Chapter 6
Producer Concentration, Foreign Ownership, and Firms' Performance in Thailand

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1. Introduction

This chapter presents a relationship among producer concentration, foreign ownership and firms' performance in Thai manufacturing. Thai manufacturing is one of the excellent cases for the issue at hand for three reasons. Firstly, Thailand has always pursued a 'market-friendly' approach towards foreign investors in manufacturing from about the early 1960s. Hence, multinational corporations (MNCs) began being involved in Thai manufacturing since the early stage of industrialization in Thailand and continued to play their role in Thai manufacturing for the past four decades. Second, due to the nature of MNC affiliates whose firms' size are relatively large as opposed to locally non-affiliated firms. Hence, we could expect MNC affiliates are dominant firms in Thai manufacturing. On the other hand, Thailand like other Southeast Asian economies, the conglomerate nature of large and local firms is very prominent (Studwell, 2007). These two groups of firms and their interaction to each other would affect level and changes of producer concentration in the manufacturing sector. Thirdly, experience of industrialization in Thailand seems to be a success case in the developing world as indicated by the fact that the Thai manufacturing sector is relatively broad based, compared to neighbouring countries. In addition, Thailand is the global major exporters in several manufacturing goods such as processed foods (e.g. canned tuna, canned pineapple, frozen chicken, frozen shrimp), hard disc drive, electrical appliances automotive, apparel, etc. Nevertheless, there has not been any systematic analysis unveil how the MNC affiliates affect industrial structure and firms' performance especially that of locally non-affiliated firms.

Our analysis in this chapter covers the periods during 1996-2006, a tumultuous period in Thai economic history. During this period, the economy went through important adjustments that included the strengthening of corporate oversight and important changes in many large (primarily local) firms that took on large debts before the crisis. There was also a large increase in foreign direct investment (FDI) immediately following the crisis, partly due to abolishment of foreign ownership restriction in the onset of crisis.[1] In addition, a large portion of this FDI was used to finance buyouts of Thai partners in joint ventures, so that foreign ownership shares rose in many of these joint ventures.[2] A number of new, majority- or wholly-foreign MNCs were

[1] For example, according to Bank of Thailand (2008), inward FDI rose more than three-fold from an average of US$2.2 billion per year in 1995-1996 to an average of US$6.8 billion in 1998-1999. Flows then declined to an average of US$4.6 billion in 2000-2004, before reaching new highs of US$8.0 billion in 2005 and US$9.0 billion in 2006.

[2] Note that increases in FDI stocks (positive FDI flows) can be used to finance (1) increases in fixed assets, (2) other (mainly financial) assets, or (3) decreases in non-FDI sources of equity or liabilities in

established and several MNC groups also reorganized themselves substantially. The key hypothesis is that their interrelationship can vary from industry to industry, largely depending on level of import protection, the key policy instrument in creating policy-induced economic incentives for the past three decades.

The chapter's organization begins with policy environment in Thai manufacturing (Section 2). Section 3 provides databases used in this chapter, followed by Trends and Patterns of producer concentration and MNCs presence in Section 4. The relationship among producer concentration, foreign ownership and firms' performance is presented in Sections 5-7. In Section 5, the analysis begins with examining changes in producer concentration between 1996 and 2006 and relates such changes to industry-specific characteristics such as presence of Thai conglomerate, MNC presence, and import protection. The key novel feature in this section is that producer concentration is carefully measured by taking into consideration possibility that two close substitutes are treated as different industries. In this section, our analysis is extended to gain better understanding of characteristics of large firms in Thai manufacturing.

Analysis in Section 6 is on the productivity determinants. The question raised in this section is whether MNC affiliates have higher productivity than locally non-affiliated firms, and whether firms in a highly concentrated industry experience higher productivity than those in a less concentrated one. In addition, we examine whether or not there is MNC technology spillover, which is the most desirable benefit for host countries from MNC involvement. Section 7 examines export performance of firms in Thai manufacturing to gain better understanding in characteristics of exporting firms. In line with Section 5, we also test whether entry of MNCs has a positive effect on the possibility that locally non-affiliated firms would export. The final section (Section 8) provides conclusion and policy inferences.

2. General Investment Climate and Policy-Induced Incentive in Thai Manufacturing

The discussion in this section provides general investment climate and incentive structure in Thai manufacturing over the past four decades. The general investment climate matters when MNCs decide to involve in a given host countries. This is due to the fact that MNC involvement in host countries, especially FDI, involves risk and uncertainty as well as sizable sunk costs. The only way to recover the initial investment is to operate for a longer period. Hence, the role of the general investment climate is to reduce this risk and uncertainty involved in direct investment. When host countries successfully create conducive investment climate, policy-induced incentives might matter.

2.1 General Investment Climate[3]

Over the past four decades, a macroeconomic environment in Thailand has been conducive for enticing MNC involvement. Inflation on average was around 5.6 % between 1970 and 2007, far lower than the average figure for developing countries (i.e. 24.7%).[4] The

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MNC affiliates.

[3] Since there is no consensus as to the definition of general investment climate (for example, see Dollar et al. 2004) in this chapter it is a catch-all term for various considerations impinging on investment decisions, such as macroeconomic stability, the attitudes of the host country toward foreign enterprise participation, the clarity of rules governing foreign investment.

[4]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

impressive record of domestic price stability has been attributed to the combination of disciplined fiscal and monetary policies and a stable nominal exchange rate. In the past forty years, there were two periods where Thailand experienced fiscal deficits; 1975-87 and 2000-06.[5] Nevertheless, the level of fiscal deficit was below 5% of GDP, which was relatively low, compared with the average level for other developing countries. More importantly, the deficit was mostly financed by public revenue and domestic borrowing, rather than through inflationary means (Jongwanich, 2007).[6] With a considerable degree of policy independence, the Bank of Thailand (BOT) effectively pursued a conservative monetary policy. Inflationary monetary policy, on the other hand, has been remarkably reduced since 1980.

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 in 1997. Except a short period of massive fluctuations in the nominal exchange rate during the onset of the crisis in July 1997, the nominal exchange rate tended to stabilize at around 42–43 baht/$ between 2001 and 2004. From 2005 onwards, Thailand experienced currency appreciation. During the first nine months of 2008 nominal exchange rate were in a range between 31.4 and 34.9 baht/$.

From about the early 1960s, Thailand has always pursued a 'market-friendly' approach towards foreign investors in manufacturing. Foreign business can operate without any significant discrimination between local and foreign entrepreneurs. Foreign investors have been able to involve 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. 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 at 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.[7] According to the Alien Occupation Law, passed in 1973 and amended in

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8.1 per cent in 1998, despite a more than 60 per cent depreciation of the exchange rate.

[5] Data during the 1980s are from Kohpaiboon (2006: Ch 3) and those between 2000 and 2006 are extracted from Key Indicators for Asia and the Pacific 2008 available at www.adb.org/statistics.

[6] Nonetheless, there has been a growing concern of an increase of non-budgetary public spending and public debt for the past five years.

[7] Under the Thai-US Treaty of Amity and Economic Relations signed in 1966, US companies in Thailand

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.

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).

To ensure fair domestic competition, the Competition Act which replaced the anti-monopoly Act of 1979 was enacted in 1999 applies to all types of business operations except those of central, provincial, and local administration; state enterprises under the law on budgetary procedure; group of farmers, co-operatives or co-operative societies recognised by law that their businesses are operated for the benefit of the farmers; and businesses prescribed under the Ministerial Regulation. Under the 1999 Competition Act, a criterion to justify as anti-competition action is based on industrial conduct, such as setting unfair prices for goods and services, setting unfair trading conditions, limiting supply of goods and services, and intervening in other business without proper reasons. Nevertheless, anti-competition cases that have been trialed so far involved with conflicts between Thai conglomerates such as tying sale of whisky and beer, the merger of two cable television companies (OCED, 2001; Nikomborirak, 2005).

2.2 Policy-induced economic incentives

Trade policy has been used as a main instrument to influence resource allocation in the private sectors. 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 Kohpaiboon, 2006 & 2007).

Between 1964 and the late 1980s, a level of tariff rates was high. From about the late 1980s, considerable tariff reductions have been implemented. The simple average applied tariff rate sharply declined from 40 percent between 1985 and 1994 to 23 percent from 1995 to 1996 and 11 percent in 2005-08. A considerable reduction in tariffs has been less likely to entice tariff-hopping FDI inflows. However, a tariff structure in Thailand is cascading in which tariff rates for raw materials and intermediates have usually been lower than those on finished products. 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

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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.

greater than the level of nominal protection on outputs.

Table 1 illustrates nominal and effective rate of protection (ERP) estimates for 2002 and 2003, as well as previous studies' estimates for 1980 and 1985. Note that a comparison of *ERP* across studies must be treated with caution because the *ERP* estimates from different studies have been based on different types of data and different product definitions.[8] Nevertheless, a broad comparison would still provide useful information in understanding the evolution of the protection structure in Thailand. In addition, a rank correlation of *ERP* estimates across studies, rather than a simple correlation, is constructed to provide statistical evidence of changes in inter-industry protection structure over the period.

Three key inferences can be drawn from *ERP* estimation. Firstly, from 1980 to 2003, *ERP* estimates exhibited a downward trend in all industries (Table 1). The simple average of the *ERP* in the manufacturing sector fell from 51.7 per cent in 1980 to 27.8 per cent and 24.4 per cent in 2002 and 2003, respectively. This is in line with the downward trend in nominal protection discussed above. Secondly, the pattern of *ERP* estimates across industries did not change significantly between 1980 and 2003 (Table 1). As a consequence of the cascading tariff structure, *ERP* estimates for finished goods like agro-processing products, textiles, and leather products are likely to be higher than those for intermediate products (e.g. chemical and petroleum products, machinery, metal products). Measured by the coefficient of variation (CV) of ERP estimates, the degree of ERP dispersion seems to be more or less unchanged. The rank correlation coefficients of ERP estimates, which indicate a change in the industry ranking according to the level of protection, are 58 and 49 per cent during the period 1975–2002 and 1975–2003, respectively. Thirdly, any interpretation of ERP estimates of consumer goods and motor vehicles in Table 1 requires caution. The figure represents average protection across a wide range of manufacturing products, covering consumer goods, electrical appliances, auto parts and motor vehicles, some of which were recently subject to low tariffs. For example, *ERP* estimates of electrical appliances were around 9-10 per cent (Table 1). Most auto parts were recently subject to tariff rates of less than 10 per cent (see Kohpaiboon, 2007).

3. Data Issues

Since the following analyses are involved considerably with micro-database, this section discusses issues related to database used in this chapter. Here we use two different data sets, the 1997 industrial census and data on large corporations from Business On-Line (2008). The latter is industry-level dataset for producer concentration analysis whereas the former is plant-level dataset which has been used for analyses of productivity determinants and export performance.

So far the most comprehensive source of plant-level data available is the 1997 industrial census (data for 1996).[9] While there are alternative datasets available (e.g. industrial surveys in 1998 and 2000 by National Statistics Office (NSO) and those in 2001-05 by Office of Industrial Economics (OIE)), their coverage is far shorter than that in the 1997 census. For example, the 2001-04 industrial survey by OIE covered 3,000 plants, accounting around 35 per cent of the estimated manufacturing value added from National Account. Hence, the 1997 census is our

[8] 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 a direct comparison of the industry's *ERP* estimates.

[9] National Statistics Office (NSO) conducted the 2006 industrial census. However, the final outcome has not been published yet (up to September 2008).

preferred choice for productivity determinants and export performance analyses.

The census covers 32,489 plants, belonging to 125 4-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. As has been described in more detail elsewhere (Ramstetter, 2001 and 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 ten key variables of interest in this study, as one record.[10] 12 industries that are either to serve niches in the domestic market (e.g. processing of nuclear fuel-TSIC 2330, manufacture of weapons and ammunition-TSIC 2927), in the service sector (e.g. reproduction of recorded media-TSIC 2230, publishing of recorded media-TSIC 2213, building and repairing of ships-TSIC3512) or explicitly preserved for local enterprises (e.g. tobacco-TSIC 1600, manufacture of articles of fur-TSIC 1820; manufacture of ovens, furnaces and furnace burners-TSIC 2914, manufacture of coke oven products-TSIC 2310, building and repairing of ships-TSIC 3511; railway/tramway locomotives and rolling stock-TSIC 3520, aircraft and spacecraft-TSIC 3530) are excluded. As a consequence, the final dataset contains 8,471 plants (1,684 foreign-owned plants and 6,787 domestic-owned plants) in 113 industries. The coverage of the industrial census estimates reported only 1.8 million workers or 38.8 per cent of corresponding estimates from the labour force surveys. Similarly the gross output and value added reported in the census was only 76.2 and 59.2 per cent of their corresponding estimates in national accounts reported by National Economics and Social Development Board (NESDB).

While the 1997 industrial census provides adequate information for researchers to undertake a systematic plant-level analysis such as productivity determinants and/or export performance, it is quite difficult to estimate industry-level variables like the four-firm concentration ratio and related indicators with two reasons. The first and most importance is that we need to identify large firms or plants in each industry to construct a meaningful concentration ratio. Information provided by the only known official time series on industry output (revenue) comes from national accounts' estimates made by the National Economic and Social Development Board (NESDB) and the only known comprehensive industrial census is for 1996 from the National Statistics Office (NSO). It is only possible for plants in the industrial census for 1996 but this is impossible from official sources for 2006. In order to circumvent this constraint, we use data on large corporations from Business On-Line (2008) (henceforth referred to BOL database), supplemented by a large number of related sources, to estimate sales of the largest firms in each industry. In addition, as our paper emphasize the relationship among producer concentration, foreign presence and firms' performance, during a tumultuous period in Thai economic history, the decade beginning just before the 1997-1998, to a certain extent BOL database allows us to construct the most consistently defined key variables in both 1996 and 2006. Hence, we use BOL database to construct producer concentration and in the analysis of trends, patterns and determinants of producer concentration (Sections 4 and 5).

