with PF4 products, evidence from firm interviews suggests a considerable degree of MNE involvement. Such involvement occurring through both FDI and non-FDI channels creates favourable technological impact on Thai food processors and allows them to gain a foothold in international markets. It also stimulates local firms to engage actively in the process of technological development.

8.2.1 Canned Pineapple

MNE involvement played a vital role in introducing pineapple plantations into Thailand and in linking up local firms with the global market. The entry of Dole Co Ltd (a US affiliate) and Thai Pineapple Canning (a Taiwanese direct investor) during the early 1970s demonstrated the export business opportunity. This motivated many local firms to commence production of canned pineapple.

These foreign firms not only demonstrated business opportunity but also showed local firms how to operate a commercial pineapple plantation designed to produce fruit for canning and what necessary processing facilities they needed to install. There are significant differences between plantations of pineapples for the direct-consumer market and those destined for canning. Plantations of pineapples for direct consumption aim to produce a large harvested product. The larger the pineapple, the higher the price farmers can expect to charge. In contrast, canning pineapples are relatively small so they can be packed into a can with minimal waste. The different sizes of harvested products result in a different seed density in the cultivated area, i.e. the number of seeds sown in the cultivated area. This smaller harvested pineapple for canning allows farmers to plant around 10,000 seeds per rai,[2] twice the number for pineapples for direct consumption. In addition, the fruit processing operation is complicated by the fact that pineapples grown for canning need to have a higher degree of acid than those for direct consumption in order to extend the product's shelf life. Hence, this results in differences in pineapple seed types as well as fertilizer formula. Local enterprises also have to install an automatic peeling and coring machine, called a 'Ginaca',[3] as this cannot be done manually. The high acid content also makes the canning and sterilization process more difficult than for other canned fruit. One factory manager (Sample No.1) emphasised that incorrect canning of high-acid fruit like pineapple could lead to can explosion. Although no specific example was provided, the company owner of Sample No.2 gained knowledge on how to run the canned pineapple business from its own working experience in MNE affiliates.

Since tacit knowledge was required in the early stage of this business operation, many local enterprises used the labour mobility channel, which is complementary to the demonstration effect of FDI. These local firms hired high-profile workers (e.g. the technical heads) from MNE affiliated companies to assimilate the knowledge. All firms interviewed pointed out the relative importance of the labour mobility channel in the early stage of business operations. In particular, one pineapple processor (Sample No.1) hired Taiwanese technicians from a foreign company to assist in the starting period. They helped the company in a wide range of activities from raw material preparation, and

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[2] 'Rai' is a unit of area measurement in Thailand. One unit of rai is 1,600 square meters and 0.16 hectares.

[3] 'Ginaca' was invented by Herry Ginaca, a technician in Dole Co Ltd at the end of the 19^{th} century.

flows of inputs and outputs in the factory, to setting up the canning facility and sterilization process. These technicians were also hired by other local firms later on.

In addition to playing an important role in the preparation of raw materials and on the production process, non-FDI channels are also of greater importance than FDI when it comes to opening new marketing channels. There is no evidence of technology licensing/international subcontracting channels in the canned pineapple industry. The production technology involved, e.g. sterilization and canning, is fairly mature and widely known. Local firms can access machines and/or other production facilities through general arm's length purchase (e.g. import machines or purchase locally-produced machines). The most crucial skill local firms lack is international marketing knowledge. The global market structure of canned pineapple is to some extent an oligopoly, dominated by MNEs (Rohrbach *et al.*, 2003: p.4). Global market penetration must be associated with well-established brands. As revealed by one international marketing manager (Sample No.3), these well-established brands might differ from market to market. Even though any exporter can pay for the right to use these brands, they must have a good understanding of the global market in order to use the right brand for the right market. In addition, exporters must obtain purchasing orders around the world that are large enough to utilize their production capacity economically. With their extensive international marketing networks, MNEs are likely to be in a better position to acquire this knowledge than individual firms.

It is very difficult for individual enterprises, especially from a developing country, to launch their own brands in the global market. The general impression gained from interviews suggests that it would be time-intensive and very expensive to launch a locally owned brand internationally. Moreover, the likelihood of successfully exporting canned pineapple under a Thai-owned brand would be very low. The director of a company with success in launching a brand on the local market (Sample No.1) stated that launching of a Thai-owned brand of pineapple on the global market would need strong financial commitment for 10–20 years and even then there would be no guarantee of success. Currently, it is unlikely that any local company could undertake such a venture. An international marketing manager (Sample No.3) revealed the same difficulty, even though his company also has its own brand in the local market. For locally non-affiliated firms, therefore, the link with MNE buyers is still crucial to penetrate the global market successfully.

Nevertheless, the general impression gained from all interviewed firms is that apart from marketing channels, contribution from these buyers is limited. MNE buyers merely bring in orders and assign brands for local firms at given prices. As long as local firms can comply with their price requirements, they place orders. The limited contribution of MNE buyers would be as a result of the nature of the product. Canned pineapple is subject to a limited degree of product differentiation, namely slices, chunks, or crushed (solid pack) pineapple and these product specifications are also internationally standardized, so MNE buyers have not been important in influencing the design and style of such products. Global success depends heavily on price competitiveness. In addition, the technological contribution from MNE buyers is negligible. There has not been any dramatic change in production technology. 'Ginaca' was introduced in 1925 and is still used in factories (Interview and Rohrbach *et al.*, 2004: p.2–3). Besides, canned pineapple does not involve a transformation from 'raw' to 'cooked' food so the risk of contamination is low. Food safety issues therefore are not a great concern, so there has not been significant contribution on the part of MNE buyers in helping local firms with food safety regulations, as is the case with other processed foods.

The success of Thai canned pineapple exports since the early 1980s highlighted how capable local enterprises have been enhancing technology and exploiting market opportunity with the help of MNEs. Note that despite MNE dominance in global trade and production, Thailand is one of the few countries[4] where local enterprises are significantly involved in global production and trade (Rohrbach *et al.*, 2003: p.4). The interviewed firms, all of which are domestically owned, accounted for 41.5 percent of total exports between 1999 and 2001. This high capability would be due to the fact that the entry of MNE affiliates has been to the country's comparative advantage so that local

[4] The other country is Indonesia (Rohrbach *et al.*, 2003: p.4).

enterprises have had the absorptive capability to observe, learn and adapt what they have demonstrated. Thailand has extensive experience in agricultural production and export. When the export opportunity arrived, Thai enterprises effectively relied on this existing comparative advantage.

In addition, Thai workers are skilled in food transformation processes, and play an important role in the pineapple production process. After harvested pineapples are peeled and cored, workers need to separate high quality pineapple — a yellow-gold colour — from low quality — a yellow-white colour — before the sterilization and canning process. All interviewed firms claimed labour skill as the advantage Thailand has over other competing countries. Workers learn very quickly how to grade pineapple chunks and can do it very efficiently. Finally, Thai enterprises are also involved in intensive R&D activities to improve the efficiency of farm production and maintain their international competitiveness. Global competition in the export business encourages all economic agents to seek technological innovation to improve efficiency and to survive. Most R&D activities are related to farm production and factory management. For example, the interviewee in Sample No.3 claimed a strategy to enhance competitiveness by making use of pineapple waste from the canning process, i.e. fruit skins and pineapple cores being used to produce sugar and cattle feed (Rohrbach *et al.*, 2003) was the result of a Thai enterprise R&D effort. Such a strategy has been widely adopted by other firms, including foreign affiliates.

8.2.2 Canned Tuna

The role of MNE involvement in the canned tuna industry is to some extent similar to that in the canned pineapple industry. First, the MNE affiliate creates significant demonstration effects to introduce a new business opportunity to local entrepreneurs. After that MNEs, through non-FDI buyer channels, play a vital role in assisting local firms to gain a foothold in world markets. As argued by one interviewee (Sample No.4), during the 1970s, there was a tiny domestic demand for canned tuna. This was different from the situation in other countries, especially developed countries, where there was a huge demand for canned tuna. Local firms at the early 1970s did not realize such business opportunity existed until the entry of foreign affiliates. After the establishment of the Australian affiliate producing under the brand 'SAFCO' in 1973, the first canned tuna processor in Thailand, several current leading companies of canned tuna export were established at the same time a few years later.[5]

In contrast with canned pineapple, the labour mobility channel as a conduit of technology transfer seems to be less important in the canned tuna industry. No interviewed firm pointed out its importance. This is because there is not as much tacit knowledge required in the early stage of business operation as in the canned pineapple industry. The production process is internationally standardized and easily accessed through general arm's length purchase. The key factor in determining price competitiveness is labour skill, which is acquired through a 'learning-by-doing' process. For example, after eviscerating the tuna, workers have to sort the fish carefully by size in order to ensure minimum losses during the pre-cooking stage (US Department of Labor, 2004). This skill is more likely to be acquired over a period of time.

After the entry of MNE affiliates, local firms tend to benefit more from MNE involvement through non-FDI channels. There are at least three areas where local firms can benefit from the MNE buyer channel. Firstly, to penetrate the global market successfully, locally non-affiliated firms need to be linked to MNE buyers. Similarly to canned pineapple, there are well-established brands of canned tuna on the global market. It is unlikely that local firms who want to penetrate international markets would use their own brand. The evidence that Thai Union Frozen, the leading local company, chose to purchase the well-established US brand (i.e. Chicken of the Sea) instead of developing their own company brand, sheds light on how hard it is to launch a local brand internationally. Hence, local firms export their products through MNE buyers under these well-established brands such as Chicken of the Sea, SAFCO, Bumble Bees, and StarKist.

[5] For example, Unicord was established in 1978, and Pattaya Food, Thai Union Frozen, and Tropical Canning in 1979.

Secondly, since the production process involves transforming 'raw' food into 'cooked' food, locally owned firms really need an understanding of how to comply with the complicated regulations. MNE buyers also help local firms to comply with the food safety regulations of importing countries. MNE buyers, with their extensive international marketing networks and wide experience in international trade, are better at understanding and complying with these regulations. Before local firms export their first shipment, representatives from these MNEs buyers conducted a factory visit and provided useful advice to ensure that the former comply with all the food safety regulations. One firm's quality control manager (Sample No.5), who had long-term experience as a government authority in inspecting and approving food processing factories, revealed that such advice was very helpful. Sometimes, there are details that are not even in the interest of enterprises in developing countries but need to be fulfilled. MNE buyers mainly emphasize sanitary concerns in the production process. This applies to larger firms as well. However, once a locally owned firm manages to export, MNE buyers visit the factory less frequently.

Finally, MNEs buyers also help local firms to overcome export obstacles. Sometimes each importing country imposes its own food safety and border inspection regulations. This causes difficulties for processors coping with various sets of requirements and regulations across countries. These regulations also occasionally change at short notice. The marketing manager of a medium-size exporter (Sample No. 4), mentioned that one European country requires all canned tuna exporters to comply with a test that measures net weight after draining water off the tuna for 15 minutes. This departs from the usual practice of around 2 minutes draining time. As a result, their exported canned tuna failed to meet this requirement. Eventually, this case was easily overcome with the assistance of the company's MNE buyer counterpart. He asked the company to add a new line in the labeling '55% conform STAS 6516/78'. This means the conversion ratio between gross and net weights conforms to the international standard. With the inclusion of this additional sentence, the company's export product could pass border inspection.

Interestingly, one firm's quality control manager (Sample No.5) revealed that there are some foreign buyers who behave very differently from MNE buyers. They mainly emphasize low price with less concern for quality. Most of them are from the Middle East. Such buyers are unlikely to be of technological benefit to local firms.

