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Contents

Abstract

This paper examines the determinants of a firm's export decision and the role of multinational corporations (MNCs) in generating export spillovers to domestically owned firms based on cross-sectional econometric analysis of the manufacturing sector in Thailand. The role of market structure in determining firms' export decisions is also emphasized in the study. The key finding is that MNCs tend to be more export-oriented than indigenous firms and the entry of the former stimulates the latter to become involved in the production of exports, i.e., the presence of MNCs export spillovers. However, the impact of MNCs on export activity/spillovers is not automatic, but depends on the trade policy regime. A restricted trade policy, especially tariff protection, could retard the process of MNCs enhancing export spillovers and overall export activity. Competition fostered by open trade policies tend to be required if a high level of MNC participation is to be translated into higher export activity/spillovers. In addition, the negative direct effect of high tariff rates on export activity/spillovers highlights the relative importance of trade policy neutrality on firms' export decisions and export spillovers.

I. Introduction

Strong export performance is generally recognized as one of the crucial factors in driving impressive economic growth. Exports are usually considered as enhancing a firm's productivity since exporting firms must improve their production efficiency to overcome higher trade barriers and address different consumer tastes and tougher competition in international markets. In addition, exporting makes firms aware of potential innovations abroad, which they may assimilate in order to improve their position in foreign markets (Barrios et al. 2003, Greenaway and Kneller 2007). This would encourage firms to acquire the appropriate knowledge and improve their technological capability.

To induce impressive export performance, multinational corporations (MNCs) are regarded as crucial, especially in developing countries, with their firm-specific advantages in the form of knowledge-based assets such as proprietorial information relating to production, technology, and managerial know-how,. While entering the export market incurs sunk costs (Greenaway and Kneller 2007), MNCs are likely to overcome sunk costs and access into foreign markets easier than domestically owned firms. The presence of MNCs could, therefore, generate positive effects on overall export performance in a host country. In addition, the presence of MNCs could generate indirect effects through export spillovers to domestically owned firms. In particular, local firms could learn from the export activities of foreign subsidiaries in the host country through information externalities and demonstration and competition channels. This would help local firms to lower sunk costs associated with export market entry, and to expand sales in foreign markets.

While there is a fairly large literature on determinants of exports, few studies have examined the importance of MNCs on firms' export decisions and the role of MNCs in generating export spillovers (Aitken et al. 1997, Kokko et al. 2001, Barrios et al. 2003, Greenaway et al. 2004, Ruane and Sutherland 2005). In particular, few studies have paid attention to developing countries (see Aitken et al. 1997, Kokko et al. 2001), where MNCs have played an important role in development of the local manufacturing sector over the past three decades. In addition, empirical evidence on the role of MNCs on export activity is somewhat mixed. Some studies identify strong positive spillover effects (Aitken et al. 1997, Kokko et al. 2001, Greenaway et al. 2004) while others have either found none, and in some cases, negative impacts (Barrios et al. 2003, Ruane and Sutherland 2005).

With the increasing importance of MNCs in developing countries in the face of limited empirical evidence on their impacts on firms' export decisions, this study aims to examine the role of MNCs in generating export activity and spillovers using the manufacturing sector in Thailand as a case study. Thailand's export sector has played a crucial role in driving growth in the economy over the past three decades. During 1986–1996, exports grew at an annual rate of 21% while the share of exports to gross domestic product (GDP) increased noticeably from 23% in the early 1980s to 36% and 48% in 1990 and 1996, respectively. Even though in 1996 export growth dropped to 1.6% as a result of persistent real appreciation, the crisis-driven floating exchange rate regime helped to boost export growth to around 12% after the crisis (Jongwanich 2007). Alongside impressive export performance, there has been a rapid increase in inward foreign direct investment (FDI) in the Thai manufacturing sector during this period. In contrast to other forms of capital flows, FDI inflows continuously rose after the 1997–1999 financial crisis and during 2000–2005, FDI inflows registered about US$2.5 billion, increasing from US$0.1 billion in mid-1980 and US$1 billion in 1991–1995.