In principle, the sample of large firms consisted of the largest 15 firms in each industry as identified by Business On-Line (2008). However, cross checks of alternative sources revealed several hundred firms larger than the cutoffs implied by Business On-Line and these firms were thus added to the sample. On the other hand, a few firms included in the Business On-Line

[10] See detail in Ramstetter (2004) footnote 5. In addition, there are the near-duplicate records. A careful treatment to maximize the coverage of the samples is used as described in more detail in Ramstetter (2004: p.9-10).

sample were clearly not engaged in manufacturing and omitted from the sample. Moreover, if two or more majority-owned firms belonging to same corporate group were included in an industry, data for these firms were combined and the combined entity was treated as a single firm. It can be argued that this estimate of producer concentration also greatly overestimates the level of concentration in industries especially for those dominated by small firms relative to those dominated by large firms. Nevertheless, the sensitivity analysis conducted in Kohpaiboon and Ramstetter (2008:17-18; Appendix Tables 4 and 5) suggests that there was not any noticeable effect on trends and patterns of producer concentration.[11]

The original data of BOL database are classified at the 4-digit ISIC disaggregation. They are re-grouped, in which two or more reasonably substitutable goods into an industry. For example, firms in manufacture of tapioca (ISIC 1532) are likely to compete with those in other animal feeds manufacture (ISIC 1533). Treating them as distinguish industries in the analysis of industrial concentration could mislead the outcome. As a consequence, the final sample contains 58 industries, many of which remain at the 4-digit disaggregation level and some of which are at the 3-digit level. The freshly proposed industrial classification here is done to mitigate possible problems arising from the fact that two reasonably substitutable goods are treated as two different industries according to the conventional industrial classification at high level of disaggregation. Such problems are important in measuring producer concentration for market power purpose.

4. Trends and Patterns of Concentration, Foreign Ownership and Export Performance between 1996 and 2006

Table 2 provides estimates of *CR4* for 1996 and 2006. Over the decade, there was a mild increase in concentration. The mean 4-firm concentration ratio for the 58 industries increased from 61 to 65 percent and *CR4* increased in 39 industries but declined in only 17, and was unchanged in 2 (Table 2). Relatively large increases of 15 percentage points or more were observed in 10 industries: 4 in food products (meat, fish, fruit & vegetables, other food) plus footwear, paper, and non-metallic mineral products, radio & TV transmitters, optical & photographic machinery, and jewelry. On the other hand, similarly large declines were observed in only two industries, wood sawmilling and synthetic fibers. Likewise the number of industries experiencing moderate increases in *CR4* of between 10 and 15 per cent (8) was slightly larger than the number of industries experiencing declines of similar magnitude (5). However, the largest group of industries (21) experienced relatively small increases of between 0 and 10 percentage points and another substantial group (10 industries) had similarly small decreases.

As a core in our analysis, Table 2 reports the shares of intra-industry conglomerate members (defined as firms operating in the same industry that are majority-controlled by the same ultimate parent), all foreign firms (defined as firms with 10 per cent or more of their ownership controlled by a single foreign firm or group) majority-foreign firms (firms with foreign ownership shares of 50 per cent or more) and exporting firms. Of these groups, intra-industry conglomerate members were the smallest, accounting for 22 per cent of all large firm revenues in 1996 and 19 per cent in 2006. Conglomerate members were present in 32 of the 58 industries in both years and had moderate shares equal to or exceeding 15 percent of the sales in 24 (1996) or 25 (2006) industries. Conglomerate members had particularly large shares of 50 per cent or more in five industries in both years (meat products, starched & animal feeds, paper,

[11] Simple correlations between large-firm estimates and the NESDB-adjusted estimates were rather high (0.67 for 1996, 0.61 for 2006, and 0.51 for changes between the two years).

non-metallic mineral products, and other transportation machinery), one industry in 1996 only (motor vehicle bodies & trailers), and three in 2006 only (dairy products, glass products, and miscellaneous manufacturing). It is not surprising that some of Thailand's most prominent groups have multiple firms in these industries.[12] However, conglomerate shares were much smaller in most industries, under 30 percent in 44 industries in 1996 and 51 industries in 2006.

Foreign MNCs accounted for a relatively large portion of large-firm sales in both years, i.e. 58 per cent in 1996 and 69 per cent in 2006 (Table 2). A large, albeit declining, portion of the MNCs are majority-owned firms. A share of majority-owned foreign firms increased from 34 per cent in 1996 to 52 per cent in 2006. Two important causes of the increase majority-foreign ownership were (1) the loosening of Thai ownership restrictions after the 1996-1997 crisis and (2) the financial difficulties incurred by local joint venture partners during and after the crisis, which sometimes required the foreign parent either to raise its equity share or see the joint venture go bankrupt. In the analysis of producer concentration we focus on the majority-foreign share because control is an important element.

The trend toward increased shares of majority-foreign MNCs is also observed at the industry level. For example, in 1996 majority-foreign shares were 50 per cent or more in 15 of the 58 industries (Table 2). 11 of these 15 industries were among the 20 machinery industries listed from general purpose machinery to other transportation machinery in Table 3. The observed pattern here is consistent with what argued in Kohpaiboon (2006: Table 1), which examined pattern of MNC presence across industries using the 1997 industrial census. By 2006, the number of industries in which majority-foreign MNCs accounted for half or more of total revenue more than doubled to 29. In 2006, majority-foreign shares were 50 per cent or more in all 20 machinery industries, reflecting the advantages that multi-plant, geographically disbursed production often has in these industries.

Exporters were the largest group and also increased their share of large-firm sales from 63 to 74 per cent in 1996-2006 (Table 2). Moreover, the number of industries in which exporters accounted for 70 per cent or more of total sales rose from 27 to 36 during this period. The group of 20 machinery industries accounted for just under half of the industries (13 in 1996, 14 in 2006) in which exporter shares exceeded the 70 per cent threshold. Exporters also exceeded this threshold in traditional labour intensive export industries such as meat products (chicken), fish products, starches & animal feeds, textiles, spinning, & weaving, knitted fabrics, apparel, footwear, other wood products, and other rubber products, as well as in couple of other industries (synthetic fibers, and non-metallic mineral products).

Table 3 presents shares of conglomerate members, all MNCs, majority-foreign MNCs, and exporters as a portion of top-4 instead of top 15 firms to identify characteristics of dominant firms in industries. It is manufacturing conglomerate members whose shares increased by an average of 12 percentage points in 1996 and 8 percentage points in 2006 (Tables 2, 3). Out of 32 industries in which conglomerate members had positive sales, there are 29 industries in which conglomerate shares of top-4 firm sales were larger than corresponding shares of all

[12] For example, Siam Cement, Thailand's largest conglomerate was dominant in paper and non-metallic mineral products in both years. The Charoen Pokphand Group and the Betagro Groups are two other well-known Thai conglomerates with several firms each in meat products and animal feeds. On the other hand, firms belonging to foreign MNC groups were important in several other industries (e.g., Nestle in dairy products in 2006, Mitsubishi Motors and Nissan in motor vehicle assembly in 1996, Honda in other transportation machinery [motorcycles] in both years, and Unilever in miscellaneous manufacturing in 2006).

large firm sales. Interestingly in 21 industries, their shares of top-4 firms are higher than those of top-15 firms by 10 percentage points or more in each year. Negative differentials were rare (only 3 industries in 1996 and 1 in 2006). In other words, conglomerate members tend to be potential candidates to exercise market power. This is consistent with cases brought to be judged under the Competition Act. All MNCs, majority-foreign MNCs, and exporters also tended to account for disproportionately large shares of top-4 firms, but differences in these two sets of shares were relatively small and inconsistent across industries (Tables 2, 3). MNC shares of top 4 firms were both slightly larger than shares of all large firms in 1996 (by 2-3 percentage points each) but identical or slightly smaller in 2006 (0 to -1 percentage points). For majority-foreign MNCs, shares of top 4 firms were larger than shares of all large firms in 25 industries in 1996 and this number increased to 32 in 2006. A magnitude of share difference in the majority foreign firms group is small, as opposed to conglomerate members. Among exporters, positive differentials were somewhat more common at the industry level (42 vs. 16 in 1996 and 44 vs. 11 in 2006), but relatively large positive differentials (10 percentage points or more) were not that common in this case either (17 industries in 1996, 15 in 2006). The evidence summarized here suggests that conglomerate members, followed by exporters, and majority-foreign MNCs all tended to account for disproportionately large shares of sales by *CR4* firm sales and that this characteristic was most conspicuous for conglomerate members followed by exporters, and least conspicuous for majority-foreign MNCs, especially in 1996.

5. Producer Concentration, Foreign Ownership and Import Protection

As illustrated in Section 4 that MNC affiliates, exporters and conglomerates accounted a considerable share in large firms, the analysis in this section further explores their statistical relationship with producer concentration. Specifically, how and how much do they attribute to changes in producer concentration observed between 1996 and 2006 is examined in this section. The revealed statistic relationship is undertaken while controlling for other relevant determinants of producer concentration such as entry barriers, domestic demand conditions. And then, the analysis is extended to gain better understanding of characteristics of large firms as they are the potential to affect the level of producer concentration.

5.1 Determinants of producer concentration

Our analytical framework employed here follows the dynamic model of producer concentration with incomplete adjustment developed by Levy (1985). While long-run equilibrium producer concentration exists, what we actually observe the level of producer concentration is not necessarily equal to the equilibrium one. In this model, it takes time for the former to reach the latter and how fast to reach the long-run equilibrium largely depends on economic conditions in countries such as scale economies and market growth. The dynamic model was used in a number of empirical studies e.g. Sleuwaegen and Yamawaki (1988); Battacharya (2002); Ramstetter & Phan (2007).

The alternative framework is to estimate equilibrium producer concentration which is a function of entry barriers, industry size, and sometimes international influences (i.e. market orientation, import competition, foreign ownership shares, and trade policy variables).[13] The major shortcoming of this model is an implicit assumption that producer concentration is always at the

[13] The model was used in a number of empirical studies such as Resende (2007) Narjoko (2006), Bird (1999) and Delorme *et.al*., 2002).

equilibrium level. In other words, producer concentration completely and instantaneously adjusts to unexpected changes in market conditions. This assumption is rather restrictive as concentration is determined by the interaction between incumbents and new entrants, and often takes time to evolve because the absorption of adjustment costs takes time (Lieberman, 1999; Schmalensee 2004). This is especially true in cases where entry involves substantial sunk costs (Schmalensee 2004). In addition, in oligopolistic or monopolistic industries, adjustment may be slowed by the dynamic pricing policies of firms or firm groups with short-run market power (Gaskin, 1971, Kamien and Schwartz, 1971). Hence, the dynamic model of producer concentration with incomplete adjustment is our preferred model choice.

The basic specification of the dynamic model of producer concentration is that changes in an industry's producer concentration ratio are a function of entry barriers, i.e. (1) minimum efficient scale for a firm in an industry and (2) the capital requirements of a minimum efficient scale firm in an industry in the initial year, (3) market growth during the period studied (the growth of industry sales during the period), and (4) the level of concentration in the initial year, which reflects the adjustment toward long-run equilibrium (Levy, 1985; Sleuwagen & Yamawaki, 1988).[14] The entry barrier variables are all expected to be positively correlated with changes in concentration, except the coefficient on the initial level of concentration that is expected to be negative to reflect the adjustment process of concentration.[15] Entry barriers are often expected to be higher in slower growing industries, and if this is the case, the market growth variable will be negatively correlated with changes in concentration. However, it may also be possible for large firms to expand relatively rapidly in anticipation of higher growth, and if this is the case, the correlation will be positive correlation.

Four additional explanatory variables are included to the basic specification, namely the share of conglomerate members within each industry, foreign presence, effective rate of protection (ERP) and the product of the protection variable and the foreign ownership variable.[16] Thai conglomerates (*CON*), some of which have numerous firms in one industry, constitute another ownership group of interest here and all members of such intra-industry conglomerates are consolidated and treated as a single observation in our data set. If conglomerates account for a relatively large share of production in an industry, it seems most likely that overall concentration will also tend to be relatively high in that industry because conglomerate groups are likely to be relatively large. However, there are also a large number of industries with no conglomerate presence so the strength of this correlation is not clear *a priori*.

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[14] These studies are also cited in Martin's (2002) standard textbook and included a fifth explanatory variable (the advertising-sales ratio). High research and development expenditures can also act as an important entry barrier (Yang 2007). However, the only estimates of these variables that can be made for Thailand would from the raw data underlying the 1997 industrial census of 1996 data and it is very difficult to match these data with those employed in this study as will be discussed in the following section.

[15] See Levy (1985) and Bhattacharya (2002) that focus on analyses of the adjustment process and the roles of conventional entry barriers. By contrast, Sleuwaegen and Yamawaki (1988) and this study use the model to define relevant controls when investigating the relationships between concentration and tariffs or ownership, for example.

[16] As explained in Jongwanich and Kohpaiboon (2007), the effective rate of protection is the focus of political bargaining in Thailand so the effective rate is thought to be a more appropriate measure of protection than the alternative nominal rate of protection in this case. In addition, the *ERP* series used is the average of calculations for importing-competing and export-oriented industries, weighted by the corresponding export-output ratio. Calculations for import-competing industries assume that all tariff rates are binding while calculations for export-oriented industries are based on the assumption that exporters can utilize input tariff exemption schemes.

The role of foreign ownership (*FOR*) is hypothesized to be another important determinant of producer concentration but the relationship between these two variables is inconclusive. On the one hand, as emphasized by Caves (2007, ch. 4), MNCs will only exist in imperfectly competitive markets and previous results indicate that MNC presence is often positively correlated with producer concentration. However, much of this literature is rather old and focused on developed economies.[17] On the other hand, there is a substantial literature emphasizing that MNCs can stimulate competition and reduce producer concentration. This would partially because MNCs are relatively large and have relatively easy access to resources and markets so that they can sometimes overcome entry barriers and increase competition previously dominated by large local firms. Entry by a particular MNC may also encourage entry by other competitors (MNCs or even local firms) who think they must compete with the entering MNC's move. In Thailand and many other developing economies, MNCs tend to be important sources of technology transfer and spillovers.[18] If this is the case, MNC presence is also likely to have important dynamic impacts on producer concentration as cost structures of firms change in response to the transfers and spillovers, though the nature of these dynamic effects on producer concentration (whether they benefit incumbent large firms more than others or not) is not clear.