The long period of export success is also contributed to by the high absorptive capability and R&D investment, including labour training by Thai enterprises. The canned tuna industry is in the area where Thailand has comparative advantage. The cost competitiveness heavily relies on labour skills involved in production process. It tends to be less difficult for local firms to learn and benefit from MNE involvement. One interviewed firm (Sample No.6) pointed out that many leading Thai firms learned how to run their canned tuna business in the global market from MNE buyers, referred during the interview to as 'strategic partners'. With their entrepreneur skill, many of them took the advanced step of investing abroad by buying their own well-established brand.[6] For example, one of the leading US canned tuna brands, Bumble Bee, was taken over by Unicord during the late 1980s.[7] In 2000, the second largest US brand, 'Chicken of the Sea', was taken over by Thai Union Frozen (holding a 50 per cent share).[8] Nowadays, many local firms have become actively involved in outward direct investment in canned tuna in other developing countries like China, Vietnam and American Samoa (Interviews; Pananond, 2004).

In addition, Thai firms in the canned tuna industry actively strengthen their own competitiveness by providing labour training and being alert to innovation in order to survive global competition. Sample No.7 revealed that the company concerned has actively undertaken several activities to improve their labour efficiency and strengthen their international competitiveness. For example, the company kept improving the speed of inputs and intermediate goods flows in its factories. Workers were also trained to

[6] Note that the primary motivation was to acquire the brand name, rather than any 'reverse engineering' considerations.

[7] During the crisis, the company sold out the brand. However, this initial step encouraged other locally owned firms to follow suit.

[8] See also at http://www.chickenofthesea.com/company.aspx.

reduce the waste in transforming 'raw' to 'semi-processed' fish. In addition, in order to maintain longer term industry competitiveness, several local firms (Samples No.6 and 7) began exploring the market opportunity for cooked tuna in new type of package, i.e. the retort pouch.[9] The quality of tuna in a retort pouch is better than that in cans so it is more expensive. Many companies plan to switch to retort packaging when domestic wages become less competitive.

8.2.3 Processed Chicken

Though important, the role of MNE involvement in processed chicken is quite different from canned pineapple and tuna. There is no evidence that the entry of MNE affiliates in the processed chicken industry has generated a demonstration effect to entice local enterprises into the business. Instead, MNEs, which have been involved in the upstream industries, i.e. chicken hatcheries, broilers, and feeds, induce attempts to upgrade chicken farms and export chicken meat. In other words, there is technology spillover through forward linkages. Farming chickens for domestic consumption was not new in Thailand but mostly not at the commercial plantation level. Chicken farmers used locally bred chicks. The modern chicken farming began in the early 1970s with the establishment of the Arbor Acres Farm Inc, a joint venture between the US company, International Basic Economy Corporation (IBEC), and a local firm, the Chareon Pokphand Group (CP Group). This joint venture brought in advanced technology in chicken breeding, enhancing the quality of chicks.

The CP group had entered the animal feed industry in the late 1960s. Following the entry into the joint venture with IBEC, the CP group ventured into full integration of

[9]The retort pouch is a three-layered laminate with flexible plastic films as the outer and inner layers and aluminium foil in the middle. Tuna in a retort pouch is of better quality than that in a can because it overcomes the excess heat problems associated with processing canned tuna. Since food is not a good conductor of heat, excess heat needs to be applied to the can's surface for a period of time to guarantee sufficient heat at the centre, or "cold spot", in order to destroy any organisms that might cause spoilage and disease. This method of preservation causes foods to lose their juices, texture, flavour, and nutrients. In contrast, the pouch, which is approximately 19 mm (0.75 in) thick, and is filled and sealed under vacuum, has a large surface-to-volume ratio. Heat needs to penetrate less than 10 mm (0.38 in) from the surface to the "cold spot", thereby yielding greatly improved products. Source: Microsoft® Encarta® Encyclopedia 2003. © 1993-2002 Microsoft Corporation. All rights reserved.

chicken meat production so that the group ultimately provided all inputs (day-old chicks, animal feed, medicines, credit, services) as well as processing and marketing the chicken meat outputs (Goss *et al.,* 2000). At the same time, the group began to organize a system of contract farming to encourage small and medium farmers to operate modern chicken farms. While the main purpose of the company's full integration was to increase total sales of inputs, it positively affected production efficiency at the farm level. For example, in order to increase sales of inputs, the company has to promote modern chicken farm practice among local farmers. The greater the number of farmers running modern chicken farms, the greater the expected sales of inputs. The company also actively provides technical support and shares its own R&D outcomes with farmers in order to increase their farm efficiency (the number of chickens that survive, their net weight), which subsequently promotes the company's sales. Under the contract farming system, the findings of the company's R&D laboratories can easily benefit small and medium chicken farmers. This eventually enhances the production efficiency of poultry industries, putting Thailand in an advantageous position to access chicken meat at competitive prices (Gronski, 1994: p.11 cited in Goss *et al.*, 2000; Akira, 1989: p.270). Hence, the combination of technology spillover through forward linkages and the CP group modernized the production of chicken meat in Thailand.

In the international marketing knowledge area, the MNE buyer channel is far more important than the FDI channel. This is because most processed chicken products are preserved by freezing (pasteurization) rather than sterilization. This preservation process does not kill all types of bacteria, but merely prevents their multiplying. Exporters must comply with more complicated food safety regulations to ensure the level of hygienic quality than those needed for sterilized foods. The first processed chicken exporter interviewed (Sample No.8) highlighted the contribution of MNE buyers to the company's export success. The company was enticed into the processed chicken export business by Japanese buyers. These buyers helped the company to prepare its production facilities for the sale of processed chickens in Japan. The production facilities requested by export firms were far different from those producing for the domestic market during the early 1970s. While details were not specifically revealed during the interview, the most difficult requirements concerned the slaughter house and sanitary management in the factory. With assistance from MNE buyers, the company has successfully exported processed chicken to Japan. The relationship between the company and the buyers has been long term and was still operating at the time of the interview. The relationship between export success and MNE buyers' channel is also revealed by other interviewed firms, including the CP group, which formed its international marketing channels with the help of Mitsui & Co of Japan (Akira, 1989: p.270).

Note that the special feature of the Japanese market, the largest export destination of Thai processed chicken is that Japanese MNE buyers also provide this marketing channel for local suppliers. The internal trade system of the Japanese market is highly complicated and dominated by a handful of these Japanese MNEs. It is unlikely local suppliers could export goods to Japan without having links with these MNEs.[10]

Apart from assistance in complying with food safety regulations, the role of MNEs buyers is crucial for local enterprises in successfully adapting to changes in regulations in importing countries. Similar to the case of canned tuna, regulation changes occasionally occur in importing countries and can adversely impact on sales and interrupt export flows. Sample No.9 illustrated the relative importance of MNE buyers. Without clear reference as to date, the company concerned revealed that the EU had introduced a new tariff schedule discriminating between unprocessed and processed frozen chicken with the former subject to higher tariff rates than the latter. This had the potential to affect Thai exporters adversely, mainly those exporting unprocessed chicken breasts to the EU. The MNE buyers assisted local firms to evade the new tariff discrimination by advising them to add salt to the frozen chicken, so that it would be classified as a processed product and subject to the lower tariff rates.

In the Japanese market, there is a high degree of product differentiation ascending from simple portion cuts like chicken breasts and drumsticks, to ready-to-cook/ready-to

[10] The evidence is summarized from a personnel interview with some Japanese MNEs in Suphachalasai *et al.* (1999).

eat products (e.g. marinated, roasted chicken with herbs, inner fillets, steamed and diced chicken, and roasted chicken with soy sauce). Japanese MNE buyers have been involved with the development of new products. Most of these new products are at the higher level on the quality ladder. Moving into a higher position on the quality ladder is not automatic, especially where ready-to-cook/ready-to-eat products are concerned. Local entrepreneurs must acquire knowledge of how to produce these products at a competitive price so that they have an acceptable flavour and appearance to consumers in importing countries. To do so, companies would have to send their marketing teams to Japan and conduct extensive marketing research into acceptable flavours and marketing opportunities. The Thais and Japanese do not necessarily enjoy the same flavours. All interviewed firms in both the processed chicken and shrimp industries (Samples No.8–10 and 12–14) whose products destination is Japan were in agreement on this issue.

Japanese buyers bring in guideline recipes and work with local suppliers to formulate practical recipes that give details of ingredients. Sometimes, slight departures from the recipes are possible to save on production costs and/or to adjust to the manufacturing environment. With the assistance of Japanese buyers, many Thai exporters successfully manufacture various types of ready-to-eat and/or ready-to-cook food for the Japanese market.

For the EU market, the second largest export destination of Thai processed chicken, product differentiation is less complicated and mainly involves simple further processing, i.e. cutlets, steaming. This kind of assistance from MNE buyers is less important than it is for the Japanese market. Price competitiveness of the final products is far more important.

Apart from the contribution of MNE involvement, absorptive capability, the great entrepreneurship of the CP group and the R&D investment of local firms are other contributing factors to Thai export success. As discussed earlier, the CP group aggressively and efficiently relied on the presence of MNE affiliates in the upstream industry, thereby widely benefiting chicken farmers countrywide. Over and above, the

CP group factor, the production process of processed chicken industry requires agricultural skill to farm chickens and labour skills to slaughter, dismember and slice them where Thailand has comparative advantage.[11] In addition, for the ready-to-eat/ready-to-cook products, labour skill is crucial to the manufacturing process. Thus, the absorptive capability of local enterprises is likely to be high in this industry.

Local firms frequently invest in their own R&D to strengthen their competitiveness. At the farm level, the CP group and other leading chicken growers (e.g. Betago, Saha Farm) have successively conducted R&D activities to improve farm efficiency. At the processing level, local firms, which manufacture ready-to-eat/ready-to-cook products, must establish their own R&D teams to work with MNE buyers and to turn 'guidelines' into 'practical' recipes. R&D teams must then work out how to manufacture these recipes at very competitive prices. The faster this can be done, the more efficient the firm's performance. This helps Thai firms to maintain their leading position in the global market.

8.2.4 Processed Shrimp

To some extent, the role of MNEs in the processed shrimp industry is similar to that in the processed chicken industry. The Japanese joint venture and the CP group played a crucial role in developing intensive shrimp farms in Thailand. This significantly improved the yield of shrimp farms, expanded raw material availability and lowered their prices, eventually making exporting a possibility. In other words, there is technology spillover through forward linkages. There is no evidence that the entry of foreign shrimp processors demonstrated the business opportunity of frozen/processed shrimp export to

[11] Thailand is at a disadvantage where raw materials are concerned, especially chicken feed (i.e. soybean, and corn) in comparison to the major competitors e.g. the US and Brazil. The disadvantage is a result of protection on these inputs. See details in Chapter 7. To overcome this disadvantage, Thai chicken processors exploit their advantage in skilled and cheap labour to penetrate the global market. Thailand exports portion cuts of chicken instead of the whole chicken as the other two major competitors do.

local enterprises. In fact, Thai enterprises have been involved in frozen seafood exports since the late 1960s.[12]

From 1960 to the mid–1980s, Thailand's export industry mainly relied on ocean catch. Nevertheless, this source of raw materials was rather limited and subject to high uncertainty, and was clearly constrained by the limited size of the catchment area. During the late 1970s, ocean catch became even more limited as a result of the finalization of the Law of the Sea Treaty (Goss *et al.*, 2000). In addition, an increase in oil prices during the second half of the 1970s raised operating costs for Thai trawling vessels. The demand for shrimp in developed countries has increased noticeably to become the most sought after item of international trade in fisheries from 1985 onward (Goss *et al.*, 2000). This stimulated Thai enterprises to become involved in processed shrimp exports.

Therefore, Thailand, led by the CP group, introduced intensive shrimp farming. Farmers cultivate shrimp larvae within an inland, prepared pond, in which feeding and quality of water are controlled. This is in sharp contrast to extensive farm production where farmers use wild larvae deposited in the culture area with tidal changes being relied upon for water exchange (Goss *et al.*, 2000: p.516). The latter depends on numerous uncontrollable factors, and cultivated areas are limited to coastal areas only. As a result, yields from intensive shrimp farms are far higher than those from extensive ones. The extensive system yields up to approximately 500 kilograms per hectare per crop (live weight), far below the intensive system's yields of 5,000–20,000 kilograms per hectare per crop[13].