With the increase in exports and MNC involvement in Thailand, an interesting question to ask is whether these two trends are related. Has rising foreign presence in the Thai economy helped exports to expand or would it have risen even more dramatically without the presence of MNC involvement? In particular, can the presence of MNCs generate benefit to local firms?

This study represents two key departures from the model in previous empirical studies. First, the role of MNCs on firms' export decision in this study is hypothesized to be conditioned on trade policy regime. A restricted trade policy regime could encourage MNCs to produce and sell in domestic markets to enjoy the benefits from a highly protected domestic market. In this situation, it may be more difficult for local firms to learn the advanced technology from MNC subsidiaries. Instead, the highly protected domestic market might encourage local firms to manufacture products not directly competitive with those being produced by the foreign affiliates. Second, the industrial market structure is introduced as another controlling variable in the firm's export decision, in addition to firm characteristic variables introduced in the previous literature. In industries with a high level of producer concentration, the probability of a firm to export is low since it could enjoy market power in the domestic market. The new producer concentration data introduced by Ramstetter and Kohpaiboon (2008) are included in examining firms' export decisions.

The rest of the paper is structured as follows. Section II presents trends and patterns of exports and MNCs in Thai manufacturing. The analytical framework that links export activity, MNCs, market structure, and trade policy regime is provided in Section III. Section IV discusses the empirical model of firms' export decisions. Data, variable measurement, and econometric procedures are discussed in Section V. The empirical

results are provided in Section VI, while Section VII concludes and provides some policy inferences.

II. Exports and MNCs in Thai Manufacturing

Thailand's growth performance has been generally remarkable compared to other developing countries. Between 1981 and 1996, average annual growth of real GDP was 7.9%, and rapid growth occurred without a single year experiencing negative growth of income per capita. The level of GDP per capita in 1996 was more than six times that in 1960. This was a unique achievement among developing countries (Warr 1993). After experiencing an annual growth rate of 7.0% from 1960 to 1986, the Thai economy entered a 10-year boom beginning 1987. During the period 1987–1996, real GDP grew at an average annual rate of almost 10%. Growth performance in this decade ending in 1996 exceeded that of any other country (Warr 1999, 631). This period of rapid growth was interrupted by the financial crisis that began in mid-1997. The economy contracted by 1.4% in 1997 and 10.5% in 1998—the most dramatic reduction of economic growth in Thailand over the past three decades. The economy began to recover in 1999, and by 2003, GDP had regained precrisis (1996) levels.

An export-led growth strategy has been one of the policies leading to the striking record of economic growth in Thailand. During 1981–1996, exports grew at an annual rate of 21% while the share of exports to GDP increased noticeably from 23% in the early 1980s to 36% and 48% in 1990 and 1996, respectively. Even though in 1996, export growth dropped to 1.6% as a result of persistent real appreciation, the crisis-driven floating exchange rate regime helped to boost export growth to register at around 12% after the crisis (Jongwanich 2007).

A structural change of exports toward manufacturing products has also helped the country to maintain high export growth. The share of manufacturing exports to total exports increased to about 75% after 1996 from about 30% in the early 1980s. Traditional labor-intensive products such as clothing and footwear, toys and games, and processed food products such as canned tuna and canned pineapple were the key export items until the early 1990s (Table 1). Since then, machinery and transportation equipment, especially electronics and electrical appliances, have become the important export items. In 2006, this item accounted for 43% of total exports while traditional labor-intensive products accounted for only 6%. The share of electronics and electrical appliance was about 20% of total exports. After 1997, completely built-up vehicles became another important export in Thailand. Its share in total exports increased to 9% in 2005, from 3% in 1996–2000.