High import protection, measured here by effective rate of protection (*ERP*), can be thought of as another entry barrier, which is often erected by a government to protect relatively large, entrenched firms that have successfully lobbied the government for the protection. To the extent that this is true, import protection probably penalizes small or new firms more than large or older firms, and is likely to be positively correlated with concentration. On the other hand, it is also possible that high protection could lead to the proliferation of small firms in an industry and thereby reducing concentration.[19] As with other entry barriers, it probably makes most sense to measure protection at the beginning of the period, but it is only possible to obtain mid-period (2003) estimates in this case. This is not a large problem in the Thai context, however, because the inter-industry distribution of tariffs has not changed much in 1997-2003, though nominal tariff levels did decline some on average (Jongwanich & Kohpaiboon, 2007; World Trade Organization various years). Finally, previous studies also suggest that productivity spillover effects of foreign ownership are related to the level of protection (Kohpaiboon 2006, ch. 6) so it may be important to account for such interactions between foreign ownership and import protection effects when analyzing producer concentration.

While the exact nature of the relationship between these two ownership variables (*CON* and *FOR*) and changes in concentration are not known, the sensitivity analysis conducted in Kohpaiboon & Ramstetter (2008: p.17-18) suggests that the relationship between ownership

[17] For generally older studies of developed economies, see for example, Rosenbluth (1970) Gorecki (1976) and Shapiro (1983) for Canada; Knickerbocker (1976), Levy (1985), Geroski et al. (1987); Dunning (1974), Hart & Clarke (1980) and Fishwick (1982) for Britain; Jenny and Weber (1978) for France; and Dixon (1987) for Australia. For developing economies, older studies cover Malaysia (Lall 1980; Kalirajan 1993), Mexico (Newfarmer and Mueller 1975; Connor 1977, Blömstrom 1986), Chile (de Melo and Urata 1986), Taiwan (Chou 1986), Brazil (Mooney et al. 1980; Willmore 1989), and Guatemala (Willmore 1976), while some more recent studies examine Indonesia (Bird 1999), Malaysia (Bhattacharya 2002), Taiwan (Yang 2007), and Vietnem (Ramstetter and Phan 2007).

[18] See, for example, Athukorala (2007), Khantachai et al. (1987), Kohpaiboon (2006), Ramstetter and Sjöholm (2006), and Santikarn (1981).

[19] Indeed, protection can be designed for the very purpose of promoting smaller firms but governments don't usually design trade protection schemes to do this and Thai import policy seems to be no exception in this respect. On the other hand, Jongwanich & Kohpaiboon (2007) found a positive relationship between protection (either NRP or ERP) and producer concentration in Thai manufacturing, suggesting that protection benefits relatively concentrated industries more than others

shares at the beginning of the period and changes in concentration is more favorable based on the model performance on overall explanatory power.

Therefore, the empirical model is as expressed in equation 1:

$$\Delta CR4_{96-06,i} = \alpha_0 + \alpha_1 AKC_{96,i} + \alpha_2 MES_{96,i} + \alpha_3 GMS_{96-06,i} + \alpha_4 CON_{96,i} + \alpha_5 FOR_{96,i} + \alpha_6 ERP_{03,i} + \alpha_7 FOR_{96,i} \cdot ERP_{03,i} + \alpha_8 CR4_{96,i} \quad (1)$$

where

$\Delta CR4_{96\text{-}06,i}$ = change in *CR4* between 1996 and 2006 (percentage points);

$AKC_{96,i}$ (+) = absolute minimum capital requirements of industry *i*; estimated as the average value of fixed assets for firms accounting for 50 percent of the industry's output (billion baht);

$MES_{96,i}$ (+) = minimum efficient scale; estimated as the average sales of firms accounting for 50 percent of the industry's output (billion baht);

$GMS_{96-06,i}$ (-) = growth of sales for industry *i* (percent);

$CON_{96,i}$ (+) = share of firms belonging to intra-industry conglomerates in the sales of industry *i* in 1996 (percent);

$FOR_{96,i}$ (?) = share of majority-foreign firms in the sales of industry *i* in 1996 (percent);

$ERP_{03,i}$ (?) = effective rate of protection in industry *i* in 2003 (percent);

$FOR_{96,i} \cdot ERP_{03,i}$ (?) = the interaction term between $FOR_{96,i}$ and $ERP_{03,i}$

$CR4_{96,i}$ (-) = Top 4-firm concentration ratio in industry *i* in 1996;

(the expected sign of explanatory variable is in the bracket)

The inter-industry cross-sectional econometric analysis here is based on the BOL database discussed in Section 3. In addition, there are three observations (i.e. synthetic fibers, optical & photographic machinery, and jewelry), which have influential impacts on econometric estimates based on the statistical test, namely Cook's Distance. The models without these observations generally have more explanatory power than those with them as indicated by the higher $\left(R^2\right)$ in the former. Therefore, discussion here is based on the sample without these influential observations.

Table 4 reports results based on Ordinary Least Square Estimation Method with robust standard errors. Results of four columns in Table 4 are to examine the statistical robustness of $FOR_{96,i}$, $ERP_{03,i}$ and their interaction term. Coefficients on $FOR_{96,i}$ and $FOR_{96,i} \cdot ERP_{03,i}$ are positive but never significant at the standard level. It implies they might have been positively related to changes in producer concentration between 1996 and 2006, but the correlations are very weak and probably means little. It is the coefficient corresponding to $ERP_{03,i}$, which is negative and weakly significant whether or not the foreign ownership variable is included. Hence, the following discussion is based on Column 4.3, where $CON_{96,i}$ and $ERP_{03,i}$ are included.

The model's overall significance indicated by F-test statistically passes at the 1 per cent level. The explanatory power of the model $\left(R^2\right)$ is 0.40 which is reasonably high by the standard of cross-sectional analysis. The standard variables in *CR*4 determinant equations such as the initial *CR4* level, absolute minimum capital requirements (*AKC*), are statistically significant at the conventional level with theoretical expected sign. But standard measures of market barriers (*MES*) and market growth (*GMS*) still explain very little if any of the variation in concentration changes between 1996 and 2006 as the coefficients corresponding to them are not significantly different from zero at the conventional statistic level.

Among the key variables in our research interest, only *CON* and *ERP* are statistically significant although the latter's statistical significance is rather marginal. Regard to the share of intra-industry conglomerate members (*CON*), the positive and significant coefficient implies a strong tendency for industries in which conglomerates had relatively large shares in 1996 to experience relatively large increases in concentration during the following decade. Its statistical significance is insensitive to model specification. Food, paper products, non-metalic, footwear and synthetic fibers industries are the example of the positive relationship between changes in *CR*4 and *CON*. Specifically, these industries experienced relatively large increases in concentration (exceeding 15 percentage points). They had conspicuously large conglomerate shares in 1996, i.e. meat products (52 per cent), paper products (52 per cent), non-metallic minerals (74 per cent), fish products (23 per cent), footwear (31 per cent), and synthetic fibers (34 percent). These industries are dominated by some prominent business groups such as the Betagro Group, the Chaoreon Pokphand Foods (CPF) Group, and the Saha Farms Group in meat products; the Siam Cement Group (SCG) in paper and non-metalic industries; Thai Union Group for fish products, Saha Union for footwear industries

The negative coefficient corresponding to *ERP* suggests that industries with high effective protection experienced falling concentration. That is, high protection encourage firms enter to benefit policy-induced economic incentives and thereby reduce concentration.[20] This findings would be in line with expected outcome from the cascading nature of tariff structure in Thailand pursued over the past three decades. Under the cascading structure, finished goods which are relatively labour intensive are subject to higher tariff rates than intermediates and raw materials. Hence, when controlling for entry barriers, initial producer concentration, and Thai conglomerates, the negative relationship between changes in concentration on the one hand, and effective protection on the other hand is revealed. All in all, a share of Thai conglomerates and effective protection play a crucial role in explaining changes in concentration after accounting the role of entry barriers and initial level of concentration.

5.2 Characteristics of the Largest Firms

To strengthen the finding above that Thai conglomerates play an important role in determining changes in concentration observed between 1996 and 2006, another econometric analysis is conducted with emphasis on the statistical relationship of output share of large cooperates and three key variables in the core analysis conglomerates, foreign, and/or exporters after accounting for firm- level variation in the average capital productivity relative to the industry

[20] Indeed, protection can be designed for the very purpose of promoting smaller firms but governments don't usually design trade protection schemes to do this and Thai import policy seems to be no exception in this respect. On the other hand, Jongwanich & Kohpaiboon (2007) found a positive relationship between protection (either NRP or ERP) and producer concentration in Thai manufacturing, suggesting that protection benefits relatively concentrated industries more than others

mean and industry-level variation in producer concentration, as described by the following equation:

$$S_{ijt} = \gamma_0 + \gamma_1 DC_{ijt} + \gamma_2 DF_{ijt} + \gamma_3 DX_{ijt} + \gamma_4 SK_{ijt} + \gamma_5 CR4_{it} + \gamma_6 D2_{ijt} \qquad (2)$$

where

S_{ijt} = firm *j*'s share industry i's sales in year t (percent);
DC_{ijt} = a dummy variable equal to 1 if firm *j* in industry *i* belongs to a conglomerate with more than one firm in industry *i* for year t; equal to 0 for all other firms;
DF_{ijt} = a dummy variable equal to 1 if firm *j* in industry *i* is majority-foreign owned (50-100%) in year t; equal to 0 for all other firms;
DX_{ijt} = a dummy variable equal to 1 if firm *j* in industry *i* is an exporter in year t; equal to 0 for all other firms;
SK_{ijt} = the sales-fixed assets ratio of firm *j* in industry *i* in year t divided by the mean sales-fixed assets ratio for industry *i* in year t (ratio);
$CR4_{it}$ = 4-firm concentration ratio in industry *i* in year t;
$D2_{ijt}$ = a dummy variable equal to 1 if the observation is for 2006; equal to 0 for all other observations (only relevant in samples containing observations from 2 years).

The specification in equation (2) is clearly *ad hoc* because it omits other important variables that can determine the variation of firms' shares of their industry or market sales.[21] However, estimates of equation (2) are still thought to be useful for investigating the nature and the strength of relationships between ownership and export characteristics on the one hand, and market shares of the largest firms, on the other. For example, if γ_2 is positive, it would suggest that majority-foreign MNCs tend to have relatively large market shares than the control group (i.e. firms that are not conglomerate members or exporters), even after accounting for firm-level variation in capital productivity and industry-level variation in producer concentration. Then if γ_2 is also statistically significant, it would suggest that the correlation between foreign ownership and market share is relatively strong in the sample. Interpretations of γ_1 and γ_3 are similar with regard to relationships between conglomerate membership or export status, on the one hand, and market share on the other.

Our key interest here is to understand characteristics of firms with significant market power defined as those having market share of 15 per cent or more. Clearly, 15 per cent criterion is arbitrarily chosen. To ensure our result robust as much as possible, two alternative criteria are used. First, we alter the criterion to be 10 instead of 15 per cent. Second, Equation 2 is estimated in the whole sample of large firms (all top 15 firms). As a result, we find that a 15 per cent threshold provides the most plausible distinction between firms that are large enough to potentially exercise market power and smaller firms, which generally have no market power to exercise (Kohpaiboon & Ramstetter, 2008).

These groups are then further divided into a subgroups meeting respective sample criteria in both years (incumbents) and a subgroup meeting the criteria in only one year. If they meet only in 1996, they are referred to as exiting firms. New entrants are firms whose market shares meet the criteria in 2006. Results for the subgroup of incumbent firms differ greatly from results for

[21] These variables include other measures of firm productivity and proxies for the extent to which non-price competition is used (i.e. advertising expenditure; Mixon and Hsing, 1997).

the subgroup of exiting firms or new entrants that exceeded the threshold size in only one of the two years. Correspondingly, it is probably inappropriate to pool these subgroups. Besides, results for each group also differ markedly between the 1996 and 2006 and each year results are reported separately,[22]

Table 5 reports the OLS estimates of Equation 2 above. Coefficients on the control for industry-level concentration are positive as would be expected except the exiting firm in 1996. Its statistic significance is insensitive to the criteria employed (15%, 10%, and all large firms samples). Given the possibility of presence of simultaneity problem, the positive and significant coefficient implies that it is likely industries experiencing high level of producer concentration would consist of large firms whose market share equals or exceeds 15 per cent. The positive relationship between market share of large firms and average capital productivity is weaker as opposed to that with producer concentration. It is significant in only some subgroups and sensitive to the criteria employed. To a certain extent, the coefficient corresponding to average capital productivity implies that large firms with a higher level of average capital productivity tend to have higher market share.

Among three variables in the core analysis, it is only the dummy for members of intra-industry conglomerates whose coefficient was positive and statistically significant in almost all subsamples. By contrast, coefficients on the dummies for MNCs and exporters were positive for some subsamples, i.e. incumbents and new entrants. More importantly, coefficients corresponding to the dummy for incumbent conglomerate members were relatively large (6.7 in 1996 and 5.1 in 2006) as opposed of those to MNCs and exporters(a maximum of 4.6 percentage points for incumbent MNCs in 2006). Thus, there is some indication that among incumbent firms, market shares of conglomerate firms were on average 5.1-6.7 percentage points higher than in those of the control group (firms that are neither MNCs, exporters, nor members of intra-industry conglomerates). Similarly, MNCs and exporters usually had larger market shares than the control group only among incumbents and new entrants. All in all, the inter-industry cross-sectional analysis revealed the positive relationship between conglomerate firms, MNCs and exporters, on the one hand and firms' market shares on the other hand. Nevertheless, the statistic relationship is far stronger in the case of conglomerate firms.

6. Plant productivity, Producer Concentration and MNC Presence

This section is to examine impact of producer concentration and presence of MNCs on plants' productivity. Specifically, two main questions are raised in this section. Firstly, whether MNC affiliates have higher productivity than locally non-affiliated firms, and whether firms in a highly concentrated industry experience higher productivity than those in a less concentrated one. Secondly, whether MNCs can generate technology spillover to host countries. Even though productivity improvement decision seems to be firm-specific, it can be affected by industry-specific factors such as producer concentration and MNC presence. This is due to the fact that an individual firm must commit resources to a long-term, incremental and cumulative effort to substantially gain productivity (Bell ***et al.***, 1984; Eveson & Westphal, 1995). It is true even in the imitative type of productivity-enhancing activities. To a large extent, they involve risk and uncertainty.