During the mid–1980s, Thailand lacked the technology required to run intensive shrimp farms, such as breeding technology for shrimp larvae, feeds, and farm practices. As a result, the CP group formed a joint venture with the Mitsubishi Corporation, namely

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[12] There is no evidence to confirm who the first exporter of frozen seafood was. Several exporting firms were established during the late 1960s, such as Thai Agriculture Food (1966) and Asian Food Cold Storage (1968).

[13] All details are available at http://www.shrimpnews.com/About.html

CP Aquaculture[14], in order to access the breeding technology (Goss *et al.*, 2000; Akira, 1989: p.270). In the initial period, the Mitsubishi Corporation, knowing what kind of advanced technology was needed and where to search for and acquire it, hired Taiwanese technicians to assimilate breeding know-how. They were chosen because it was in Taiwan that intensive shrimp farming was first developed and applied until the industry collapsed in the late 1980s. This collapse further stimulated the search for alternative and cheaper production sites, one of which was Thailand.

After accessing the initial technological requirements for production, the CP group undertook full vertical integration as it did in the processed chicken industry. The CP group supplies all related raw materials (i.e. shrimp larvae and feed) and related services (i.e. diagnostic services, pond lining, and educational services), as well as being a shrimp processor.[15] This full vertical integration enabled the CP group to promote local farmers to cultivate shrimp and to access shrimp for further processing as well as to maximize the company's sale volumes of raw materials, i.e. larvae and feed. The CP group has also been actively involved in R&D activities to improve shrimp farming yields as well as to reduce the likelihood of shrimp farm epidemics. Under this full vertical integration structure, any R&D outcomes from the company laboratories can easily spread to local shrimp farmers. There was consensus in all interviewed firms that R&D activities by the CP group are very important to maintain international competitiveness at the farm level.

MNE buyers seem to be more important than MNE affiliates in the expansion of shrimp exports. All interviewed firms agreed that FDI inflows in processed shrimp exports are negligible. In particular, one interviewee (Sample No.15) pointed out that, even though there were a number of small and medium Taiwanese direct investors involved in processed shrimp exports in the late 1980s, these direct investors are unlikely to transfer any advanced technology to local firms. They operate the intensive shrimp farming ponds and are engaged in the simple freezing process. At the shrimp farming

[14] The joint venture ended in 1992 when the CP group acquired 100 percent control of CP Aquaculture in a buy-out of Mitsubishi's share (Goss *et al.*, 2000).

[15] Information is drawn from Figure 2 of Goss *et al.* (2000: p.519).

level, the role of the CP group in supplying advanced technology and new development dominated any potential technology spillover from these direct investors. At the processing level, the technology associated with the freezing process was widely known among Thai enterprises long before Taiwanese involvement. The technology gap between these direct investors and local enterprises seems to be narrow. In addition, sales representatives of freezing technology suppliers regularly reported any innovations related to the freezing process.

In contrast, the general impression from the firm interview suggests that the MNE buyers' channel is crucial to providing international marketing knowledge and contributing to current export success, especially where the market destination is Japan. As with processed chicken, Japanese MNE buyers also provide a marketing channel for local suppliers because of the complicated internal trade system and the dominant role of Japanese MNEs (see above).

During the interview, each firm revealed its own experience of various kinds of assistance from MNE buyers. The MNE buyer for the company in Sample No.14 is closely involved with its production process. The buyer's representative visits the company every month and goes through even minor matters in the production process. For example, the representative noticed production workers who were wearing their hats incorrectly and requested changes in order to ensure good hygiene controls. MNE buyers bring in recipe guides to work with the company as in the case of processed chicken. They work together with the company to achieve appropriate flavours and appearances (packaging, colours, sizes) at competitive prices. In addition, MNE buyers introduce new products. Sample No.14 gave the example that shrimp for sushi is the latest product that MNE buyers brought, with a guide as to how to produce this product. Even though the product seems to be just boiled shrimp, it needs to be processed very quickly to preserve freshness. Such knowledge is unlikely to be acquired without any help from MNE buyers.

The company in Sample No.16 expressed the same view about the role of MNE buyers although they had also received different kinds of assistance from the company in Sample No.14. Since the company's export destination is the US, where the degree of product differentiation is less, compared to the Japanese market, the kind of assistance from the buyer is in overcoming any potential export obstacles. Even though the company is small (its export value is less than $5 million), it has never been on the US food and drug administration (FDA) detention list in the past thirty years because of its close cooperation with its buyer. The buyer had informed the company of the US requirement that exporting firms had to attain ISO certification so that it provided a longer preparation period, and the buyer even introduced this local firm to some qualified ISO auditors. It seems difficult for firms, especially local small and medium firms from developing countries, to undertake this requirement within a short period of time. For example, firms must search for an appropriate auditor, and take the time to attain ISO certification. Early information from the MNE buyer helped this company to avoid any potential export disturbances.

Another company (Sample No.12) also indicated the extensive involvement of a MNE buyer's representative in their operation. In their experience, local firms need most help from their MNE buyers in international marketing channels. They argued that, as far as the production process is concerned, local firms are in better position to source raw materials and manufacture final goods at a competitive price. What they lack is knowledge as to what products should be sold and what flavours and appearances are acceptable to consumers in importing countries. They maintained that, if the company just produces whatever appeals to Thais and launches it abroad, especially in the Japanese market, it is unlikely to be successful. MNE buyers are in a better position to understand their consumers' demands.

All of these firm-specific experiences highlighted the need to be linked with MNE buyers in order to penetrate the global market successfully and maintain their long-term international competitiveness. It is important to note that all the companies involved in the above samples have had long-term relationships of 20–30 years with these MNE buyers.

For processed shrimp, there were no well-established brand in the way there were in the canned pineapple and fish industries. As claimed by one interviewee (Sample No.15), inland grown, black tiger prawns were introduced in the US market after Thailand had successfully developed intensive shrimp farming. Thus, there are other foreign buyers and they emphasize low price. Most of these foreign buyers are small and medium trading companies. Their orders are mainly for a simple processed shrimp, e.g. frozen headless and pilled shrimp, boiled shrimp, and shrimp cocktail. Most of these products are supplied to the US rather than the Japanese market. Such foreign buyers are unlikely to contribute any significant technological benefit to Thai exporters.

As occurred in the previous products, the high absorptive capability of local firms and the R&D investment of local firms are the other contributing factors to Thai export success. The CP group considerably enhanced the benefits from the presence of MNE affiliates in the upstream industry. The production process of processed shrimp industry requires agricultural skill to farm shrimps and labour skills to pill and cook them, where Thailand has comparative advantage. Thus, the absorptive capability of local enterprises is likely to be high in this industry. Similar to the case of processed chicken, local firms also invest in their own R&D to strengthen their competitiveness both at the farm and processing levels. Local shrimp farms as well as shrimp processors have successively conducted R&D activities to boost their production efficiency.

8.2.5 Inter-product Comparison

In summary, MNE involvement is the key factor contributing to the industrialization process of the Thai PF4 industries. MNE involvement was through both FDI and non-FDI channels, especially the MNE buyers' channel. The contribution of MNE involvement is different in the case of each PF4 product (Table 8.1). Several key inferences can be summarized as follows:

Table 8.1
Summary of Contributions of MNE Involvement in the Thai Processed Food Industry

	FDI Involvement				MNE Buyers Link		
	Demonstration Effect	Labour Mobility	Backward Linkages	Forward Linkages	Marketing Channel	Compliance with Food Safety Regulations	Development of New Products
Canned pineapple	Demonstrate business opportunity	Factory technicians	None	None	Brands	None	None
Canned tuna	Demonstrate business opportunity	None	None	None	Brands	-Helpful in the early stage of business operations - Assistance to overcome unusual practices	Little
Processed chicken	None	None	None	Hatchery industries	Important for Japanese market	Highly significant	Highly significant
Processed shrimp	None	None	None	Hatchery industries	Important for Japanese market	Highly significant	Highly significant

Source: Author's compilation

1. For all PF4 products, MNE involvement plays a vital role in the industrialization process. MNE involvement began with establishing affiliates (FDI channel), which generated considerable technology spillovers and enticed local firms to undertake the manufacturing process. For canned pineapple and tuna, FDI technology spillover took place through demonstration effects. There was no domestic demand for these two products in Thailand during the early 1970s. Local enterprises did not realize there was an export business opportunity until the entry of MNE affiliates. By contrast, in the processed chicken and shrimp industries, there is no demonstration effect from MNE affiliates. Instead, the entry of MNE affiliates in upstream industries significantly induced local enterprises to upgrade their production (i.e. chicken and shrimp farms) and export. In other words, local firms in the processed chicken and shrimp industries benefited from technology spillover through the forward linkage channel of FDI.

2. In the canned pineapple industry, where there is tacit knowledge involved in the initial period of business operation, the labour mobility channel of FDI is needed to complement its demonstration effect. The tacit knowledge is a result of the high-acid property of harvested pineapple for canning that makes the production process more complicated than for other preserved fruit. Experienced factory technicians were needed to assist local inexperienced firms in the initial period. There is no evidence of the significance of the labour mobility channel with other PF4 products.

3. MNE buyer linkages play a far more important role than FDI channel in contributing to international marketing knowledge and export success (Figure 8.1). International marketing here can be broken down into three main areas, in which MNE buyers contribute to export success of Thai PF4:

(3.1) Marketing channel

MNE buyers brought in the marketing channel for local enterprises to penetrate the global market successfully. The need to be linked with MNE buyers varies depending on the product. In the canned pineapple and tuna industries, there were well-established brands on the market, especially in developed countries. It is unlikely local firms can launch their local brand on the international market. Thai firms have to produce and sell their products under these well-established brands. Besides, knowledge is needed of what the right brands are for each market as well as of where the market opportunity is around the world, to ensure the firms obtain purchasing orders large enough to run their business. Hence, MNE buyers, with their extensive international marketing networks, are in a better position to acquire the knowledge. In the case of processed chicken and shrimp, where there are no well-established brands, the role of MNE buyers in providing marketing channels is still relevant to the Japanese market where the internal trade system is complicated and dominated by Japanese multinational trading companies. For other markets like the US and European Union, the role of MNE buyers becomes less important. Nevertheless, the Japanese market is the largest export destination of processed chickens and shrimps

(3.2) Compliance with regulations of importing countries

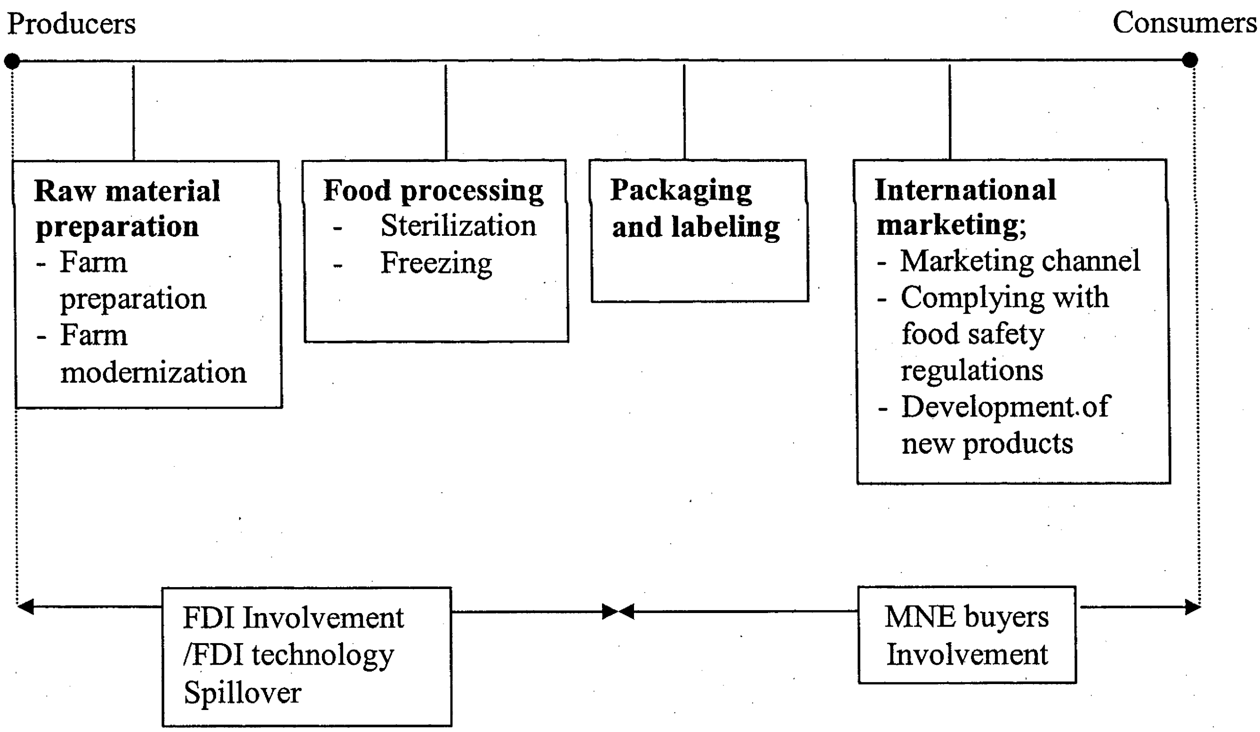
MNE buyers play a very important role in assisting local firms to comply with the food safety regulations and overcome any potential export obstacles. The role of MNE buyers is important in all PF4 products except for canned pineapple. In the canned tuna industry, its production process is involved with transforming 'raw' to 'cooked' foods. In the processed chicken and shrimp industries, its final products are still either 'raw' or 'semi-cooked' foods preserved by the freezing process. The food safety issue is of great concern and related food safety regulations seem to be more complicated than for canned pineapple. In addition, there are cases in the canned tuna and processed chicken industries where MNE buyers have helped to overcome some export obstacles or occasional changes of regulations induced by governments in importing countries.

(3.3) Development of new products

Regarding processed chicken and shrimp, whose product specifications are not internationally standardized, MNE buyers have been involved with the development of new products. MNE buyers introduce Thai firms to new products and work together to ensure final goods will sell in importing countries. This role of MNE buyers is likely to be relevant only for the Japanese market where there is a high degree of product differentiation. This considerably contributes to moving up to the higher level of quality ladder.

4. For all PF4 products, Thai enterprises seem to have a high absorptive capability to learn and maximize benefits from MNE involvement because its open trade policy regime causes MNE involvement take place in areas where Thailand has the comparative advantage, i.e. agricultural plantation and labour skill in processing foods. In addition, this regime allows the global competitive pressure to encourage all economic agents to seek technological innovation to improve efficiency and to survive.

Figure 8.1
MNE Involvement in the Processed Food Industry



Source: Author's compilation

5. In the export success of processed chicken and shrimp industries, the CP group, the Thai MNE, a 'Fortune 500' company, was an important element of the enabling environment to make maximum benefits from MNE involvement with its solid business history and strong entrepreneurial skills. It played a pivotal role in harnessing MNE involvement in the upstream industries. Besides, the active involvement of the CP group in R&D activities at the farm level significantly contributes to strengthen competitiveness and improving quality through the use of improved inputs.

8.3 The Automotive Industry

The firm interviews found a considerable level of MNE involvement in the Thai automotive industry. This occurs through both FDI and non-FDI channels. Through FDI linkages, there have been numerous MNE affiliates in both car making and parts manufacturing industries in Thailand. Where non-FDI linkages are concerned, there was evidence that local parts manufacturers access advanced technology from MNEs under technology licensing contracts. There was not evidence of other non-FDI channels.

MNE involvement contributed to the technological capability of Thai parts suppliers. Obviously, some Thai firms directly use technology licensing agreements to acquire production technology. This results in technological improvement in local parts suppliers. On the other hand, there is FDI technology spillover in the Thai automotive industry. The key FDI channel is through backward linkages developed between car assemblers and local parts suppliers. Other FDI channels, like the demonstration effect and/or labour mobility, are relatively less important. MNE car manufacturers demand finished parts made to precise specifications so they need to contact parts suppliers to ensure that the manufactured parts measure up to precise specifications. This involves a great deal of complex information that is unlikely to be effectively absorbed by simply observing other existing foreign-owned parts suppliers (demonstration effect) or by employing a few high-profile workers who used to work with foreign firms (labour mobility). As a result, backward linkages are the key channel for FDI technology spillover. Nonetheless, this does not imply that there is no technology spillover taking place through other channels. Rather their contribution is likely to be relatively less important, compared with that from backward linkages.

Note that the discussion here emphasizes the OEM market where parts manufacturers supply their products directly to car assemblers, in order to examine the role of backward linkages and gains from FDI. In contrast, there is another market for parts, the REM market where parts manufacturers sell their products as spare parts. Customers are general car owners not car assemblers, so this is not an area where direct linkages are involved.

When parts suppliers want to be OEM suppliers, they must build up technological capability to ensure that they are able to produce finished parts made to precise specifications. Since orders from MNE car assemblers are relatively large, this motivates individual suppliers, especially local ones, to invest in upgrading their technological capability to boost their existing production capability. Usually MNE car assemblers are able to take part in the selection of capital equipment and production technology of suppliers. Based on the Thai automotive industry, MNE car assemblers usually demand their locally non-affiliated suppliers to be under technology licensing contracts with MNE parts suppliers to acquire well-established production technology. In order to obtain reliable quality, car assemblers also always request that their OEM parts suppliers run quality tests on manufactured parts. Local suppliers must install several quality testing facilities and conduct these tests. In the ongoing process, there are continuous flows of new products, thereby creating a demand for successively upgrading production technology. All of these activities are instrumental in causing backward linkages to boost the technological capability of parts suppliers.

Over the past three decades, there has been a notable structural change in the nature of backward linkages in the Thai automotive industry. This affects the way that linkages positively affect the technological capability of parts suppliers. There is no clear-cut time period during which backward linkages have been changing, but many firms mention they have gradually changed since the late 1980s (Samples No.17–19). Hence, a distinction in the nature of linkages is roughly drawn between before and after the mid–1980s. Note that, as argued in Chapter 7, car assemblers gradually commenced their strategy change around the late 1980s and it became clear from the mid–1990s onward. The time of linkage change to some extent coincided with the changes in government policy toward the Thai automotive industry as discussed in Chapter 7 (see above).

8.3 1. Linkages during the period of the 1970s to the mid–1980s.

Linkages occurring during this period would be regarded as 'policy-induced' linkages. Part procurement by car assemblers was not completely reliant on market mechanisms. Instead these assemblers had to procure locally made parts to fulfill the LCR measures. With the policy-induced linkages, car assemblers still positively affected the technological capability of local parts suppliers by requesting that locally non-affiliated firms use well-established production technology. However, technological benefits derived from this type of linkages are limited and do not lead to sustainable development of part manufacturing as seen below. Car assemblers provided lists of accepted technology owners. This reduced the transaction costs involved in technology searches as well as lowered the risk of acquiring inappropriate technology. Local parts suppliers had to comply with this request as a prerequisite for becoming OEM suppliers. This compliance led to upgrading the production and technological capabilities of these firms.

Under these contracts, technology owners that are usually MNE parts manufacturers not only sold machinery but also sent their technicians to train their customers (i.e. local suppliers) to operate the machinery properly. Three interviewed firms producing rubber parts, radiators, and pressed parts (Samples No.18, 20–21) all argued that the modern technology production of their companies commenced when they became OEM suppliers in the early 1970s. Even though these companies were large and successful in the REM market during the 1960s, their production technology at that time was rather informal. It was not reliant on any well-established production technology.

As long as they could imitate OEM parts (i.e. genuine parts) as closely as possible at competitive prices, they could survive in the REM market.

The decision to create linkages came about to fulfill the LCR obligation and locally assembled vehicles were sold on the highly-protected domestic market. Hence, after car assemblers requested reliable production technology, they did not seem to care what technology local suppliers acquired under the technology licensing agreement. As a result, local suppliers, who realized they were protected by LCR measures, complied with this request by bringing out-of-date technology and second-hand machines. This was confirmed by many interviewed suppliers (Samples No.18, 19 and 21).

In addition, foreign technicians that were usually associated with the technology licensing contracts were limited. A die casting supplier (Sample No.19), which was a Thai-owned firm during this period, pointed out that one foreign technician looked after around 20 machines. This has changed completely since the mid–1980s when the company became a MNE affiliate. Now one technician looks after only 2 machines. This same pattern was found in the case of Thai-owned rubber parts suppliers (Samples No. 18 and 21). For parts like aluminium casting and rubber hoses, local workers need close supervision to learn how to fine-tune machines and to overcome normal day-to-day problems in operating them. This skill is mainly developed through a learning-by-doing process rather than once-and-for-all training. This education will help firms to save on operating costs and improve production efficiency. For example, the skill of fine-tuning machines is important in determining a firm's efficiency. If the firm is very skillful, it can reduce waste occurring through trial-and-error at the start-up period, i.e. by setting the right pressure, temperature and vulcanizing periods. It also saves time in changing from one mould to another and increases production efficiency.

Linkages between car assemblers and local parts suppliers are rather weak. Car assemblers brought parts samples and/or 3-dimensional drawing and asked their local parts suppliers to duplicate the samples at the negotiated prices. Sometimes, local suppliers were requested to conduct a few quality tests. The level of technological capability required to do this job was merely the capability to run mass production with uniform quality, i.e. quality control capability.

In addition, car assemblers saved on the cost of monitoring the quality of manufactured parts by minimizing lists of quality tests. The requirement to conduct quality tests is one of the important mechanisms to force parts suppliers to learn and improve their production capability and efficiency. In the policy-induced linkages, quality tests were far shorter than the usual practice. A radiator supplier (Sample No.20) argued that there were only 5–6 items, for which car assemblers requested quality tests during this period. More importantly, these items were simple and obvious. A Japanese car assembler (Sample No.25) confirmed that these lists of quality tests were short, and further argued that in some cases local suppliers were not even capable of doing these simple quality tests. Instead, the assembler had to perform them himself. As long as they were of 'acceptable' price and quality, car assemblers complied with the LCR measures. The word 'acceptable' in terms of price refers to the price level that allows car assemblers to earn a profit on the local market. 'Acceptable' in terms of quality means a level of quality that does not jeopardize the long-term goodwill of the car maker, especially in terms of car safety.

The LCR measure gave parts suppliers economic rents but did not provide any economic incentive for them to convert the created rents into developing their technological capability. Even though, it would have benefits from learning by doing in the manufacturing process, the general impression from firm interview suggests such benefits were not significant. Once they were successfully linked up with MNE car assemblers, there was no incentive for them to strengthen their technological capability further. Manufacturing parts became routine. In particular, a supplier (Sample No.20) even argued that as long as customers bought their products, there was no reason to waste sizable amounts of money in learning and upgrading technological capability. A Japanese car assembler (Sample No.26) also gave a good example in the case of radiators. The LCR measure might encourage local suppliers to import well-established production technology to manufacture radiators (made of copper) but there was no ongoing enforcement to keep updating technology. While the technology has changed to using aluminium because of its better heat dissipation, the presence of LCR measures has allowed these suppliers to put off adopting this innovation.