Even though these are two separate international aspects of productivity determinants, it is

[22] Regressions combining the two groups and/or the two years are available from the authors but are not thought to be very meaningful as described in the text.

necessary to bring them together as they are not mutually exclusive. The fact is what attributes to presence of entry barriers and high degree of producer concentration is linked to the reasons why MNEs exist in the first place (Caves, 2007). Specifically, the key factor driving a firm to transplant its activities abroad relates to having firms' proprietary technology, which is typically generated in industries with relatively high cost-related barriers to entry. As a consequence, the high degree of foreign presence is frequently found in a highly concentrated industry as suggested by the empirical studies and also observed in Section 2 in this chapter.[23] Hence, we combine them together in our empirical analysis.

6.1 Analytical Framework

6.1.1 Impact of Producer concentration

Because of its visible measurement, producer concentration is often used by policy makers to signal the intensity of product market competition and justify any action in preventing any possibly anti-competitive behaviors. Nonetheless, its net impact on plant productivity is ambiguous. Pioneered by Schumpeter (1942), on the one hand, productivity-enhancing activities typically involve large fixed and irrecoverable upon exit. They are also subject to a large degree of risk and uncertainty. Therefore, the expectation of some forms of transient *ex post* market power is required for firms to undertake such activities. This is especially true in the context of developing countries whose domestic market is limited (Roberts & Tybout, 1996). This link between producer concentration and productivity can be related to the Structure-Conduct-Performance Paradigm in the field of industrial organization (IO) as indicated by the relation between producer concentration and firm's profitability. Despite unclear whether to interpret high accounting profits as a sign of good or bad performance of a market, to a large extent, high accounting profit is often regarded as a sign of market power and could also be a result of high efficiency of firms.

Nonetheless, the expected positive relation between producer concentration and productivity-enhancing activities has not been supported in the empirical study.[24] Several sensible explanations for the unfound positive relationship are provided. Firstly, Schumpeter's proposition had never claimed a continuous relationship between productivity and firm size. What Schumpeter focused on is said to be the qualitative differences between small, entrepreneurial enterprises and large, modern corporations in their innovative activities (Cohen & Levin, 1989). Secondly, when productivity enhancing activities occur in step-by-step manner, competition between firms is needed for them to carry on such activities (Aghion & Howitt, 1998, Aghion *et al.* 1999).[25] This is different from a simple model of creative destruction where the incumbent firm unlike the new entrant has no incentives to innovate because productivity enhancing activities occur in once-and-for-all manner (i.e. poison process). Once the incumbent firm discovers, it will maximize benefit to cover its cost. Economic rent will disappear when there is new invention by the new entrant. In addition, the competition could also mitigate principal-agent problems occurring in the organization (Nickel *et al.* 1997). Thirdly, productivity-enhancing activities undertaken in a large firm can be affected by presence of scale diseconomies referred to as the bureaucratization of inventive activity (a′la in Cohen & Levin, 1989), in which benefits

[23] See Caves (2007) and works cited therein.
[24] See Symeonidis (1996) and Ahn (2002) and works cited therein.
[25] This is different from what proposed in a simple model of creative destruction. The incumbent firm unlike the new entrant has no incentives to innovate because productivity enhancing activities occur in once-and-for-all manner. Once the incumbent firm discovers, it will maximize benefit to cover its cost. Economic rent will disappear when there is new invention by the new entrant.

derived from these activities could be undermined through loss of managerial control. In addition, the incentives of individual scientists and entrepreneurs become weaken as their ability to capture the benefits from their effort diminishes.

In addition, a major weakness of producer concentration in measuring the degree of product market competition is inability to capture dynamic aspects of competition especially from import (i.e. market contestability). Given the level of producer concentration, its impact on plant productivity could be different according to the degree of market competition. In the competitive environment, the less productive firms tend to be weeded out so a highly concentrated industry structure would be more conducive for firms to continue their innovative activities. By contrast, in absence of significant market competition, economic rents generated as a result of highly producer concentration are likely to be captured by its managers (and workers) in the form of managerial slack or lack of efforts. All in all, this suggests that the impact of producer concentration tends to be conditioned by the degree of market competition.

6.1.2 Presence of MNCs

MNCs and their entry can positively affect productivity of local firms in investment-receiving (host) countries as they are now widely regarded as the principle bearers of technology across international borders. As a consequence, their direct investment brings in not only capital but also production technology, managerial skills, international marketing channels and so on to host countries (Sjöholm, 1997; Borensztein *et al.*, 1998; Lipsey, 2000; Vernon, 2000). Hence, their entry would be equivalent to adding high productive firms and eventually affect the overall productivity in host countries. As suggested in a number of empirical studies[26], nonetheless, potential gains discussed above do not always exist, depending on type of FDI inflows (e.g. efficiency and/or market seeking), economic and policy environments in host countries.

Over and above, associated advance technology MNC affiliates bring it with them could generate a considerable positive externality in terms of productivity benefit to the local firm because technology is partially a public good. The latter is referred to as FDI technology spillover (Blomström & Kokko, 1998).[27] Of all the gains from FDI, it is often argued that spillover is the most desirable benefit. As suggested in the recent survey by Görg& Greenaway (2004) and Crespo & Fontoura (2007), positive technology spillover has not been found in several countries. Two factors are highlighted in the literature of FDI technology spillover as the key determinant, namely absorptive capability and trade policy regime. Whether a local firm benefits from MNC presence depends on its capacity for assimilating knowledge-absorptive capability. The higher the absorptive capability, the greater the spillover the local firm in the host country can expect. On the other hand, as pioneered by Bhagwaiti (1973) as an extension to his theory of immiserizing growth and further developed by Bhagwati (1985, 1994); Brecher & Diaz-Alejandro (1977); and Brecher & Findlay (1983), technology spillover tends to be smaller, or

[26] See the comprehensive survey in Görg & Greenaway (2004) and Crespo & Fontoura (2007)

[27] There are at least four channels where FDI technology spillover can take place. Firstly, the spillover occurs through subcontracting and other direct relationship between MNCs and local firms. It can happen when employees of foreign affiliates move on to local employers or set up their own business, using knowledge learned during their previous employment (i.e. labour mobility). In addition, the presence of foreign firms can have a demonstration effect that allows local firms to become familiar with superior technologies including marketing and managerial practices used in foreign affiliates. Local firms can imitate and/or adapt 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.

possibly even negative, under a restrictive, import substitution (IS) regime compared with a liberalizing, export promotion (EP) regime (referred to as the 'Bhagwati's hypothesis'). FDI inflows enticed by import substitution (IS) trade regime tend to be market-seeking and are invested mostly in the industries where proprietary assets are important. This creates barriers to entry for local firms and thus constrains technology and efficiency spillovers. In contrast, the export promotion (EP) regime is more conducive to generating favorable spillover effects because, under such a regime, FDI is mostly attracted to industries in which the country has comparative advantage, i.e. efficiency-seeking FDI. In such industries local firms have a greater potential to catch up with foreign firms and achieve productivity improvement.

6.2 Empirical Analysis

By nature, there are a number of factors affecting plant productivity, some of which are firm-specific ones such as age, type of technology (i.e. capital-labour ratio), quality of workers (a portion of skilled to total workers). Hence in order to reveal true relationship between producer concentration and MNC presence on the one hand and plant productivity on the other hand, other key determinants of plant productivity must be properly controlled. In our study, the empirical model is based on production function in which output is a function of several types of inputs including technology progress. It is technology progress through which other firm-and industry-specific factors can affect plant productivity.

Our preferred choice of production function is translog because it is free from restrictions imposed as in the widely-used Cobb Douglas production, i.e. unity of elasticity of substitution and log-linear relationship between inputs and outputs. In the translog production function, output is a function of three types of inputs, i.e. capital, two types of labour (i.e. unskilled and skilled workers). The latter is done to allow possibly different effect of each type of workers. In this setting, we allow non-linear relationship between input and output reflecting in the squared term in the production function (e.g. the positive effect unskilled labour on output might be decreasing as a number of unskilled labour increase) as well as the interaction effect of two inputs on output measured in the product between two inputs (e.g. the positive effect of skilled labor might be positively related to the level of physical capital employed in the plant).

To examine determinants of plant productivity, two firm-specific and three industry-specific factors are added in the production function as they are likely to affect plant productivity. The two firm-specific factors are foreign ownership (*OWN*), i.e. whether a plant is owned by foreign investors, and market orientation (*MKT*), i.e. whether a plant production is for exports. The justification of including *OWN* is clearly discussed above whereas *MKT* is suggested by the literature of export-productivity nexus that exporters are found to have higher productivity than non-exporters after controlling for observed plant characteristics (Wagner, 2007: 66). Hence, the nature of market orientation is included in the plant productivity equation with the theoretical expected positive sign.

As in the core hypothesis in this volume, producer concentration (*CR4*) included in the production function. Another two industry-specific factors are import protection measured by ERP and growth performance of domestic market (*GMS*). The effect of import protection on plant productivity has been long recognized in numerous previous studies (e.g. Corden, 1974: Hart, 1983; Martin & Page, 1983; Scharfstein, 1988; Rodrik, 1991). While protection can create economic rents that can be used for productivity improving activities, in practice this could run the opposite. By insulting firms from foreign competition, high protection tends to induce producers to become 'unresponsive' to improved technological capability as well as requests for improvement in the quality and price of what they offer (de Melo and Urata, 1986; Moran, 2001).

This in turn results in a general deterioration of technological and management skills. Hence, the sign of trade protection is theoretically ambiguous.

Growth prospect of an industry (*GMS*) is included because the nature of productivity improving activities incurs considerable fixed costs, most of which are irrecoverable, i.e. sunk costs. A large volume of domestic market sales over which to spread the fixed cost of innovation are needed. Hence, in this study, the industry's growth prospect is proxied by annual growth of gross output. The higher the annual growth the more the likelihood firms commit resources to productivity enhancing activities.

Over and above, as argued above, the impact of producer concentration (*CR*4) on plant productivity is conditioned by the degree of domestic competition (*ERP*). An interaction term between producer concentration and trade policy regime variable is introduced in determining plant productivity with the negative expected sign.

All in all, the empirical model to examine the impact of producer concentration and MNC presence on plant productivity is specified as equation (3);

$$\begin{aligned}\ln Y_{ij} = {} & \beta_0 + \beta_1 \ln K_{ij} + \beta_2 \ln PL_{ij} + \beta_3 \ln NL_{ij} + \beta_4 \ln K_{ij} \ln PL_{ij} + \beta_5 \ln K_{ij} \ln NL_{ij} + \beta_6 \left(\ln NL_{ij}\right)^2 \\ & + \beta_7 \left(\ln PL_{ij}\right)^2 + \beta_8 \left(\ln K_{ij}\right)^2 + \beta_9 CR4_j + \beta_{10} ERP_j + \beta_{11} CR4_j * ERP_j \\ & + \beta_{12} GMS_j + \beta_{13} OWN_{ij} + \beta_{14} AGE_{ij} + \beta_{15} MKT_{ij} + \varepsilon_{ij}\end{aligned} \qquad (3)$$

where

$\ln Y_{ij}$		= Value added of plant *i* in industry *j* (in natural log)
$\ln PL_{ij}$		= Number of production workers of plant *i* in industry *j* (in natural log)
$\ln NL_{ij}$		= Number of non-production workers of plant *i* in industry *j* (in natural log)
$\ln K_{ij}$		= Fixed assets of plant *i* in industry *j* (in natural log)
$CR4_i$	(+/-)	= Producer concentration of industry *j* (in natural log)
ERP_j	(-)	= Effective rate of protection (in natural log)
OWN_{ij}	(+)	= Foreign ownership dummy variable of plant *i* in industry *j*, which equals to one for foreign plants and zero otherwise.
AGE_{ij}	(+)	= years of operations (in natural log)
MKT_{ij}	(+)	= market orientation dummy variable of plant *i* in industry *j*, which equals to 1 for exporting plants and zero otherwise.
GMS_j	(+)	= Annual growth rate of gross output of industry *j* (in natural log)
$CR4_j * ERP_j$	(-)	= the interaction between $CR4_i$ and ERP_j
ε_{ij}		= A stochastic error term, representing the omitted other influences.
	(the expected sign of explanatory variable is in the bracket)	

Equation 3 is slightly modified to examine presence of MNC technology spillover. By definition, MNC technology spillover occurs when locally owned plants in an industry with a higher foreign

share exhibit higher labour productivity than those with a lower foreign share. Hence, the sample to examine MNC technology spillover must include only locally-owned firms. Hence, *OWN* variable in Equation 3 is replaced by foreign presence (*FOR*), i.e. the output share of foreign plants in total industry.[28] As mentioned above, MNC technology spillover is conditioned by absorptive capability and trade policy regime so that two interaction terms are introduced. Absorptive capability of the local plant is measured by the ratio of supervisory and management workers to total employment (*QL*) as supervisory and management workers are regarded as skilled labor. The higher the ratio, the higher the labor quality. An expected sign of the corresponding coefficient is positive. The interaction with ERP is to examine the 'Bhagwati hypothesis'. The higher the level of protection, the less the MNC technology spillover so that the negative sign of the interaction term is expected.

All in all, the estimating equation of FDI technology spillover is as follows;

$$\begin{aligned}\ln Y_{ij} = {} & \gamma_0 + \gamma_1 \ln K_i + \gamma_2 \ln PL_i + \gamma_3 \ln NL_i + \gamma_4 \ln K_i \ln PL_i + \gamma_5 \ln K_i \ln NL_i + \gamma_6 \left(\ln NL_i\right)^2 \\ & + \gamma_7 \left(\ln PL_i\right)^2 + \gamma_8 \left(\ln K_i\right)^2 + \gamma_9 CR4_j + \gamma_{10} ERP_j + \gamma_{11} CR4_j * ERP_j + \gamma_{12} GMS_j + \gamma_{13} FOR_j \\ & + \gamma_{14} ERP_j * FOR_j + \gamma_{15} QL_{ij} * FOR_j + \gamma_{16} AGE_{ij} + \gamma_{17} MKT_{ij} + \gamma_{18} BOI_{ij} + \mu_{ij}\end{aligned} \quad (5)$$

where

FOR_j	(+/-)	= Foreign presence measured by output share of foreign plants to total sales.
QL_{ij}	(+)	= Quality of labour measured by the ratio of supervisory and management workers to total employment
$ERP_j * FOR_j$	(-)	= the interaction between FOR_j and ERP_j
$QL_{ij} * FOR_j$	(-)	= the interaction between FOR_j and QL_{ij}
μ_{ij}		= A stochastic error term, representing the omitted other influences.
		Other variables are the same as in equation (4)

To estimate the foreign presence, the ratio of sales of foreign plants to total sales (local and foreign) is measured. All plants with FDI (regardless of the magnitude of the foreign share in capital stock) are considered to be foreign plants for the identification of local plants. The cutting point (i.e. zero per cent) seems to be slightly higher than what is widely used 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 (IMF, 1993; Lipsey, 2001), i.e. 10 per cent. However, the choice is dictated by data availability. Information of foreign ownership is reported with a wide range, i.e. zero, less than 50, greater 50 and 100 per cent foreign shares. Value added is

[28] In some previous empirical studies, employment or capital shares have been used to measure the foreign presence. Expressing the 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.[7] 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. The capital share would not be a good proxy for the foreign presence in a country as in Thailand where there was a foreign ownership restriction. Hence, the output share is the preferred proxy (Kohpaiboon, 2006).

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.

For measuring labor 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. The other information related to plant-specific variables (i.e. *OWN* and *AGE*,) are reported in the census.

The nature of market orientation is measured by a binary dummy variable. Firms exporting regardless the extent to which they export are treated as exporting firms and the dummy variable is assigned to be one. Otherwise is zero. Information about the firm's market orientation in the census is reported in five wide ranges; no exports, less than 50, 50, less than 100 and 100 per cent exports. Hence, the choice of cut-off point is dictated by data availability.

Data on ERP estimates are from Jongwanich & Kohpaiboon (2007). They reflect the protection structure in 1997. Even though 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. Since ERP is based on the input-output (IO) industrial classifications, the official concordance is used to convert them into 4-digit TSIC. Since a number of industries in the IO industrial classification are far lower than those in the 4-digit TSIC, it is likely that there is not one-to-one matching in the concordance. In cases where an item of TSIC belongs to more than one IO item and vice versa, ERP in the latter is averaged with value added as a weight.

To construct GMS_j, gross output data on 4-digit TSIC industries are obtained from National Economics and Social Development Board (NESDB). The official data series are available in both Revisions 2 and 3 with the different time span. The former includes the early 1980s up to 1996 whereas the latter is available between 1995 and 2005. Since introduction of GMS_j in the model to capture medium- to long-term demand conditions, the annual real growth rate is based on TSIC revision 2 and then the official concordance is applied to converting them to TSIC Revision 3. Nevertheless, there are many cases where TSIC revisions 2 and 3 are not perfectly matched. The gross output weighted average is applied.

As argued above, measuring producer concentration would not be based on the high level of industry disaggregation like the 4-digit ISIC classification where it is possible that two or more reasonably substitutable goods are classified as distinguish industries. Hence, CR4 used here is the 1996 estimates from BOL database as we employed in Sections 4 and 5.

6.3 Results

An empirical model of the productivity determinant is estimated using the ordinary least squares (OLS) method. The final results are based on the sample in which statistic outliers are

excluded.[29] As raised in Cohen & Levin (1989), studies of the firm size-innovative activity relationship need to control for industry effects at a high level of aggregation, e.g. 2-digit level, especially when using a sample covering many industries. It becomes even more important for those undertaken in the context of developing countries where large firms are likely to be diversified and operate in more than one industry.[30] To mitigate such potential problems, 14 industry dummy variables at the 2 digit ISIC industry classification are introduced, over and above the three industry-specific factors included so far (i.e. producer concentration, protection, and output growth). To a large extent, the results with and without the industry dummies are resilient, indicating that the three industry-specific factors (i.e. the nature of market orientation, age and government promotion) introduced seem adequate to take into consideration any industry characteristics. Hence, the following regression analyses will cover the sample without outliers and industry dummies.

To estimate MNC productivity spillover model, the same statistical procedure is pursued with a minor modification. Specifically, one criticism of the cross-sectional econometric analysis of MNC productivity spillover is that the regression might be affected by the simultaneity problem so that the relationship between foreign presence and plant productivity might not be appropriately interpreted as the spillover. To guard against this criticism, the instrumental variable estimation (IV) instead of OLS method is used.

Table 6 reports estimates of key variables in our interest, i.e. MKT_{ij} , OWN_{ij} ,, $CR4_i$, ERP_j as well as MNC productivity spillover. In the productivity determinant equation where the sample includes both locally non-affiliated and MNC affiliated plants, the positive and statistic significance of MKT_{ij} suggests that exporters tend to exhibit a higher level of productivity than non-exporting ones. Value added of exporters are higher than that of non-exporting firms by 4.4 per cent. Regard to OWN_{ij} , its corresponding coefficient is positive and statistically significant at 1 per cent. This supports the proposition that foreign plants tend to be more productive than locally non-affiliated ones. All other things being equal, the former tends to have higher value added than the latter by 18.7 per cent.

Interestingly, when the whole sample is truncated to individual industry at the two-digit TSIC classification level, there are only 5 out of 14 industries whose ownership coefficient is positive and statistically significant at the conventional level (i.e. 5 percent) (Table 7). They are textiles, non-metallic products, metal products, general machinery and chemical.[31] The similar findings are also found in Ramstetter (2006). Noticeably, these five industries share three common characters, i.e. high degree of capital intensity, high protection in the mid 1990s, and the relative importance of proprietary assets in determining competitiveness. In addition, these proprietary assets are owned by a handful of MNCs. In this circumstance, MNCs were likely to be enticed by the highly protected domestic market and it is more difficult for the local firm to learn the advanced technology. Instead the highly protected domestic market might encourage the local firm to produce products not directly competitive with those being produced by the foreign affiliate and to enjoy economic rents induced by the regime. Kokko (1994) refers to this as a situation where the foreign affiliate in such an industry may operate in 'enclaves' in isolation

[29] There are around 500 observations detected by Cook's Distance as outliers. Including these observations would have major effects on the level of significance instead of ERP. See Appendix 3 for full OLS estimate reports.

[30] The conglomerate nature of large firms is very prominent in Southeast Asian economies (Studwell, 2007).

[31] Regression results of 14 industries are reported in Appendix.

from the local firm. They are producing totally different products and employ different production technology, indicated by the statistical significance of ownership variable.

By contrast, the other nine industries (foods, clothing, footwear, jewelry, plastics, electronics, rubber, and furniture) are in line with the country's comparative advantage and are the major export items in Thai manufacturing. Even though some of them such as canned tuna, frozen shrimp, clothing, were subject to high tariff rates during the mid 1990s, they were unlikely to discourage export because exporters can mitigate the negative effect of high tariffs by applying for various tariff exemptions/rebates.[32] The statistical insignificance of *OWN* variable in these nine industries would result from an indifference in production technology between foreign and local plants. Otherwise, poorer performance firms must leave the industry.

Coefficients corresponding to $CR4_i$ and $CR4_j * ERP_j$ are statistically significant in productivity determinants equation only. The negative coefficient of *CR4*ERP* associated with the positive coefficient of *CR4* suggests that while plants operating in higher concentrated industries has a potential to experience higher value added. Nevertheless, whether a plant can materialize such a potential depend on the degree of market competition from abroad. That is, tariff reduction must reach a certain level (i.e. ERP less than 51) before the potential positive impact of producer concentration on productivity is observed. Even though the coefficient of *ERP* turns out to be positive but insignificant, their negative and significant coefficient of the interaction term suggests that insulting firms from foreign competition is not sufficient to promote plant productivity improvement. In a highly concentrated industry, high protection tends to induce producers to become 'unresponsive' to improved technological capability and retard productivity growth.

When MNC affiliates are excluded from the sample, value added of locally non-affiliated plants in industries with higher MNC shares are not always higher. In other words, MNC technology spillover does not always exist, but conditioning on the level of import protection. Locally non-affiliated plants operating in a low import protection sector are likely to have higher value added than those in a high import protection. The negative coefficient associated to $QL_{ij} * FOR_j$ indicates that locally non-affiliated plants with higher non-production workers tend to gain higher benefit from MNC presence. Among locally non-affiliated plants, exporters have higher value added than those which sell their products domestically. In the context of developing countries where the local firm largely engages in imitative, MNC presence as a key channel to access advance technology, firms' absorptive capability, and policy-induced incentive are far more important than producer concentration. After taking into consideration these factors, the impact of producer concentration becomes negligible. Hence, coefficients corresponding to $CR4_j$ and its interaction with ERP_j are not significantly different from zero at the conventional level.

7. Export performance, Foreign Ownership and Producer Concentration

This section focuses on export performance at the plant level. This is very important as governments in developing countries now recognize the important role of export in the development process. Exports are usually considered as firm's enhancing productivity since exporting firms must improve their production efficiency to incur higher trade barriers and face different consumer tastes and tougher competition in international market. In addition, exporting

[32] See evidence of unbinding tariffs in processed foods and clothing industries in Kohpaiboon (2006; 2008), respectively.

makes firms aware of potential innovations taking place aboard and they may assimilate these in order to improve their position in foreign market (Barrios *et.al*., 2003; Greenaway and Kneller, 2007). This would encourage firms to acquire and improve the appropriate knowledge and technological capability. As a result, a rapid export growth could promote economic growth through multiplier mechanism as well as enhance productivity that is a key factor in determining long-term growth sustainability. While the growth-enhancing role of export is widely recognized, why only some firms can export in a given industry remains puzzle and is essential for empirical analysis (Wagner, 2007; Greenaway & Kneller, 2007). In particular, does foreign presence and market structure (producer concentration) play a crucial role in determining the likelihood of firm to export?

7.1 Analytical Framework

Entering a foreign market is not costless but incurs considerable sunk costs to firms which must be written off whether the firm decides to export or not (Clerides *et.a*l 1998; Wagner, 2007; Greenaway & Kneller, 2007). Firms must acquire information on different consumer preferences, distribution channels, marketing. Moreover, it is necessary to identify the main competitors and to learn about the foreign institutional framework. Firms are likely to have different ability to acquire such information. Hence, entry cost could vary from firm to firm, depending on certain firm characteristics. Similar to plant productivity, a number of industry characteristics would also influence such decision. Therefore, whether firms decide to export depends on both firm- and industry-specific factors.

Both producer concentration and MNC presence could by theory have affect firms' decision. All other things being equal, firms operating in highly concentrated industries are likely to sell their products domestically as they can enjoy market power. Hence, we would expect the negative effect of producer concentration on export decision. However as argued by White (1974) and Utton and Morgan (1983), the effect of producer concentration tends to be conditioned by the degree of cross-border protection. In presence of high import protection, firms are able to isolate domestic markets from the world and then charge higher prices in the former. That is domestic prices are equal to world prices plus tariff whereas firms also export at the world price and earn normal profit. In other words, firm can do price discrimination between the domestic and foreign market under the situation of cross-border protection so that it is possible to observe the positive relationship between producer concentration and export performance.

MNC presence is another crucial factor influencing firms' export decision. By definition, MNCs have an international network and are not only familiar with its home country but also have information on other markets. Hence, they can benefit from network economies and know-how of managing the international marketing, distribution and servicing of their products. In addition, they undertake a large proportion of the world's total R&D and are principle bearers of technology across international borders (Borensztein *et al*., 1998; Sjoholm, 1997; Lipsey, 2000; Vernon, 2000; Greenaway *et.al*., 2004). With the above advantage, one would therefore expect that MNC affiliates would be in a better position to overcome fixed costs induced by the export and have higher chance to successfully export. In addition, MNC presence could indirectly promote locally non-affiliated firms to export. This could occur in several ways. For example, domestic firms can observe and learn from the export activities of MNC affiliates operating in the host country through information externalities (Aitken *et.al*., 1997; Greenaway *et.al*., 2004). As pointed out, before exporting, firms must gain intelligence on consumers' tastes, market structure, competitors and regulations. Since such information has certain public good qualities, which cannot be fully internalized, this information acquired in MNC affiliates could, to a certain

extent, spill over to domestic firms so that the latter face lower sunk costs associated with export market entry and participate more in foreign markets. Another example, co-location of foreign and domestic firms may improve information about foreign tastes and markets, or lead to improvements in the domestic infrastructure necessary to provide access to foreign market or provide channel through which products are distributed. MNCs can also be another source of information – not directly related to exporting, i.e. technologies and management techniques – from which domestically-owned firms can benefit through processes of demonstration and imitation. This includes providing new technologies and management techniques. Subsidiaries tend to have more advanced production technology than local firms.

Over and above, MNC affiliates could increase the level of competition, force domestic firms to become more productive and therefore allow them to start exporting. This is particularly the case where MNCs invest in sectors with higher barrier to entry or with more oligopolistic market structure (Greenaway *et.al*., 2004). Increased competition in the domestic market may also be responsible for reinforcing the imitation (or demonstration) effect, as it constitutes an incentive to engage in more efficient and learner production techniques, which in turn facilitates entry into foreign markets. The indirect effect of multinational firms to domestically-owned firms on export decision is generally referred to MNC export spillovers.

However, the positive effect of MNC presence can be conditioned by the nature of trade policy regime. Restricted trade policy regime could entice MNCs to produce and sell in domestic markets (i.e. market-seeking FDI) (Moran, 2001; 2006). Hence, we would expect the overall effect on host countries' export less. In addition, trade policy regime influences the cost effectiveness in the learning activities of the local firms. That is every effort to enhance the technological capability of the local firm is more costly in any industry where the trade policy regime is more restrictive because much of the FDI flowing to an industry with high trade restrictions often enters relatively capital- and skill-intensive products where output is mainly supplied for highly protected domestic market. Although the production technology associated with FDI is typically older and less advanced than used in the MNCs' home country, it is often relatively capital- and skill-intensive compared to those employed by the local firms. In this environment, it is more difficult for the local firm to learn the advanced technology. Instead, the highly protected domestic market might encourage the local firm to produce products not directly competitive with those being produced by the foreign affiliate and to enjoy economic rents induced by the regime.

By contrast, a high level of policy neutrality results in a higher likelihood for MNCs to become involved with the host country's production to serve their strategy for maintaining a competitive position in international markets (i.e. efficiency-seeking FDI). With this motivation, the associated advanced technology will be cutting edge and will make use of the existing resource endowments in the host country. 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 (Moran, 2001; Kohpaiboon 2006).

7.2 Empirical Model

Although there is an extensive theoretical literature on the determinants of trade at an aggregate level, it is only recently that attention has turned to the determinants of exports at the firm level. Hence, in this chapter, we follow general practice in previous empirical studies that firms' export decision depend on firm- and industry-specific factors in addition to ownership, producer concentration and trade policy regime.