Under this policy environment, it was unlikely car assemblers would work jointly with local parts suppliers in developing parts for any new vehicles. In reality, there are various stages before mass production that car assemblers and parts suppliers can work together and benefit from each other through backward linkages. As illustrated in Figure 8.2, there are long lists of such activities. In this study, these activities are divided into 7 stages (Figure 8.2).[16] In Stage 1, the concept of a new vehicle model is expressed in order to enhance competitiveness with a new product that meets market needs. Usually, this is done entirely by car assemblers. This stage will only provide a vehicle concept without any engineering or technical information. This is followed by Stage 2, 'part design', which involves the design of the functional characteristics and basic structure required to implement the vehicle concept in Stage 1. Stages 3 to 6 are conducted in order to obtain all necessary information for the manufacturing process, namely Stage 7. Such information is represented in 2– or 3–dimension drawings. From Stages 2 to 6, car makers and parts manufacturers must work together intensively. The production of a vehicle requires various types of manufactured components (such as metal, plastic, rubber, glass, and electronics). Car makers are not necessarily specialists in all these parts. They need assistance from manufacturers that specialize in individual parts to improve vehicle quality and enhance competitiveness of the overall vehicle. However, to be able to be involved in these stages, parts suppliers must attain a technological capability that is higher than mere quality control, i.e. product development and product engineering.

It is unlikely that the deepening linkages would go beyond the mass production stage in an environment where linkages are 'policy-induced'. As mentioned earlier, local suppliers were unresponsive to innovations and requests to improve their product quality.

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[16] Seven Stages mentioned here conform with the classification of Takayasu and Mori (2004: p.228-9) which separates these activities into three stages, namely product development (Stages 1 to 2), process engineering (Stages 3 to 6) and mass production (Stage 7).

It was difficult to find capable suppliers. The protection of vehicles allowed car assemblers to stagnate and enjoy policy-induced economic rents. In this environment, as substantiated by several car assemblers (Samples No.25 and 26), locally assembled vehicles were old models launched previously in other markets, namely 'repeat' models. For the 'repeat' model, stages 2 to 6 were all completed elsewhere and car assemblers acquired complete information of how to manufacture parts. That is, they worked with MNE parts manufacturers. Assistance from Thai parts suppliers in product engineering and product design was not needed.

8.3.2 Linkages from the late 1980s –present.

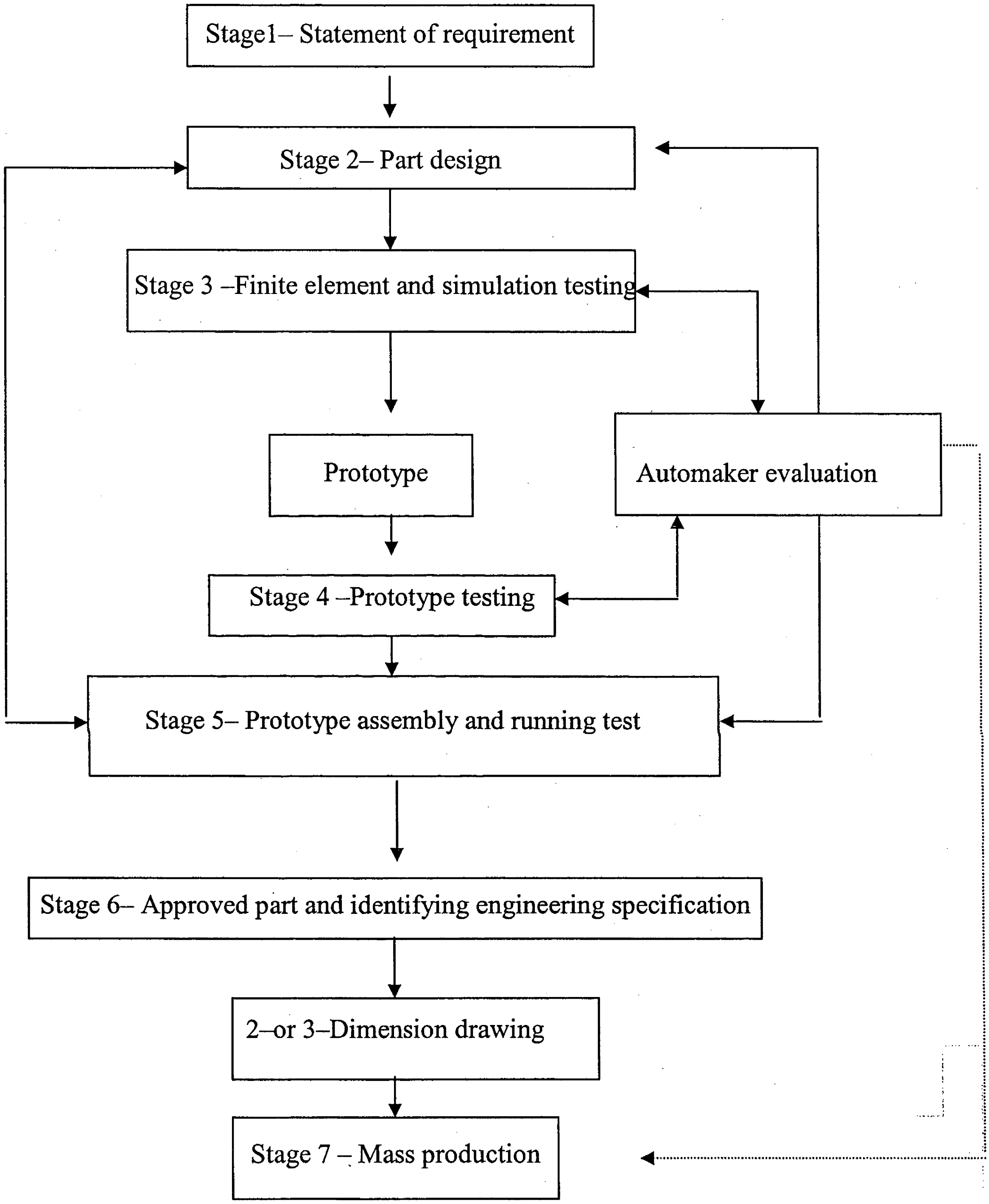
As mentioned, global competition in the automotive industry became increasingly intense during the late 1980s and the early 1990s (see above). This caused car assemblers to change their strategy from operating behind a protection wall to exploiting the regional/global network to strengthen their international competitiveness. As discussed above, one of the outcomes of the strategy change was to increase local parts procurement only when production site is likely to be able to operate efficiently and attain economies of scale in production. Hence, some countries, which fail to achieve from such condition, are dropped off the regional/global network. The increase in local content naturally occurred in order to strengthen international competitiveness of car assemblers. Hence, linkages during this period would be regarded as 'natural' linkages.

With 'natural' linkages, car manufacturers also require higher technological capability from their parts suppliers. Local suppliers are expected to attain the technological capability to work on product development and product engineering (Stages 2–6 in Figure 8.2). The expectation of supplier capability was even higher when many car assemblers developed the strategy of launching the same model on multiple markets at the same time, namely the 'original' model strategy.[17] This meant car

[17] This strategy aims to reduce R&D costs per vehicle. The scope of multiple markets can be either a region e.g. ASEAN or worldwide. For example, the one-ton pick-up truck is the global vehicle for both developing and developed countries (Takayasu and Mori, 2004: p.219-20).

Figure 8.2

Series of Backward Linkages in the Automotive Industry



Source: Firm interviews

assemblers did not have full information on producing a vehicle because it had not already been produced somewhere else. Hence, after car assemblers decided where to produce this model, they and the parts suppliers jointly work out all necessary information for the manufacturing process (Stages 2 to 6), based on input prices available at selected production sites to minimize total costs of a vehicle. In Thailand, this strategy began in 1996 (Techakanont, 2002). This is sharply different from producing 'repeat' models where car assemblers were not involved in the manufacturing production of vehicles. As argued by a Japanese car assembler (Sample No.26), car assemblers nowadays just provide engineering properties and product qualification as well as assign space where parts have to be fitted to the vehicle. Parts suppliers must do this to retain their status as OEM suppliers. Backward linkages become longer-term relationships because Stages 2 to 6 commence a few years before the vehicle is launched on the market. This allows parts suppliers to be involved beyond the mass production stage. Car assemblers and parts suppliers set up their staff teams and work closely together from product design, to prototype production and then mass production.[18]

In addition, car assemblers have placed far more emphasis on the quality and performance of parts suppliers. The radiator supplier (Sample No.20) stated that the MNE car assemblers extended the list of quality testing from 5–6 tests to almost 40. These additional tests were far more complicated. This was totally different from the situation between 1970 and the early 1990s.[19] New quality testing facilities had to be installed and the company had to learn how to pass these quality tests. Interestingly, although the company had been manufacturing these parts for the past thirty years, it was not until these new and longer lists of quality tests were introduced that they realized how complex the manufacturing process really was. This supplier emphasised that these additional lists were not a result of technological progress. The delay in applying them was entirely due to a lower expectation of parts' quality.

[18]Techakanont (2002) provides a detailed case study of inter-firm cooperation in the automotive industry.

[19] The car assembler corresponding to this supplier commenced the strategy change in the early 1990s. In fact, the changes in the nature of backward linkages in other car assemblers began in the late 1980s.

As revealed by many rubber suppliers (Samples No.18, 21 and 23), car assemblers rate their suppliers according to ability to comply with requirements. This rating depends on several aspects of supplier performance such as delivery, defect ratio, etc. The higher the score, the higher suppliers are ranked for allocation of future contracts. Greater emphasis on quality and performance of parts suppliers increases competition pressures and forces suppliers to improve X-efficiency.

This competition among parts suppliers has become even more intense after the entry of the US Big 3, namely Ford, GM and Daimler Chrysler. The parts procurement policy of these US car assemblers heavily relies on price bid competition among parts suppliers around the world. This prompted other car assemblers to follow suit. In the traditional practice of Japanese car assemblers, it was usual for a parts supplier to be attached to only one car assembler. This practice changed from around 1995 onward. A parts supplier is now allowed to supply more than one auto maker. Orders are heavily reliant on the competitiveness of suppliers. This also enhances the likelihood of parts suppliers benefiting from scale economies.

Suppliers, in addition, must propose their cost-reduction plans to car assemblers, i.e. cutting production and operating costs by a certain per cent within given time periods (revealed by Sample No.22). This is to enhance the competitiveness of assembled vehicles. For example, Toyota has set a 25 per cent cost reduction target within 3 years. Isuzu and GM have adopted a target of cost reduction of about 5 per cent a year.

Interestingly, there is evidence of car manufacturers providing assistance to locally owned suppliers. Car assemblers conduct regular factory visits to informally audit parts manufacturers' capability. Where some parts are concerned, like pressed parts or suspension parts, where car assemblers are familiar with their production technology, i.e. pressing technology, they provided useful suggestions. A technician of a pressed parts supplier (Sample No.24) pointed out that from around the early 1990s, the frequency of factory visits from car assemblers and their intention to help local parts suppliers has increased remarkably, compared to the early 1980s. Sometimes, car assemblers would give useful recommendations regarding jig arrangements and machining processes so as to reduce the defective rates and dollar costs per unit of manufactured parts. A similar pattern was found in the case of suspension parts (Sample No.22). During a factory visit, car assemblers worked with the company to overcome production cost reduction problems.

Even though they were still reliant on the technology licensing channel to acquire advanced technology, technology owners with influence over the car assemblers gradually requested on upgrading production technology. The more cutting edge production technology was transferred with close supervision from foreign technicians, and many interviewees pointed out that this is when the real development of local labour skills began. According to one multi-parts supplier (Sample No.17), these foreign technicians even "ate and slept with local workers". The number of foreign technicians has increased remarkably. Local labour is now able to produce relatively more complicated parts. This is verified by the deputy head of factory engineers of an aluminium casting supplier (Sample No.19) which used to be Thai-owned. More importantly, local firms began investing in R&D activities as a result of increased MNE involvement.

8.3.3 Comparison between 'Policy-induced' and 'Natural' Linkages

Key different aspects between 'policy-induced' and 'natural' linkages are summarized in Table 8.2. Firstly, the technological capability car assemblers expect from parts suppliers is far higher in 'natural' linkages than 'policy-induced' ones. Where the latter are concerned, the capability car assemblers expect is the ability to duplicate parts samples with well-established production technology. Whether parts suppliers acquire out-of-date or cutting edge production technology is not of interest to the car assemblers. Where 'natural linkages' are concerned, on the other hand, parts suppliers are expect to be capable of producing engineering and design. Even though locally non-affiliated firms use the technology licensing channel as they did the 'policy-induced' linkages, more cutting-edge technology is requested to be transferred.

Secondly, the level of backward linkages is different between these two types. 'Policy-induced' linkages occur only at the mass production stage. One is unlikely to find the deeper level of backward linkages at some stages of the product development process as one would with 'natural' ones. In addition, the relationship in 'natural' linkages is longer term than the 'policy-induced one. In the former relationship, car assemblers and parts suppliers commence their co-operation a few years before launching vehicles. This enhances the likelihood that parts suppliers benefit from other types of advanced technology (e.g. managerial skills) from car assemblers.

Thirdly, the emphasis on price competitiveness and parts quality by car assemblers is far less in 'policy-induced' linkages than in 'natural' ones. Greater emphasis promotes healthy competition pressure and forces parts suppliers to improve their X-efficiency in the short-run and to keep alert to innovation subsequently.

Finally, there was no evidence that car assemblers significantly assist local parts suppliers to improve production efficiency in 'policy-induced' linkages. This contrasts with 'natural' linkage where car assemblers are more actively involved in the improvement of production efficiency of local parts suppliers.

All of these four respects are the key mechanisms in causing backward linkages to boost the technological capability of parts suppliers. The evidence from the Thai automotive industry shows that the policy-induced linkages distort the mechanism and retard growth-enhancing effects from FDI backward linkages.

Nevertheless, only a handful of indigenous parts suppliers can pass the new requirement standards and benefit from 'natural' linkages with car assemblers. In 2002, there were 354 Thai-owned OEM suppliers (Figure 8.3). The other 1,100 Thai suppliers were indirectly linked with car assemblers through first-tier suppliers. In the opinion of interviewees (Samples No.19, 20, 22 and 25), these official figures of Thai-owned OEM

Table 8.2

Comparisons between 'Policy-induced' and 'Natural' Linkages in the Thai Automotive Industry

	'Policy-5nduced' Linkages	'Natural' Linkages
Requirement of Production Technology	- Technology-licensing for locally non-affiliated parts suppliers - Careless what technology negotiated under the licensing agreement - Require only quality control capability	- Technology-licensing for locally non-affiliated parts suppliers - Require more cutting edge technology - Require higher technological capability than quality control capability i.e. product engineering/design.
Deeper Level of Backward Linkages	- Weak i.e. car assemblers ask suppliers to duplicate parts sample	- Deeper level, i.e. car assemblers work with parts suppliers in a product development process. - Take place 3–4 years before mass production starts.
Price and Quality of Parts	- Acceptable prices and quality - Short lists of quality tests	- International standards - Heavily reliant on price bidding - Request for cost effectiveness plans - Longer and far more complicated quality tests
Assistance from Car Assemblers	- - Introduce potential technology owners	- For qualified parts suppliers, car assemblers frequently conduct factory visits and sometimes provide useful suggestions

Source: Author's compilation

suppliers tend to grossly overstate the number of surviving firms. The number of purely Thai firms must be around 10–15 suppliers. The official figure above would include some OEM suppliers that manufactured parts for old car models, i.e. the models that were being assembled before the strategy changes.

It can be argued that OEM suppliers that survive in the new environment are likely to be large firms that are able to access longer-term financial support in order to comply with the new requirements. In addition, since car assemblers have employed the modularization system where OEM suppliers must be fully responsible for a module instead of individual parts,[20] this reinforces the notion that OEM suppliers must be large firms. It has become harder for small and medium firms to survive as OEM suppliers. Nevertheless, the general impression gained from the interviews is that the main obstacle is the difficulty of acquiring higher technological capability within a short transition period. This finding could shed light on the ineffectiveness of the policy packages, i.e. protection of vehicles and imposition of LCR measures to promote the Thai automotive industry.

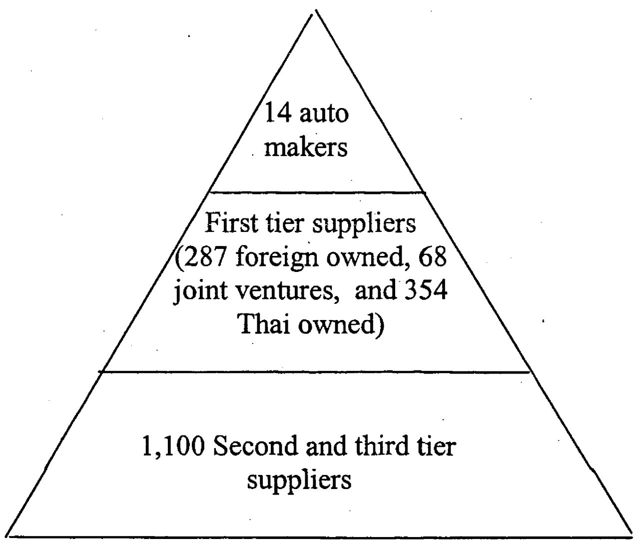
Parts suppliers need time to accumulate technological capability from the quality control level to the product engineering and product design levels. This seems to be consistent with the 'infant industry' argument of temporary protection to gain dynamic economies in following periods. However, there is no evidence to suggest that the LCR measures enabled local suppliers to achieve dynamic economies. The LCR measures commenced 20 years before the strategy change but only a handful of local suppliers survived. In addition, the reason that local suppliers (Samples No.17 and 22)[21] passed the new requirement standard was not directly related to the protection provided by LCR

[20] Under modularization, parts suppliers are classified into three levels, namely first-, second- and third-tier suppliers, according to their relationship with car assemblers. First-tier suppliers are required to take responsibility for the design as well as the manufacture of modules and not just individual components. If any suppliers fail to attain this requirement, they will be classified in the lower tiers, i.e. the second- or third- tiers. The lower tier suppliers are not directly involved with car manufacturers but are responsible for individual parts and/or raw materials and deliver their products to the first-tier suppliers.

[21] The firm in Sample No.24 is another one that survived. However, interviewees were not in a position to give convincing evidence of this transition.

measures, but because they received significant assistance from the car assembler whose production strategy in the late 1980s shifted towards exporting vehicles from Thailand (see above). Hence, these firms undertook their technological upgrading from the late 1980s onwards. This longer transition period enabled these firms to build up their technological capability gradually and maintain their positions successfully in the OEM market.

Figure 8.3
A Relationship Structure in the Thai Automotive Industry



Source: Thai Automotive Industry Association (2003).

It is unlikely to be able to reject that during the IS period, local suppliers did gain technological capability benefit from the presence of LCR and the other protection measures granted so far. The relevant question is whether such protection measures generate sufficient benefits to induce sustainable development of the automotive sector, especially the auto parts industry, where local firms participate. The firm-level study failed to uncover any evidence in support of the proposition that LCR measures had any lasting positive impact on local part suppliers. Such measures, in other words, were not a sufficient condition in building up the technological capability of local suppliers and allowing them to benefit from the gains of dynamic economies. They did help local firms to acquire well-established quality-controlled production technology but failed to motivate them to use this technology efficiently and advance to even higher levels of technology. When car assemblers changed their strategy, a few suppliers were able to pass this new requirement standard. Hence, they enticed MNE parts manufacturers to establish affiliates in Thailand, thereby rapidly increasing FDI inflows in the automotive industry. OEM suppliers have been supplanted by MNE affiliates. Some of these parts manufacturers were technology owners and provided such knowledge to local parts suppliers under technology licensing agreements (Samples No.18, 20, and 21). As evidenced by a rubber parts supplier (Sample No.18), these technology owners have expressed their intention to be co-owners since the late 1980s where car assemblers commenced their strategy changes. The tendency of strengthening their involvement with local parts suppliers was observed during the first half of the 1990s (Samples No.18 and 21). When the foreign ownership restriction was abolished during the onset of the crisis in 1997, these technology owners took full control of the OEM market. Local partners are responsible for production for the after market (i.e. repaired parts for vehicle services and maintenance).

Therefore, the 'infant industry' argument for protection to promote dynamic economies is not supported by the experience of the Thai automotive industry. These findings are in line with previous studies, e.g. Battat *et al.* (1996) and Moran (1998, 2001). The LCR and 'policy-induced' linkages retard rather than promote growth and efficiency. In particular, Moran (1998: p.46) points out:

> 'In short, the imposition of domestic-content requirements on foreign investors —far from generating a dynamic learning process in which foreign subsidiaries, local suppliers, labor, and host authorities work together to grow from infant industry status to internationally competitive operations — contains multiple sources of breakdown and stagnation.'

8.4 Inter-industry Comparison

Table 8.3 provides a summary of channels of MNE involvement and their contribution to these two industries. In both industries, MNEs have been involved through both FDI and non-FDI channels and have significantly contributed to their success. In the processed food industry, MNEs are more likely to have non-FDI buyer linkage with local enterprises. In contrast, despite the presence of both FDI and non-FDI channels, MNEs in the automotive industry prefer the FDI channel.

In both industries, MNE involvement plays a vital role in their industrialization process. MNEs act like an industrial catalyst to entice local enterprises to undertake the manufacturing process. Production of PF4 products at the commercial plantation level commenced after the MNE involvement. Similarly, production of locally owned parts suppliers started using the modern technology production of their companies as a result of MNE involvement.

MNE involvement occurs through both FDI and non-FDI channels. The non-FDI channel was through MNE buyers in processed foods and technology licensing in the automotive industry. The relative importance of FDI and non-FDI channels is different for these two industries. While in the processed food industry MNE involvement is likely to rely on the MNE buyer channel, in the automotive industry, MNEs tend to prefer FDI. The rationale is that the processed food industry is likely to involve mature/stable production technology that is generally available for arm's length purchase. It becomes of less concern for local enterprises to be linked with MNEs through the FDI channel and to share ownership and control in order to access advanced production technology. Hence, local firms tend to acquire such knowledge from MNEs through the non-FDI channel. In contrast, in the automotive industry, where production technology *per se* is a proprietary asset, MNEs prefer the FDI to the non-FDI channel to secure their proprietary asset. As seen, since the late 1980s many MNE parts suppliers have expressed their intention to be co-owners with local counterparts.

Table 8.3
MNE Involvement and their Contribution in the Thai Processed Food and Automotive Industries

	Processed Food Industry	Automotive Industry
MNE Involvement	- Presence in both FDI and non-FDI channels. - More likely to be non-FDI channel (MNE buyers)	- Presence in both FDI and non-FDI channels. - More likely to be FDI channel
Technological Contribution	- Significant throughout the past three decades.	- The contribution of MNE affiliates under an IS regime was limited and far less than that under an EP regime.
FDI-Channel	- Emphasis on production process - FDI-channel occurs through (1) Demonstration effect (canned pineapple/tuna) (2) Labour mobility (canned pineapple) (3) Forward linkages (processed chicken/ shrimp)	- Create backward linkages from car assemblers to local enterprises - No evidence of technology spillover through other FDI-modes - 'Policy-induced' (an IS regime) and 'natural' (an EP regime) linkages are significantly different from each other
Non-FDI Channels	- Presence of MNE buyers - Provide international marketing know-how.	- Presence of technology licensing channel

Source: Author's compilation.

The inter-industry comparison supports the central hypothesis of this dissertation. There exist considerable technological benefits from MNE involvement in the processed food industry. Where FDI channel is concerned, technology spillover occurs through various channels such as demonstration effects (canned pineapple and tuna), labour mobility (canned pineapple) and forward linkages (processed chicken and shrimp). The contribution through the FDI channel is related to building up production capability for export, e.g. raw material preparation. On the other hand, MNE buyers considerably help local firms to acquire international marketing knowledge (marketing channel, compliance with border regulations, and the development of new product) and to penetrate the global market successfully. Despite the difference in pursued methodology, the finding, to some extent, are in line with the findings in previous studies, e.g. Kokko *et al.* (2001). In particular, Kokko *et al.* (2001) find that international marketing, export skills, quality control, and design are potentially important for EP industries, based on the econometric analysis of Uruguayan manufacturing firms.