As in our core analysis, firm ownership (*Own*) is included in the model to examine whether MNC affiliates are more likely to export as opposed to locally non-affiliated firms. To address the impact of trade policy regime on the likelihood to export of MNC affiliates, an interaction term between the presence of MNCs and trade policy regime is introduced in this study, i.e $Own \cdot ERP$ .The second factor is firm size (*size*). As mentioned earlier, entering export market incurs sunk costs so that larger firms are likely to get sufficient profits to cover the sunk costs. Hence, the positive relationship between firm size and export decision is expected. The second factor is firm age (*age*). A sign of firm age in determining firms' export decision is inconclusive. On the one hand, according to Roberts and Tybout (1996) and Barrios *et.al*., (2003), older firms are more likely to be good performers, be more efficient and have more experience in business than younger firms so that the former are more likely to export than the latter. On the other hand, the negative relationship between firm age and export activity is expected in a circumstance where firms were first established mainly in order to supply local market and diversification into exports does not occur until opportunities to expand domestically have been exhausted,. In this circumstance, younger firms may be in a better position to export since they were established during a more outward-oriented period.

The last firm-specific factor is firm's productivity (*VD*) measured by value added per worker. As pointed out by Clerides *et.al* (1998) and Greenaway and Kneller (2007) firms have to raise productivity before they enter in world market so that there would be a direct and positive connection between productivity and firm's export decision.[33] As argued by Power (1998) and Barrios *et.al* (2003), to certain extent, the impact of *size*, *age* and *VD* might not be linear. That is, once they reach a certain level, they cease to exert a positive influence on their efficiency and performance. Our analysis explicitly tests such a non-linear relationship in the model.[34].

Regard to industry-level factors, as argued above, producer concentration (*CR*4) and its interaction term with trade policy regime (*ERP*) are introduced in the model. In addition, another two industry-specific factors are included, namely *ERP* and capital-labor ratio (*KL*). Obviously, high import protection could motivate firms to supply goods for highly protected domestic market instead of export and benefit policy-induced benefits. The capital-labor ratio (*KL*) is included to reflect the industry's factor intensity and indicate the international competitiveness. Since the developing country is labor abundant relative to the developed one, labor intensive industries in the former have comparative advantage. Hence, firms in a more labor intensive industry are likely to export as opposed to those in a more capital intensive ones. The negative relationship between the ratio of capital and labor and export activity is expected.

All in all, the empirical model of firm's export activity (decision) is as follows:

$$\begin{aligned} X_{ij} = {} & \alpha_0 + \alpha_1 size_{ij} + \alpha_2\ size_{ij}^2 + \alpha_3 age_{ij} + \alpha_4 age_{ij}^2 + \alpha_5 VD_{ij} \\ & + \alpha_6 VD_{ij}^2 + \alpha_7 Own_{ij} + \alpha_8 Own_{ij} * ERP_j + \alpha_9 ERP_j \\ & + \alpha_{10} CR4_j + \alpha_{11} CR4_j * ERP_j + \alpha_{12} KL_j + \varepsilon_{ij} \end{aligned} \qquad (6)$$

[33] Note that after firms enter in world market, this would raise the possibility of 'learning by exporting', i.e. productivity growth of firms may receive a further boost once a firm has entered export markets.

[34] In the model, $size^2$, age^2 and VD^2 are included See details in Jongwanich & Kohpaiboon (2008)

where

X_{ij} = export decision of firm *i* in industry *j*, which equals to one if firms export and 0 otherwises.

$size_{ij}$ (+) = Size of firm *i* in industry *j*

$size_{ij}^2$ (-) = Squared value of $size_{ij}$

age_{ij} (+/-) = Years of operation of firm i in industry j

age_{ij}^2 (-) = Squared value of age_{ij}

VD_{ij} (+) = Productivity of firm i in industry j

VD_{ij}^2 (-) = Squared value of VD_{ij}

Own_{ij} (+) = firm ownership, which equals to 1 for foreign plants and 0 otherwises.

ERP_j (-) = Effective rate of protection of industry *j*

$CR4_j$ (-) = Producer concentration of industry *j*

KL_j (-) = Capital-labor ratio of industry *j*

$Own_{ij} * ERP_j$ (-) = the interaction term between Own_{ij} and ERP_j

$CR4_j \cdot ERP_j$ (+) = the interaction term between $CR4_j$ and ERP_j

Similar to examine MNC technology spillover, Equation 6 is re-estimated by using the sample of locally non-affiliated firms only. In addition, Own_{ij} is replaced by FOR_j (output share of foreign plants). When coefficient corresponding to FOR_j turns out to be positive and statistically significant, it indicates presence of MNC export spillover. Equation 6 is rewritten as in equation 7 in examining the role of MNCs in generating export spillover.

$$\begin{aligned} X_{ij} = {} & \alpha_0 + \alpha_1 size_{ij} + \alpha_2\ size_{ij}^2 + \alpha_3 age_{ij} + \alpha_4 age_{ij}^2 + \alpha_5 VD_{ij} \\ & + \alpha_6 VD_{ij}^2 + \alpha_7 FOR_j + \alpha_8 FOR_j * ERP_j + \alpha_9 ERP_j \\ & + \alpha_{10} CR4_j + \alpha_{11} CR4_j * ERP_j + \alpha_{12} KL_j + \varepsilon_{ij} \end{aligned} \qquad (7)$$

where

FOR_j (+) = Foreign presence measured by output share of foreign plants to total sales.

$FOR_j * ERP_j$ (-) = an interaction term between FOR_j and ERP_j

To estimate both export decision and MNC export spillover, we use the 1997 industrial census. Most of variables in Equations 6 and 7 except $size_{ij}$, age_{ij}, and VD_{ij} are the same set we use in Equations 4 and 5. $size_{ij}$ is measured by plants' total sales whereas age_{ij} is periods where a

plant has been operated in an industry. VD_{ij} is value added per worker.

7.3 Results

To examine firms' export decision, we follow the standard practice in this area. Equations 6 and 7 are firstly estimated by Ordinary Least Square (OLS) estimation methods in which certain diagnostic tests are conducted to ensure the appropriateness of functional form, to guard against the impact of statistic outliers, and to attain reliable estimates. Due to the nature of decision variable that can be either export or not export, OLS estimation method could yield biased results as the method implicitly assumes continuous variables. Hence two alternative estimation methods, the Probit and Logit models are used to avoid any biasness of OLS estimates.

Table 8 reports only estimates of key determinants in our core analysis. Even though results are not sensitive to estimation method, our discussion here is based on the Probit model estimates according to their performance in explanatory powers (measured by standard error of regression and Akaike information criterion).[35]

When export decision is concerned (Column 1), the positive and statistically significant coefficient corresponding to *OWN* indicates that a probability that MNC affiliates export is higher than that of locally non-affiliated firms. This is consistent with the fact that a number of MNCs entering from the mid 1980s onward use Thailand as their export platform. Presence of MNCs in electronics and hard disc industry occurred in the late 1980s is the obvious example that MNCs tend to use Thailand as one of their export platforms. The recent influx of FDI in the automotive industry since 1995 is another example. Interestingly, the interaction term between firm's ownership and trade protection ($Own \cdot ERP$) which turns out to be negative suggests that the nature of policy environment can influence which types of MNCs enter into Thailand (either market- or efficiency seeking FDI). High protection could entice foreign firms to establish affiliates for domestic market and to enjoy policy-induced benefits from protection measures.

The statistical significance of $CR4_j$ and $CR4_j * ERP_j$ implies that in a highly concentrated industry, firms prefer to sell their products in domestic markets. When a high concentration is combined with considerably high protection (greater than 21 per cent), firms would have incentive to export by allowing prices to discriminate between the home and foreign markets. Note that this does not imply that the government should raise import duty of a highly concentrated industry to promote export because export induced in such a circumstance is associated with welfare loss (Utton and Morgan, 1983 and White, 1974). As indicated by the negative and statistically significant coefficient corresponding to ERP_j, trade restriction itself could discourage firms export and sell their product in domestic market to benefit from high protection.

Regard to MNC export spillover, the positive coefficient corresponding to FOR_j suggests that MNC affiliates can generate export spillover in locally non-affiliated plants in Thai manufacturing. This finding is in line with Kohpaiboon (2006) examining export spillover in Thai processed foods. In particular, Kohpaiboon (2006) argues that co-location of foreign and domestic firms may improve information about foreign tastes and markets, or lead to improvements in the domestic infrastructure necessary to provide access to foreign market or provide channel

[35] Full results of each estimation method are reported in Appendices 5 and 6.

through which products are distributed in cases of canned tuna and canned pineapple.

How large MNC export spillover would take place depends on the level of import protection as indicated by the statistical significance of the interaction term between FOR_j and ERP_j in spite of its marginal significance. High import protection would entice MNCs to establish affiliates for domestic markets so that MNC export spillover would be limited. The policy neutrality would result in a higher likelihood for MNCs to become involved with the host country's production to serve their strategy for maintaining a competitive position in international markets. They tend to make use of the existing resource endowments in the host countries. Global competition makes all economic agents actively seek technological innovation to improve efficiency. With this motivation and circumstances, it is easier for the demonstration effect of foreign involvement in the host country to operate to domestically-owned firms.

The negative coefficient of producer concentration ($CR4_j$) in MNC export spillover analysis shows that when local firms have market power, the probability of firm's decision to export tends to decline. The magnitude of coefficient found in MNC export spillover (e.g. the locally non-affiliated plants) is larger than that in export performance (i.e. the whole sample). This is consistent with the findings above that MNC affiliates in Thai manufacturing are likely to be export-oriented. Nonetheless, its net impact of $CR4_j$ on export decision of locally non-affiliated plants depends on import protection. In industries with very high import protection, we could find the positive relationship between $CR4_j$ and export decision. The negative and statistical significance of *ERP* itself tends to reinforce the general hypothesis that trade restrictions would result in a decline in export activity, even for the local firms.

8. Conclusions and Policy Inferences

This chapter presents the relationship among producer concentration, foreign ownership and firms' performance in Thai manufacturing. Evidence revealed in this chapter suggests that Thailand always pursues a 'market-friendly' approach towards foreign investors in manufacturing while maintaining macroeconomic stability. Hence, MNCs have involved in Thai manufacturing since 1960.

There was a mild increased concentration between 1996 and 2006, a tumultuous period in Thai economic history where the economy went through important adjustments that included the strengthening of corporate oversight and important changes in many large (primarily local) firms that took on large debts before the crisis. The industries experiencing relatively large increases in producer concentration are food products footwear, paper, and non-metallic mineral products, radio & TV transmitters, optical & photographic machinery, and jewelry. In these industries, shares of intra-industry conglomerate members tend to be high. Even though MNC affiliates and exporters are among the top firms in Thailand manufacturing, their effect on producer concentration is less than Thai conglomerates.

We find that both producer concentration and presence of MNCs could positively affect the sector's productivity measured by labour productivity. Their net impact is largely conditioned by the nature of trade policy regime. High producer concentration could create conducive environment for firms to commit their resources for productivity enhancing activities if import protection is not too high (ERP must not exceed 51 per cent). Similarly, establishment of MNC affiliates in Thai manufacturing could generate productivity benefits to locally non-affiliated plants if import protection does not exceed a certain level (around 64 per cent). ERP thresholds

reported here seem a bit too high. This would be due to the fact that while we proxy pattern of ERP in 1996 by that in 2002 on the basic that there was no major change in tariff structure, it would affect the level. Nonetheless, this could reasonably reveal the role of trade policy regime in influencing the relationship among producer concentration, MNCs presence and firms' productivity. To gain more productivity benefits, absorptive capability of locally non-affiliated plants also plays a crucial role.

Evidence from Thai manufacturing suggests that both producer concentration and MNC presence can affect export performance and the likelihood for locally non-affiliated firms to export. But their net impact is also conditioned by the nature of trade policy regime. In a highly concentrated industry, firms prefer domestic to export markets. When high concentration is combined with high protection, firms will export more. Nevertheless, induced exports under a highly concentrated industry tend to be associated with welfare loss. Trade policy regime also plays an important role in conditioning MNC effect on export performance and export spillover. The cutting point of ERP to turn MNC export spillover from positive to negative is around 33 per cent, far lower than what observed in cases of productivity determinants. Lastly, when high tariff is imposed, it could discourage firms to export by itself.

Our results in this chapter highlight the relative importance of the trade policy regime for productivity enhancement, export promotion strategy and thus development policy. Although high levels of producer concentration can result in productivity gains, the competition fostered by open trade policies is required if high concentration is to be translated into higher productivity. In addition, liberalizing the foreign investment regime has to go hand in hand with liberalizing the trade policy regime to maximize gains from FDI technology spillover.

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Table 1
Nominal and effective rates of protection in Thailand 1980–2003 (per cent)

	1980	1985	2002	2003
Nominal rate of protection (NRP)				
Processed foods	34.4	30.9	22.7	20.3
Textile products	41	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	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	15	10
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)				
Processed foods	58.1	135.2	37.4	32.4
Textile products	74.5	118.4	36.4	36.2
Leather and Footwear products	87.8	152.7	20.8	23.8
Wood products	65.4	62	26.6	26.9
Paper and Pulp	20.4	53.5	47.8	32.2
Chemical and Petroleum products	43	44.5	16.7	14.2
Rubber products	2.1	42	58.5	58.8
Other Non-Metal products	72.1	108.5	32.8	19.3
Metal products	35.6	70.9	25.1	20.0
Machinery	27.1	29.3	-0.5	0.9
Consumer goods and motor vehicles	48.4	45.6	18.8	19.8
Total manufacturing	51.7	78.4	27.8	24.4
Overall	22.9	14.7	13.9	19.4
Coefficient variation of ERPs	120.0	200.0	131.3	143.9
Spearman Rank Correlation Coefficient with 2002 ERP	0.58	n.a.		
Spearman Rank Correlation Coefficient with 2003 ERP	0.49	n.a.	0.94	1

Notes: 1. Detail of ERP estimates for 1985 is not available. Spearman Rank correlation coefficient 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.

2. NRP and ERP in 2002-3 are calculated as the unweighted average.

Source: ERP estimates for 1980 are from Akrasanee & Ajanant (1986), those of 1985 from World Bank (1988) and of 2002–3 are from the author's calculation.