In the automotive industry, FDI technology spillover is mainly through the backward linkage channel. There was also evidence of MNE involvement through the technology licensing channel. Nonetheless, the contribution of MNE involvement is radically different between the IS and EP regime periods. Backward linkages occurring in an IS regime are 'policy-induced' (LCRs-induced), not reliant on underlying economic factors. Linkages between car assemblers and locally-owned parts suppliers are rather weak. The factors that generally cause backward linkages to boost the technological capability of parts suppliers were distorted by the 'policy-induced' linkages. Local suppliers who realized they were protected by LCR measures were unresponsive to innovations and requests to improve their product quality. The protection of vehicles allowed car assemblers to stagnate and enjoy policy-induced economic rents. This resulted in the unsustainable development of local parts suppliers.

In contrast, backward linkages under an EP regime are mostly driven by economic factors (i.e. 'natural' linkages). Backward linkages seem to be more beneficial to technological capability of parts suppliers. All the factors seem to function well. Car assemblers place far more emphasis on the quality and performance of parts suppliers. Backward linkages become longer-term relationships and are deeper than 'policy-induced' ones. Car assemblers and parts suppliers are involved beyond the mass production stage, contrary to what occurred in the case of 'policy-induced' linkages. There is also evidence of car manufacturers providing assistance to locally owned suppliers. Only a handful of indigenous parts suppliers can pass the new requirement standards and benefit from 'natural' linkages with car assemblers.

Contrary to the 'infant industry' argument, there has not been evidence of dynamic economies arising from the 30 year-long protection for parts manufacturing. Even though MNE car assemblers created 'policy-induced' linkages with many locally-owned suppliers from the early 1970s onward, technology spillover through these kinds of linkages could not lead to the sustainable development of these suppliers. When MNE car assemblers required higher technological capability, a handful of local parts suppliers survived.

Even though the magnitude of technological benefit from MNE involvement cannot be precisely quantified by the analysis undertaken in this chapter, the findings support the empirical evaluation found in Chapters 5 and 6 that gains from MNE involvement are conditioned by the trade policy regime in host countries. This chapter provides insight into how FDI has helped local enterprises to build up their technological capability. An open trade policy regime provides the setting for MNE involvement to take place in areas where Thailand has comparative advantage. Local firms have a high absorptive capability to learn technological benefits from MNE involvement and adapt to local market conditions. In addition, the global competition pressure stimulates local firms to invest in R&D activities and to be alert to innovation in order to strengthen their international competitiveness. This leads to the sustainable development for locally-owned firms. These technological benefits are not necessarily detected by the widely-used productivity measures such as total factor productivity and labour productivity. In particular, the benefits in terms of opening up market channels as occurred in the processed food industry are also unlikely to be fully captured by these quantitative measures.

Appendix 13
Guide for Interview Questions

Processed Food Industry

Company profile

- Main products
- Year of establishment
- Size of work force
- Ownership structure (foreign affiliate, joint venture, fully locally owned company)
- Sales destination (domestic sales versus export)
- Major export markets
- Year the company started exporting
- Brand name of products

Technology Spillovers

- Opinion about overall development of the Thai processed food industry and export performance
- Role of foreign affiliates in the industry's development and exports
- Role of foreign buyers in the industry's development and exports

- Contributing factors of the export success (quality of input and production technology, trading company)

- Process of building and strengthening technological capability

General opinion

- Obstacles and problems for the industry (both domestic and international markets)

- Role of government in industry development

- Position of Thai products in the world market and international competitors

- View on future trends in the industry

Auto Assembly Industry

Company profile

- Main products
- Production capacity and the changes in recent years
- Size of work force
- Sales destination (domestic sales versus export)
- Major export markets
- Year the company started exporting

Backward Linkages

- General opinion about development of the Thai automotive industry
- Linkages between auto parts industries and auto vehicle assemblers
- Assistance to parts suppliers in terms of technological capability
- Special Assistance for any particular auto parts
- The impact of the local-content requirements policy, dynamic economies, technological capability of indigenous parts suppliers

General opinion

- Role of government in the industry's development
- Obstacles and problems for the industry
- View on future trends in the industry

Auto Parts Industry

Company profile

- Main products
- Production capacity and the changes in recent years
- Size of work force
- Ownership structure (foreign affiliate, joint venture, fully locally owned company)
- Sales destination (OEM/ REM/ Export)
- Recent changes in sales destination
- Year the company started exporting
- Opinion about the export market

Production technology

- Sophistication of production technology (simple, medium or very complicated)
- How to acquire advanced technology
- Assistance from car manufacturers
- Changes in backward linkages over the past three decades

- Role of foreign investors (foreign affiliates in the same parts industry) in production technology development

General opinion

- Role of government agency and/or associations in assisting technology improvement

- Obstacles and problems in the industry (both domestic and international markets)

- View on future trends in the industry

Appendix 14
Summary of the Firm Characteristics and Key Interview Findings

(A) The Processed Food Industry

Sample No.	Firm size	Ownership	Years of Operation	Export value (million baht)	Remarks
Canned Pineapple					
1	Medium	Thai-majority and public company	10–20	≤1,000	1. Incorrect canning of high-acid fruit like pineapple could lead to can explosion. 2. Receive technology spillover through labour mobility channel (i.e. workers experienced with MNE affiliates). 3. Difficulties in launching Thai-owned brands internationally
2	Medium	Thai-owned company	10–20	≤1,000	The company's owner used to work for and gained knowledge from MNE affiliates.
3	Large	Thai-majority and public company	≥20	≥1,000	1. Existence of well-established brands in the global market and linkages with MNE buyers are needed for international market penetration. 2. Difficulties in launching Thai-owned brands internationally.
Canned Tuna					
4	Medium	Thai-owned company	≥20	2,000–2,500	Reveal the experience of an unusual practice at a border inspection in Europe and received assistance from MNE buyer.
5	Small	Thai-owned company	≤5	100	1. Substantial benefit from the MNE's factory visit. 2. Different behaviour of MNE vs. non-MNE buyers (Middle East).

(contd.)

Appendix 14 (contd.)

Sample No.	Firm size	Ownership	Years of Operation	Export value (million baht)	Remarks
6	Large	Thai-owned company	≥20	≥2,500	1. Gains of international marketing knowledge from MNE buyers 2. Commence 'retort pouch' packaging 3. Also a processed shrimp producer
7	Large	Thai-majority and public company	≥20	≥5,000	1. Actively training factory workers to enhance production efficiency. 2. Commence 'retort pouch' packaging.
Processed Chicken					
8	Large	Thai-owned company	≥20	≥2,500	Receive assistance from Japanese MNE buyers for their first export shipment, especially in the slaughter house.
9	Medium	Thai-majority and public company	≥20	1,000	1. Receive information about a new tariff schedule discriminating between unprocessed and processed frozen chicken 2. Assistance in the development of new products
10	Large	Thai-majority and public company	≥20	≥2,500	Assistance in the development of new products
11.	Large	Thai-majority and public company	≥20	≥2,500	Also a major processed shrimp producer

(contd.)

Appendix 14 (contd.)

Sample No.	Firm size	Ownership	Years of Operation	Export value (million baht)	Remarks
Processed Shrimp					
12.	Medium	Thai-majority and public company	≥20	≥4,000	The area where local firms need help from their MNE buyers is in international marketing as to what products should be sold and what flavours and appearances are acceptable to consumers in importing countries.
13.	Medium	Japanese-owned company	≤15	2,000–2,500	
14.	Medium	Thai-majority and public company	≥20	≥4,000	1. Experience monthly visits from Japanese MNE buyers 2. Give a particular example of assistance in the development of new products.
15.	Medium	Thai-majority and public company	≥20	≥4,000	Reveal characteristics of small and medium firms of Taiwanese direct investors in processed shrimp exports.
16	Small	Thai-owned company	≥20	100	1. Never been recorded on the US FDA detention lists. 2. The buyer introduced this firm to some qualified ISO auditors.

(contd.)

Appendix 14 (contd.)

(B) The Automotive Industry

Sample No.	Firm size	Ownership	Years of Operation	Parts	Remarks
Auto Parts					
17.	Large	Thai-owned company	≥30	Multi-parts	1. Survived after a structural change in the nature of backward linkages 2. Reveal close supervision of foreign technicians from the mid–1980s onward.
18.	Medium	Thai-owned company	≥30	Rubber	1. Reveal the development path from REM to OEM suppliers during the 1960s and the 1970s. 2. Reveal the tendency of strengthening MNE involvement during the first half of the 1990s
19.	Medium	Thai-majority company	≥30	Aluminium die casting	A dramatic change in the nature of their technology licensing agreement between the pre and post mid–1980s.
20.	Medium	Thai-owned company	≥30	Radiator	Reveal the difference in lists of quality tests
21.	Medium	Thai-owned company	≥30	Rubber	1. Reveal the development path from REM to OEM suppliers during the 1960s and the 1970s. 2. Reveal car assemblers did not seem to care what technology local suppliers acquired under the technology licensing agreement
22.	Medium	Thai-owned company	≥30	Suspension	Reveal the experience of assistance from car assemblers during factory visits.
23.	Large	Japanese-majority and public company	≥30	Rubber	Car assemblers rate their suppliers according to ability to comply with requirements.
24.	Large	Thai-owned company	≥30	Multi-parts	Reveal the change in the frequency of factory visits from car assemblers and their intention to help local parts suppliers.

(contd.)

Appendix 14(contd.)

Sample No.	Firm size	Ownership	Years of Operation	Parts	Remarks
Car Assemblers					
25.	Large	Japanese-owned company	≥30		Reveal the difference in linkages between the past 20 years and the present.
26.	Large	Japanese-owned company	≥30		Mention the adverse effect of LCR measures on the technological improvement of local firms (radiators)
27.	Newcomer	Japanese- and the US - owned company	≤10		Reveal the parts procurement policy of the US company.

Source: Author's compilation.

Chapter 9: Conclusions and Policy Inferences

The purpose of this dissertation has been to examine and evaluate the impact of MNE involvement in the industrialization process in Thailand over the past three decades, with a view to understanding its contribution and to formulating policies for maximizing the benefits derived from this involvement. The key hypothesis is that gains from MNE involvement are not automatic but are conditioned by the policy environment of the host country. The scope of MNE involvement covers not only FDI but also non-FDI. A combination of quantitative and qualitative analyses is employed to achieve this purpose. The quantitative analysis is undertaken at both macro- and industry-levels to provide quantitative indicators of the FDI contribution. A firm-level case study complements these analyses in order to provide insight into non-FDI channels of MNE involvement. This chapter summarizes the major findings of the dissertation (Section 9.1) and discusses policy implications of these findings (Section 9.2). Limitations of the study are discussed in the final section with a view to providing directions to further research.

9.1 Findings

Over the past forty years, Thailand has successfully built and maintained a general investment climate conducive to enticing foreign investors (Chapter 3). As part of the import-substitution (IS) industrialization strategy between the 1960s and the early 1980s, the government used trade policy and investment promotion regimes to influence resource allocation in the private sector. Policy-induced incentives were titled in favour of domestic rather than export-oriented industries. From the mid–1980s, policy regimes have been gradually changed toward export promotion (EP) and the incentives have been increasingly neutralized.