Table 2: Shares of sum of top 4 firms revenue (CR4), conglomerates, MNCs, and exporters in total revenue of all large firms (percent)

	CR4		Conglomerates		All foreign		Majority-foreign		Exporters	
Industry	1996	2006	1996	2006	1996	2006	1996	2006	1996	2006
Manufacturing, mean of 58 industries	61.2	64.9	22	19	58	69	34	52	63	74
Meat products	56.1	71.7	54	55	8	3	5	2	91	92
Fish products	35.2	50.6	23	36	5	8	0	0	83	97
Fruit & vegetable products	25.4	44.3	0	0	19	13	12	13	57	49
Dairy products	78.1	75.6	47	68	83	95	51	81	50	81
Grain mill products	63.4	67.6	0	0	17	21	0	12	31	76
Starches, animal feeds	75.2	83.3	70	77	17	17	12	9	84	91
Other food products	34.6	50.3	0	0	48	61	28	29	55	41
Beverages	73.2	70.3	15	49	19	30	1	5	51	36
Textiles spinning & weaving	47.3	53.6	36	35	43	33	2	6	98	97
Other textiles	49.4	43.0	0	0	62	64	12	42	31	66
Knitted fabrics	61.5	50.6	0	0	47	44	3	22	92	96
Apparel	42.1	43.7	0	0	65	66	12	35	81	81
Leather tanning & dressing	46.9	59.1	0	0	14	49	0	22	62	84
Luggage, handbags, etc.	37.8	48.8	0	0	62	79	49	60	49	55
Footwear	60.7	75.8	31	42	36	29	25	29	78	82
Wood sawmilling & planing	62.7	45.6	0	0	0	0	0	0	30	73
Other wood products	44.2	49.4	8	18	4	17	4	17	87	70
Paper products	64.0	84.1	52	56	18	51	10	41	64	91
Publishing	81.5	86.7	0	0	1	4	0	0	44	53
Printing	52.1	54.0	0	0	4	9	0	0	11	0
Recorded media	86.1	86.0	0	0	76	79	39	18	7	40
Basic chemicals	63.5	68.8	0	11	28	20	12	17	63	70
Primary plastics' forms	55.9	58.1	21	29	60	60	14	21	87	61
Other chemical products	43.9	47.6	0	0	95	100	74	87	59	44
Synthetic fibers	76.0	56.2	34	15	90	86	55	61	83	80
Rubber tyres & tubes	82.1	69.0	6	39	52	91	46	81	59	68

(cont.)

Table 2 (cont.)

	CR4, Large Firms Only		Conglomerates		All foreign		Majority-foreign		Exporters	
Industry	1996	2006	1996	2006	1996	2006	1996	2006	1996	2006
Other rubber products	59.4	60.0	17	28	14	36	8	26	98	100
Plastic products	41.9	38.0	7	4	18	40	6	21	88	60
Glass products	70.7	77.8	42	58	39	48	0	28	28	85
Non-metallic mineral products	74.9	91.5	74	70	6	19	2	2	85	92
Ferrous metals	45.3	46.4	11	27	43	72	0	58	24	52
Non-ferrous metals	48.5	46.2	26	11	80	82	43	56	60	86
Metals' casting	71.9	57.8	0	23	34	73	7	56	31	37
Structural metal products	46.0	54.1	18	0	36	62	0	14	26	42
Other metal products	34.5	44.5	0	11	45	49	17	35	57	64
General purpose machinery	51.0	64.6	34	47	83	97	50	90	66	86
Special purpose machinery	66.4	57.3	0	0	79	83	49	75	72	59
Domestic appliances	64.4	71.0	16	21	94	96	37	84	85	91
Office & computing machinery	75.5	77.8	0	0	97	100	93	100	85	99
Electric motors, etc.	55.3	47.5	12	0	85	91	48	59	80	73
Electricity distribution machinery	87.1	79.1	0	0	45	73	45	72	94	85
Insulated wire & cable	98.7	84.3	0	0	94	94	62	63	80	6
Batteries, etc.	76.1	75.9	0	0	84	90	28	53	91	48
Electric lamps	75.9	85.9	8	11	82	88	72	87	91	85
Other electrical machinery	50.0	56.7	0	0	69	81	61	68	58	65
Electronic components	44.1	48.3	19	0	89	100	81	92	84	92
Radio & TV transmitters, etc.	66.8	86.3	8	26	86	97	46	95	42	90
Radio & TV receivers, etc.	66.5	77.0	20	11	98	99	72	99	72	73
Medical machinery	75.1	64.8	0	0	89	88	77	83	89	88
Optical & photographic machinery	68.7	84.5	0	0	72	97	71	97	96	97
Watches & clocks	71.9	78.2	10	49	98	96	96	93	99	90
Motor vehicle assembly, etc.	81.4	78.4	38	13	89	100	40	99	58	95
Motor vehicle bodies, trailers, etc.	67.7	80.8	60	32	26	85	2	54	55	55
Motor vehicle parts	46.0	59.5	20	38	71	95	31	68	64	60

(cont.)

Table 2 (cont.)

	CR4, Large Firms Only		Conglomerates		All foreign		Majority-foreign		Exporters	
Industry	1996	2006	1996	2006	1996	2006	1996	2006	1996	2006
Other transportation machinery	90.6	87.1	61	55	85	97	79	96	69	77
Furniture	46.5	48.4	0	0	26	25	6	4	69	86
Jewelry	50.8	74.8	0	0	55	23	18	10	96	84
Miscellaneous manufacturing	82.1	83.4	44	54	95	96	91	73	65	76

Sources: compiled from the authors' large-firm database (see Appendix A in Kohpaiboon & Ramstetter (2008) for detailed description and sources).

Table 3: Shares of conglomerates, MNCs, and exporters in total revenue of the top 4 firms (percent)

	Conglomerates		All foreign		Majority-foreign		Exporters	
Industry	1996	2006	1996	2006	1996	2006	1996	2006
Manufacturing	34	27	60	69	37	51	64	78
Meat products	88	76	0	0	0	0	100	100
Fish products	54	70	15	0	0	0	85	100
Fruit & vegetable products	0	0	21	29	21	29	50	44
Dairy products	60	89	86	100	60	100	60	87
Grain mill products	0	0	14	14	0	14	0	100
Starches, animal feeds	94	93	12	14	12	7	94	100
Other food products	0	0	52	82	52	35	26	43
Beverages	21	69	13	31	0	0	56	35
Textiles spinning & weaving	77	66	31	20	0	0	100	100
Other textiles	0	0	79	73	0	52	0	78
Knitted fabrics	0	0	57	60	0	18	100	100
Apparel	0	0	100	66	18	66	82	100
Leather tanning & dressing	0	0	17	65	0	24	83	100
Luggage, handbags, etc.	0	0	50	100	50	77	21	60
Footwear	40	55	18	33	18	33	82	100
Wood sawmilling & planing	0	0	0	0	0	0	43	81
Other wood products	0	37	0	25	0	25	100	100
Paper products	81	67	10	45	10	33	73	100
Publishing	0	0	0	0	0	0	54	61
Printing	0	0	0	0	0	0	0	0
Recorded media	0	0	81	87	44	21	8	41
Basic chemicals	0	15	0	0	0	0	68	65
Primary plastics' forms	38	50	62	50	0	14	100	64
Other chemical products	0	0	100	100	79	80	71	37
Synthetic fibers	44	28	100	81	65	81	79	81
Rubber tyres & tubes	8	43	51	100	51	100	62	80
Other rubber products	28	46	0	21	0	21	100	100
Plastic products	0	0	0	26	0	0	100	77
Glass products	59	74	41	55	0	29	20	100
Non-metallic mineral products	97	77	0	18	0	0	100	95
Ferrous metals	25	58	45	61	0	61	25	78
Non-ferrous metals	53	23	78	74	59	74	100	100
Metals' casting	0	41	36	81	0	65	36	25
Structural metal products	39	0	39	76	0	22	19	46
Other metal products	0	24	39	49	0	26	42	73
General purpose machinery	66	65	86	100	66	100	80	100
Special purpose machinery	0	0	92	84	68	84	76	71
Domestic appliances	25	27	100	100	41	100	100	100
Office & computing machinery	0	0	100	100	100	100	81	100

(Cont.)

Table 3 (Cont.)

	Conglomerates		All foreign		Majority-foreign		Exporters	
Industry	1996	2006	1996	2006	1996	2006	1996	2006
Electric motors, etc.	22	0	100	100	61	59	100	79
Electricity distribution machinery	0	0	52	66	52	66	100	93
Insulated wire & cable	0	0	95	100	63	75	81	6
Batteries, etc.	0	0	100	100	30	52	100	36
Electric lamps	11	13	100	100	89	100	100	94
Other electrical machinery	0	0	47	71	47	71	39	52
Electronic components	44	0	86	100	86	84	67	100
Radio & TV transmitters, etc.	11	30	88	100	49	100	51	92
Radio & TV receivers, etc.	31	14	100	100	69	100	69	71
Medical machinery	0	0	100	100	93	100	100	90
Optical & photographic machinery	0	0	69	100	69	100	100	100
Watches & clocks	0	63	100	100	100	100	100	87
Motor vehicle assembly, etc.	46	14	100	100	40	100	65	100
Motor vehicle bodies, trailers, etc.	89	39	31	93	0	61	65	54
Motor vehicle parts	44	64	78	100	31	61	74	81
Other transportation machinery	67	62	90	100	85	100	71	85
Furniture	0	0	31	23	0	0	50	100
Jewelry	0	0	47	8	0	0	100	85
Miscellaneous manufacturing	54	65	100	100	100	73	62	73

Sources: compiled from the authors' large-firm database (see Appendix A in Kohpaiboon & Ramstetter (2008) for detailed description and sources).

Table 4
OLS Estimates of Producer Concentration Determinants

	4.1	4.2	4.3	4.4
Constant	21.6***	21.5***	21.4***	20.2***
$AKC_{96,i}$	0.39***	0.39***	0.34**	0.41***
$MES_{96,i}$	-0.07	-0.08	-0.05	-0.09
$GMS_{96-06,i}$	-0.01	-0.01	-0.01	-0.01
$CON_{96,i}$	0.18***	0.18***	0.17***	0.18***
$FOR_{96,i}$	0.03	0.03	-	0.04
$ERP_{03,i}$	-0.10	-0.09*	-0.09**	-
$FOR_{96,i} \cdot ERP_{03,i}$	0.00	-	-	-
$CR4_{96,i}$	-0.33***	-0.33***	-0.31***	-0.33***
F-test	8.39	9.79	11.80	8.44
R-squared	0.41	0.41	0.40	0.39

Notes: ***,**, and * indicate 1, 5 and 10 % level of statistical test with the null hypothesis that a coefficient in our interest is not different from zero.
Sources: Kohpaiboon & Ramstetter (2008: Table 4)

Table 5
Ownership and Exporting Characteristics of Large Firms

Subgroup	OLS Estimates					
	Conglomerate(*DC)*		Foreign (*DF*)		Exporting (*DX*)	
	1996	2006	1996	2006	1996	2006
Incumbent Firms (1996 & 2006)						
Market share ≥ 15%	6.70**	5.11*	3.16	4.61	1.12	4.04
Market share ≥ 10%	4.34	3.79	6.38***	1.94	2.38	3.51
All top 15 firms	5.15***	3.99*	6.47***	0.78	1.51	3.67*
Exiting Firms (1996)						
Market share ≥ 15%	-2.30		-0.35		-0.34	
Market share ≥ 10%	-0.20		-2.24		-0.76	
All top 15 firms	0.99		-0.47		0.88	
New Entrants (2006)						
Market share ≥ 15%		-0.56		2.15		1.52
Market share ≥ 10%		0.04		0.26		1.07
All top 15 firms		0.24		0.44		1.03

Notes: ***,**, and * indicate 1, 5 and 10 % level of statistical test with the null hypothesis that a coefficient in our interest is not different from zero.
Sources: Table 6 in Kohpaiboon & Ramstetter (2008)

Table 6
Estimation Results of Productivity Determinants and MNC Productivity Spillover

	Productivity Determinants	MNC Productivity Spillover
MKT_{ij}	4.4%**	5.0%*
OWN_{ij}	18.7%***	n.a.
$CR4_i$	0.38***	0.69
ERP_j	0.31	3.34
$CR4_j * ERP_j$	-0.92*	-0.25
FOR_j	n.a.	5.31*
$ERP_j * FOR_j$	n.a.	-10.7*
$QL_{ij} * FOR_j$	n.a.	-3.34***
R^2	0.71	0.62

Notes: ***,**, and * indicate 1, 5 and 10 % level of statistical test with the null hypothesis that a coefficient in our interest is not different from zero.
Sources: Authors' estimates based on data series discussed in the text.

Table 7
Difference in Value Added between MNC Affiliates and Locally Non-affiliated Plants by the 2-digit Industry of TSIC Classification

Industry	Difference in Value Added
Textiles	0.38***
Non-metallic	0.31*
Metal Products	0.35**
General Machinery	0.24*
Chemical	0.46***
Foods	-0.02
Furniture	-0.08
Apparel	0.02
Leather & Footwear	0.08
Plastics	0.00
Jewellry	0.05
Electrical Machinery	0.16
Automotive	0.15
Rubber	0.07

Notes: difference in value added is measured by the coefficient corresponding to OWN_{ij} of the following regression.

$$\ln Y_{ij} = \beta_0 + \beta_1 \ln K_{ij} + \beta_2 \ln PL_{ij} + \beta_3 \ln NL_{ij} + \beta_4 \ln K_{ij} \ln PL_{ij} + \beta_5 \ln K_{ij} \ln NL_{ij} + \beta_6 \left(\ln NL_{ij}\right)^2$$
$$+\beta_7 \left(\ln PL_{ij}\right)^2 + \beta_8 \left(\ln K_{ij}\right)^2 + \beta_9 OWN_{ij} + \beta_{10} AGE_{ij} + \beta_{11} MKT_{ij} + \beta_{12} BOI_{ij} + \varepsilon_{ij}$$

***,**, and * indicate 1, 5 and 10 % level of statistical test of OWN_{ij} under the null hypothesis that a coefficient in our interest is not different from zero.
Source: Authors' estimates based on data series discussed in the text.