Trends and patterns of MNE involvement in Thai manufacturing, especially through the FDI channel, correspond to the evolution of the domestic policy regime (Chapter 4). The involvement began with old-style, rent-seeking FDI in the 1960s. From the mid–1980s onwards when trade and investment policy regimes became more EP directed, export-oriented and efficiency-seeking FDI has been increasingly involved in Thai manufacturing. Dollar values of manufacturing FDI inflows have increased sharply, compared to the two previous decades. Most of the new FDI is in labour-intensive industries, where Thailand has the comparative advantage. According to the data based on the Industrial Census 1997, FDI accounted almost 50 per cent of gross output and value added of Thai manufacturing in 1996. Foreign firms were generally more export-oriented than local ones. The level of FDI involvement measured in terms of exports was even higher than gross output and value added. Foreign firms accounted for nearly 60 percent of manufacturing exports and 35 per cent of manufacturing employment.

Against this backdrop, we started our analysis of the role of MNEs in industrial transformation in Thailand by probing the FDI-growth nexus for total manufacturing (Chapter 5). This is done by estimating a growth equation derived in the context of the new growth theory, which provides for capturing the impact of FDI interactively with openness in manufacturing output growth. The co-integrated estimates support the hypothesis that gains from FDI in manufacturing output growth are conditioned by the nature of trade policy regimes. Under an IS regime, gains from FDI seem to be far less or even negative, compared to a policy regime geared to EP. The key results from three alternative indices of trade openness are strikingly similar. Evaluated at the average value of the export-output ratio in the manufacturing sector (20.65 per cent), FDI contributed to almost 0.4 of average annual growth of the Thai manufacturing over the past three decades.

The analysis of the FDI-growth nexus is followed by an inter-industry cross sectional econometric analysis in order to examine two key aspects of the contribution of MNE involvement, technological benefit, namely FDI technology spillover (i.e. technological benefit to locally owned industries) and the direct impact on overall benefits to the manufacturing sector (Chapter 6). The findings support the role of trade policy regimes in conditioning technology spillover and the overall technological benefits. Two alternative measures of trade protection are used, namely the nominal rate of protection (NRP) and effective rate of protection (ERP). The findings are consistent with those in the macro-level analysis. Technological benefits are unlikely to take place in highly trade-restricted industries as opposed to more export-oriented ones. Over and above the technological benefits, the estimates of the FDI determinants equation suggests that trade barriers as well as the size of the domestic market play an important role in determining inter-industry differences in FDI participation.

In-depth firm-level case studies of the Thai processed food and automotive industries are undertaken in Chapters 7 and 8 in order to gain insights into both FDI and non-FDI channels of MNE involvement, with emphasis on the latter. The processed food industry study covers four major export products (i.e. canned pineapple, canned tuna, processed chicken and processed shrimp, referred to as PF4). The examination of the automotive industry covers both car and component manufacturing. Both industries are successful cases, but they are different from each other in several aspects. The processed food industry is labour intensive and exhibits a higher degree of export orientation than the automotive industry. Interestingly, the trade policy regime toward them seems to be strikingly different. Even though tariffs on finished PF4 products are high, Thailand has been the world's major exporter and there has not been a large domestic demand for these products. Hence, the presence of PF4 tariffs has not effectively been able to encourage enterprises to shift their resources toward the highly protected domestic market. The trade policy regime in the processed food industry is to some extent classified as an EP regime. For the automotive industry, the trade policy regime commenced with an IS regime (a high level of tariff protection and the presence of local-content requirements, LCRs) and then has been gradually liberalized since the early 1990s.

The findings from the firm-level case studies suggest that MNE involvement plays a vital role in the expansion process of both industries (Chapter 8). MNEs act as a catalyst to entice local enterprises to undertake the manufacturing process. Production of

PF4 products at the commercial plantation level commenced after MNE involvement. Similarly, in the automotive industry, locally owned parts suppliers started modern technological production as a result of MNE involvement.

In both industries, MNE involvement occurred through both FDI and non-FDI channels. The non-FDI channel was through MNE buyers in processed foods and technology licensing in the automotive industry. The relative importance of FDI and non-FDI channels is different for these two industries. While in the processed food industry MNE involvement occurred largely through the MNE buyer channel, in the automotive industry, MNEs tend to prefer FDI. The rationale is that the processed food industry involves mature/stable production technology that is generally available for arm's length purchase through the non-FDI channels. It becomes of less concern for local enterprises to be linked with MNEs through the FDI channel and to share ownership and control in order to access advanced production technology. In contrast, in the automotive industry, where production technology *per se* is a proprietary asset, MNEs prefer FDI to the non-FDI channels to secure their proprietary asset. Since the late 1980s, many MNE parts suppliers entered into joint ventures with local manufacturers.

The inter-industry comparison supports the central hypothesis of this dissertation. There are considerable technological benefits from MNE involvement in the processed food industry. As regards FDI channel, technology spillover occurs through various channels, such as demonstration effect (canned pineapple and tuna), labour mobility (canned pineapple) and forward linkages (processed chicken and shrimp). These factors help enhance production capability of local firms for export. Non-FDI channels take a number of forms including links with MNE buyers, technology licensing, international subcontracting. Of these, the role of MNE buyers was found to be the most important. MNE buyers help local firms penetrate global markets by forging market links and providing them with international marketing knowledge (compliance with border regulations, and the development of new products).

In the automotive industry, FDI technology spillover is mainly through backward linkages. There was also evidence of MNE involvement through the technology licensing. Nonetheless, the contribution of MNE involvement is radically different between the IS and EP regime periods. 'Policy-induced' backward linkages occurring in an IS regime between car assemblers and locally owned parts suppliers were rather weak. Moreover, local suppliers who realized they were protected by LCRs imposed on car manufacturers were unresponsive to innovations and requests to improve their product quality. Heavy trade protection allowed car assemblers to enjoy policy-induced economic rents without paying attention to productivity improvement. This resulted in the unsustainable development of local parts suppliers.

In contrast, backward linkages under an EP regime are mostly driven by economic factors (i.e. 'natural' linkages). Backward linkages seem to be more beneficial to the technological capability of parts suppliers. All the factors seem to function well. Car assemblers place far more emphasis on the quality and performance of parts suppliers. Backward linkages become longer-term relationships and are deeper than 'policy-induced' ones. Car assemblers and parts suppliers are involved beyond the mass production stage, contrary to what occurred in the case of 'policy-induced' linkages. There is also evidence of car manufacturers providing direct technical assistance to locally owned suppliers.

There is no clear evidence of dynamic economies arising from the 30-year long protection for parts manufacturing, contrary to the 'infant industry' argument. Even though MNE car assemblers created 'policy-induced' linkages with many locally owned suppliers from the early 1970s onward, technology spillover through these kinds of linkages could not lead to the sustainable development of these suppliers. When MNE car assemblers began to place emphasis on higher technological capability in a free market environment, only a handful of locally parts suppliers survived.

The findings of the case studies support the quantitative analysis in Chapters 5 and 6 by providing insights into how FDI has helped local enterprises to build up their technological capability. An open trade policy regime causes MNE involvement to take place in areas where Thailand has a comparative advantage. Local firms have a high absorptive capability to learn technological benefits from MNE involvement and adapt to local market conditions. In addition, under this regime, the global competition pressure stimulates local firms to invest in R&D activities and to be alert to innovation in order to strengthen their international competitiveness. This leads to the sustainable development of locally owned firms. These technological benefits are not necessarily evident in the widely-used productivity measures such as total factor productivity and labour productivity.

9.2 Policy Implications

Four policy implications can be drawn from this dissertation, which have general implications for other latecomers as FDI recipients, especially low-wage, densely populated economies. Firstly, the experience of the Thai manufacturing sector makes a strong case for the simultaneous liberalization of trade and investment policy regimes. Liberalizing the foreign investment regime must go hand in hand with liberalizing the trade regime in order to maximize gains from MNE involvement. The role of the trade policy regime could influence whether MNE involvement in host economies is of the old-style rent-seeking or the efficiency-seeking type. Different types of MNE involvement imply considerable difference in benefits host countries would anticipate from MNE involvement. Efficiency-seeking MNEs tend to be involved in areas where host countries have a comparative advantage. It is more likely for local firms to make use of advanced technology associated with MNEs. The open trade regime would be more likely to bring in efficiency seeking MNEs and more appropriate technology for host economies.

Above all, the open trade regime also brings in healthy competition that stimulates local firms to invest in R&D activities and to be alert to innovation in order to strengthen their international competitiveness. This is another key element that enables host economies to maximize benefits from MNE involvement.

The trade policy regime covers not only trade restrictions but also trade-related-investment measures like LCRs. The firm-level case-study of the automotive industry provides insights into the mechanisms of backward linkages in the presence of LCRs. Even though dynamic economies exist in industries like the automotive industry and as argued under the 'infant industry' argument protection may positively affect the industry's development path, imposing LCR does not seem to be a wise choice for governments in host countries to help local firms benefit dynamic economies. This would result in a general deterioration of technological and management skills and retard rather than promote growth and efficiency.

Secondly, the presence of a difference between 'policy-induced' and 'natural' linkages indicates that the *magnitude* of backward linkages is not a good proxy of the magnitude of benefits from MNEs. The *quality* of backward linkages is a far better indication of potential benefits from MNEs. The evidence indicates that the quality of 'natural' linkages is far higher than that of 'policy-induced' ones.

Thirdly, the conventional approach of focusing solely on FDI as the sole link between MNEs and domestic manufacturing tends to overlook an important part of the story relating to the role of MNEs in the industrialization process. MNEs contribute significantly to export-led industrialization through various non-FDI channels such as providing marketing channels, improving technological capability, and assisting to overcome export obstacles.

Finally, the complementary role of governments in host countries should involve building basic infrastructures, not only physical but also various forms of 'non-physical' infrastructures such as R&D expertise, education and training investment, human resource development and the creation of good institutional environments. Availability of physical infrastructures, such as electricity, water supply and high-quality telecommunications, seems to be a pre-requisite for enticing MNEs in any host economy. Interestingly, evidence from the firm-level case study analysis points out that all successfully local firms have to continuously commit themselves to R&D investment in order to fully assimilate and adapt advanced technology associated with MNE involvement. Such investment really needs non-physical infrastructures. Investment in non-physical infrastructures in Thailand was still below the average of middle-income developing countries. In addition, even though the in-depth analysis of the effectiveness of R&D promoting measures, such as double tax deduction of R&D expenditure, the industry institutes, and public research institutes cannot be addressed in this study, the general impression from the firm interviews suggests that these measures have not served well the need from the private sector. Some firms complain about marginal incentive from the double tax deduction measures, comparing to the costs incurred from complicated bureaucratic procedures. Most firms still heavily rely on their own R&D activities. The challenge of policymakers is to give adequate financial incentives for local firms to promote R&D investment countrywide, to build supportive intellectual property rights and to establish the link between granted incentives and performances.

9.3 Limitations of the Study

There are at least three limitations of the analyses conducted in this study, which need to be addressed in future research. Firstly, given the nature of data availability, the econometric analysis of technological benefits from FDI (in Chapter 6) was undertaken using cross-sectional data for a given year (1996). Given that technology acquisition is essentially a time-dependent process, the ideal data set for examining technological benefit from FDI need to be examined using a panel data set with considerable time difference between each observation.

Secondly, because of time and financial constraints, the firm-level case studies were based on a limited number of firms in only two industries, processed foods and the automotive industry. While the studies provided valuable insights into the process of the MNE contribution to technological capability of local firms through both FDI and non-FDI channels, it was not possible to undertake quantitative analysis of the magnitude of the MNE contributions. A major research effort involving a survey of a representative sample of firms covering a number of industries is required to fill these gaps in the present study. Moreover, it is not possible to make inferences about the form of MNE involvement and their contribution to the overall industrialization process, based on only two industries.

Thirdly, the inference of the impact of policy transition from IS to EP regime on the automotive industry (Chapter 8) needs to be treated with caution. Although the reform measures commenced in the early 1990s, in reality a notable shift from an IS regime to an EP regime occurred from about the mid–1990s. Hence, the inference of the study covers at best the short to medium effect only. It is too early to examine the long term development impact.

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