Table 8
Estimation Results: Export Decision and MNC Export Spillover

	Export Decision	MNC Export Spillover
Own_{ij}	1.35***	n.a.
$Own_{ij} * ERP_j$	-0.44*	n.a.
$CR4_j$	-1.74***	-2.3***
$CR4_j * ERP_j$	9.32***	11.6***
ERP_j	-2.58***	-2.82***
FOR_j	n.a.	0.47***
$FOR_j * ERP_j$	n.a.	-1.63*

Notes: ***,**, and * indicate 1, 5 and 10 % level of statistical test of OWN_{ij} under the null hypothesis that a coefficient in our interest is not different from zero.
Source: Authors' estimates based on data series discussed in the text.

Appendix 1

Estimates of the Relationship between Changes in Concentration, Initial Ownership Shares, and Import Protection, 1996-2006: Ordinary Least Squares' Estimates with Robust Standard Errors (dependent variable = $\Delta CR4_{96\text{-}06,i}$)

Variable, statistic	Value	p-value	Value	p-value	Value	p-value	Value	p-value
LARGE-FIRM DATA SET, all industries								
Equation	(1)		(1a)		(1b)		(1c)	
$AKC_{96,i}$	0.2666	0.18	0.2575	0.19	0.2029	0.28	0.2722	0.17
$MES_{96,i}$	-0.0239	0.78	-0.0250	0.77	-0.0015	0.99	-0.0357	0.68
$GMS_{96\text{-}06,i}$	0.0010	0.93	0.0012	0.92	0.0020	0.86	0.0017	0.88
$CR4_{96,i}$	-0.3583	0.00	-0.3561	0.00	-0.3377	0.00	-0.3517	0.00
$CON_{96,i}$	0.1547	0.02	0.1657	0.00	0.1597	0.00	0.1697	0.00
$FOR_{96,i}$	0.0221	0.70	0.0316	0.46	-	-	0.0340	0.43
$ERP_{03,i}$	-0.1027	0.19	-0.0679	0.28	-0.0716	0.25	-	-
$FOR_{96,i}*ERP_{03,i}$	0.0011	0.64	-	-	-	-	-	-
Constant	22.0328	0.00	21.3964	0.00	21.2572	0.00	20.3147	0.00
F-test	5.34	0.00	6.12	0.00	7.57	0.00	6.35	0.00
R-squared	0.33	-	0.33	-	0.32	-	0.32	-
Observations	58	-	58	-	58	-	58	-
LARGE-FIRM DATA SET, excluding 3 outliers								
Equation	(1)		(1a)		(1b)		(1c)	
$AKC_{96,i}$	0.39	0.04	0.39	0.04	0.34	0.05	0.41	0.03
$MES_{96,i}$	-0.07	0.32	-0.08	0.31	-0.05	0.50	-0.09	0.24
$GMS_{96\text{-}06,i}$	-0.01	0.46	-0.01	0.46	-0.01	0.48	-0.01	0.49
$CR4_{96,i}$	-0.33	0.00	-0.33	0.00	-0.31	0.00	-0.33	0.00
$CON_{96,i}$	0.18	0.00	0.18	0.00	0.17	0.00	0.18	0.00
$FOR_{96,i}$	0.03	0.53	0.03	0.40	-	-	0.04	0.37
$ERP_{03,i}$	-0.10	0.18	-0.09	0.08	-0.09	0.08	-	-
$FOR_{96,i}*ERP_{03,i}$	0.00	0.91	-	-	-	-	-	-
Constant	21.58	0.00	21.47	0.00	21.41	0.00	20.17	0.00
F-test	8.39	0.00	9.79	0.00	11.80	0.00	8.44	0.00
R-squared	0.41	-	0.41	-	0.40	-	0.39	-
Observations	55	-	55	-	55	-	55	-

Sources: Kohpaiboon & Ramstetter (2008) Table 4.

Appendix 2
Ownership and Exporting Characteristics of the Largest Firms: Ordinatry Least Squares' Estimates of Equation (3) with Robust Standard Errors (dependent variable = Sijt)

Variable, statistic	Largest Firms 1 (S_{ijt}>=15%)				Largest Firms 2 (S_{ijt}>=10%)				CR4 Firms			
	1996		2006		1996		2006		1996		2006	
	Value	p-value	Value	p-value	Value	p-value	Value	p-value	Value	p-value	Value	p-value
1. Firms meeting sample size criteria in both years (incumbents)												
DC_{ijt}	6.70	0.05	5.12	0.08	4.34	0.11	3.79	0.19	5.15	0.03	3.99	0.08
DF_{ijt}	3.16	0.26	4.61	0.47	6.38	0.00	1.94	0.43	6.47	0.00	0.78	0.68
DX_{ijt}	1.12	0.68	4.04	0.29	2.38	0.31	3.51	0.20	1.51	0.44	3.67	0.08
SK_{ijt}	0.73	0.63	0.20	0.31	1.40	0.29	1.50	0.19	0.70	0.49	2.37	0.02
$CR4_{jt}$	0.48	0.00	0.51	0.00	0.35	0.00	0.35	0.00	0.30	0.00	0.30	0.00
Constant	-8.60	0.31	-14.55	0.05	-6.15	0.24	-8.31	0.14	-4.93	0.20	-7.22	0.08
F-test	5.08	0.00	8.46	0.00	7.35	0.00	6.02	0.00	9.84	0.00	8.58	0.00
R-squared	0.38	-	0.42	-	0.35	-	0.26	-	0.33	-	0.28	-
Observations	47	-	47	-	83	-	83	-	126	-	126	-
2. Firms meeting sample size criteria in one year but not in the other												
	exiting firms		new entrants		exiting firms		new entrants		exiting firms		new entrants	
DC_{ijt}	-2.30	0.17	-0.56	0.79	-0.20	0.92	0.04	0.98	0.99	0.55	0.24	0.91
DF_{ijt}	-0.35	0.82	2.15	0.20	-2.24	0.20	0.26	0.83	-0.47	0.72	0.44	0.76
DX_{ijt}	-0.34	0.89	1.52	0.51	-0.76	0.71	1.07	0.52	0.88	0.49	1.04	0.54
SK_{ijt}	-0.27	0.85	2.46	0.00	-0.28	0.76	2.40	0.00	-0.01	0.99	2.03	0.01
$CR4_{jt}$	0.02	0.68	0.13	0.01	0.17	0.00	0.23	0.00	0.08	0.04	0.09	0.12
Constant	19.76	0.00	6.91	0.07	7.01	0.01	-1.89	0.60	5.63	0.01	3.66	0.29
F-test	0.58	0.07	12.41	0.00	4.16	0.00	11.56	0.00	1.46	0.21	2.03	0.08
R-squared	0.72	-	0.43	-	0.19	-	0.43	-	0.05	-	0.21	-
Observations	37	-	44	-	61	-	82	-	106	-	105	-

Sources: Kohpaiboon & Ramstetter (2008) Table 6.

Appendix 3
Determinants of Plant productivity: Full Regression Results

	Equation A.3.1		Equation A.3.2		Equation A.3.3	
	Estimates	*t*-stat	Estimates	*t*-stat	Estimates	*t*-stat
$\ln K_i$	0.16	*6.24*	0.19	*10.3*	0.16	6.23
$\ln PL_i$	0.52	*14.33*	0.60	*25.9*	0.53	14.41
$\ln K_i \ln PL_i$	-0.03	*-2.33*	-0.04	*-7.54*	-0.02	-2.00
$\ln NL_i$	0.31	*12.29*	0.30	*16.8*	0.31	12.3
$\ln K_i \ln NL$	-0.01	*-1.26*	-0.01	*-2.59*	-0.01	-1.58
$\ln K_i^2$	0.04	*5.73*	0.05	*16.8*	0.04	5.67
OWN_{ij}	0.17	*4.91*	0.19	*7.3*	0.16	4.51
AGE_{ij}	0.004	*3.39*	0.004	*4.19*	0.00	2.86
BOI_{ij}	-0.03	*-0.67*	-0.002	*-0.08*	-0.04	-0.96
$CR4_j$	0.41	*2.78*	0.38	*3.08*	0.68	3.45
ERP_j	0.11	*0.33*	0.31	*1.17*	0.72	1.74
$CR4_j * ERP_j$	-0.44	*0.63*	-0.92	*-1.68*	-5.10	-1.25
GMS_j	0.78	*4.63*	0.87	*6.36*	0.66	2.31
MKT_{ij}	0.04	*1.38*	0.04	*1.99*	0.03	0.92
INTERCEPT	-1.23	*-9.82*	-1.47	*-16.22*	-1.40	-10.20
R^2	0.64		0.71		0.64	
F-test	997.4	(p= 0.00)	1852.1	(p=0.00)	513.1	(p=0.00)
RESET	1.94	(p=0.12)	1.62	(p=0.18)	1.83	(p=0.14)

Notes: Equation A.3.1 is estimated with the whole sample (suspected outlier samples included) but without industry dummies whereas equation A.3.2 is equation A.3.1 excluding suspected outlier samples. Regression in equation A.3.3 is the estimation of the whole sample with the 2-digit TSIC industry dummy variables. *RESET* =Ramsey test for functional form misspecification (F-distribution)
Sources: Authors' estimates based on data series discussed in the text.

Appendix 4
MNC Technology Spillover: Full Regression Results

	Equation A.4.1 (OLS)		Equation A.4.2 (IV)	
	Estimates	*t*-stat	Estimates	*t*-stat
$\ln K_i$	0.16	6.23	0.18	3.94
$\ln PL_i$	0.67	19.41	0.77	8.95
$\ln K_i \ln PL_i$	-0.038	-4.17	-0.04	-3.91
$\ln NL_i$	0.24	8.44	0.14	1.77
$\ln K_i \ln NL$	-0.02	-2.91	-0.02	-2.78
$\ln K_i^2$	0.58	12.2	0.06	11.27
AGE_{ij}	0.002	2.31	0.003	2.09
BOI_{ij}	-0.001	-0.02	0.007	0.15
FOR_j	1.43	4.45	5.31	1.2
$ERP_j * FOR_j$	-1.13	-1.8	-10.7	-1.28
$QL_{ij} * FOR_j$	-0.18	-4.7	-3.96	-2.27
$CR4_j$	0.23	1.65	0.69	0.71
ERP_j	0.17	0.47	3.34	0.8
$CR4_j * ERP_j$	0.3	0.44	0.25	0.08
GMS_j	1.00	6.28	0.06	0.03
MKT_{ij}	0.06	2.6	0.05	1.31
INTERCEPT	-1.53	-12.5	-2.55	-1.68
R^2	0.651		0.621	
F-test	746.4 (p=0.00)		687.85 (p=0.00)	
RESET	1.26 (p=0.28)			
Hausman's test			8.77 (p=0.00)	

Notes: Equations A.4.1 and A.4.2 are results from Ordinary Least Square (OLS) and Instrument Variable (IV) estimation. The instrumental variable of *FOR* is gross output in 1996. *RESET* =Ramsey test for functional form misspecification (F-distribution)
Sources: Authors' estimates based on data series discussed in the text.

Appendix 5
Firm's Export Decision: Full Regression Results

	Column A OLS	**Column B** Probit	**Column C** Logit
Intercept	-0.96 (-3.01)	**-6.31** (-4.50)	**-10.73** (-4.49)
$Sale_{ij}$	**0.13** (42.24)	**0.50** (36.1)	**0.85** (34.45)
Age_{ij}	**0.10** (6.11)	**0.50** (6.12)	**0.81** (5.79)
Age_{ij}^2	**-0.03** (-6.36)	**-0.12** (-6.41)	**-0.20** (-6.10)
VD_{ij}	**0.29** (5.90)	**1.25** (5.69)	**2.13** (5.70)
VD_{ij}^2	**-0.01** (-7.33)	**-0.06** (-6.82)	**-0.11** (-6.80)
OWN_{ij}	**0.42** (26.27)	**1.35** (22.37)	**2.31** (21.68)
$OWN_{ij} \cdot ERP_j$	**-0.20** (-2.93)	**-0.44** (-1.32)	**-0.84** (-1.45)
$CR4_j$	**-0.45** (-8.20)	**-1.74** (-7.50)	**-3.12** (-7.63)
$CR4_j \cdot ERP_j$	**2.53** (8.84)	**9.32** (8.79)	**16.23** (8.87)
ERP_j	**-0.66** (-4.75)	**-2.58** (-5.05)	**-4.46** (-5.09)
KL_j	**-0.21** (-4.68)	**-0.85** (-4.72)	**-1.42** (-4.68)
Mean dependent variable	0.36	0.37	0.37
S.E of regression	0.386	0.382	0.383
Akaike information criterion	0.935	0.902	0.904
No. of observations	8106	8106	8106

Note: The value in parenthesis is t-ratio for OLS and z-ratio for Probit and Logit model.
Sources: Authors' estimates based on data series discussed in the text.

Appendix 6
MNCs Export Spillovers on Locally Non-affiliated Plants: Full Regression Results

	Column A OLS	**Column B** Probit	**Column C** Logit
Intercept	**-1.45** (-3.62)	**-9.91** (-5.31)	**-15.94** (-5.02)
$Sale_{ij}$	**0.15** (41.63)	**0.53** (34.03)	**0.91** (32.28)
Age_{ij}	**0.12** (6.87)	**0.75** (7.23)	**1.26** (6.81)
Age_{ij}^2	**-0.03** (-6.79)	**-0.18** (-7.54)	**-0.30** (-7.14)
VD_{ij}	**0.36** (5.67)	**1.77** (5.95)	**2.88** (5.69)
VD_{ij}^2	**-0.02** (-6.91)	**-0.08** (-6.76)	**-0.14** (-6.47)
For_j	**0.11** (2.68)	**0.47** (2.61)	**0.75** (2.38)
$For_j \cdot ERP_j$	**-0.48** (-1.64)	**-1.63** (-1.46)	**-2.66** (-1.37)
$CR4_j$	**-0.55** (-8.81)	**-2.30** (-8.39)	**-4.20** (-8.60)
$CR4_j \cdot ERP_j$	**3.18** (9.77)	**11.58** (9.60)	**20.51** (9.95)
ERP_j	**-0.77** (-4.65)	**-2.82** (-4.49)	**-5.10** (-4.79)
KL_j	**-0.19** (-3.57)	**-0.79** (-3.93)	**-1.37** (-3.91)
Mean dependent variable	0.24	0.26	0.26
S.E of regression	0.382	0.379	0.379
Akaike information criterion	0.919	0.890	0.891
No. of observations	6437	6473	6473

Note: The value in parenthesis is t-ratio for OLS and z-ratio for Probit and Logit model.
Sources: Authors' estimates based on data series discussed in the text.