These favorable developments coincided with the relocation of production bases by the MNCs from East Asian investors. International competitiveness of the East Asian economy had eroded at the time because of wage increases and currency appreciation. In addition, the imposition and gradual tightening of quantitative restrictions by developed countries constrained certain labor-intensive exports, mostly textiles, garments, and footwear, from these East Asian exporters (Wells 1986). In the electronics industry and other durable consumer goods industries, technological innovations had begun to allow these investors to slice up the value chain of their production, relocating labor-intensive segments rather than entire industries to benefit from cheap labor available abroad (Krugman 1995).[1] As a result, manufacturers from Japan and the Asian newly industrialized countries began to actively participate in outward direct investment to establish regional production networks.

Thailand was selected by these investors to be one of their labor-intensive export bases.[2] A number of factors influence the relocation of production bases by MNCs, such as labor market environment and the quality of human capital, infrastructure, macroeconomic environment, and investment and trade policy regime. Based on Kohpiboon (2006), the wage compensation per worker in the manufacturing sector of majority-owned United States affiliates increased during 1990–2003 but the increases have been at a comparable level with three other Southeast Asian neighbors (Malaysia, Indonesia, and Philippines) although lower than other emerging market economies, especially Latin America. While wage compensation increased in the People's Republic of China and India much slower throughout the period 1983–2000, the gap between these two countries and other Southeast Asian countries, especially Thailand and Indonesia, had narrowed since 1997.

[1] This is one of the ongoing processes of globalization. It is known by various names such as vertical specialization, international production sharing, outsourcing, and product fragmentation.

[2] For further discussion, see Petri (1993), Dobson and Chia (1997), and Hill and Athukorala (1998).

Table 1: Export Composition of Thai Merchandise Trade, 1980–2006 (percent)

Export Value (US$billion)	1981–85	1986–90	1991–95	1996-00	2001	2002	2003	2004	2005	2006
	7.0	**12.7**	**39.9**	**58.7**	**64.9**	**67.8**	**79.9**	**96.1**	**110.1**	**130.0**
Export Composition (percent)										
1. Primary products	67.2	45.3	29.1	24.4	22.1	21.8	22.3	22.1	21.5	22.7
1.1 Food (SITC 0+1+4)	51.4	35.9	23.0	17.6	15.4	14.6	14.1	12.9	11.6	11.3
1.1.1 Unprocessed food	31.9	17.4	9.3	7.4	6.0	5.8	5.8	6.0	5.2	5.0
Rice	14.3	7.5	3.8	3.4	2.4	2.4	2.3	2.8	2.1	2.0
Tapioca	0.0	1.9	1.9	0.6	0.4	0.3	0.3	0.4	0.3	0.3
1.1.2 Processed food*	19.5	18.5	13.7	10.2	9.4	8.8	8.4	6.9	6.4	6.3
Canned pineapple	2.2	2.1	1.7	1.3	1.1	1.2	1.2	1.1	1.1	1.1
Canned tuna										
Processed chicken	0.8	1.4	1.1	0.7	0.9	0.9	0.8	0.0	0.0	0.0
Processed shrimp	1.2	1.3	1.3	1.8	1.8	1.6	1.3	1.1	0.9	1.0
1.2 Agricultural raw materials (SITC 2-27-28)	9.3	7.1	4.6	3.8	3.1	3.7	4.7	4.8	4.5	5.3
Rubber (SITC 23)	7.1	5.6	3.6	2.9	2.1	2.7	3.6	3.7	3.6	4.4
1.3 Non-agricultural primary products (SITC 3+27+28+68)	6.5	2.3	1.5	3.0	3.6	3.6	3.5	4.4	5.4	6.2
2. Manufacturing products (SITC 5+6+7+8-68)	30.9	53.7	69.8	73.3	74.5	75.1	75.4	76.3	76.8	76.0
2.1 Clothing (SITC 84)	7.0	11.8	10.8	6.3	5.6	5.1	4.6	4.2	3.7	3.3
2.2 Machinery and transport equipment (SITC 7)	6.6	14.7	27.3	38.8	40.5	40.7	42.6	43.2	43.5	43.8
2.3 Electronic machinery (SITC 72)	5.2	8.7	13.8	18.7	19.7	20.9	20.9	20.5	18.3	17.5
2.4 Automotive& parts (SITC 73)	0.4	0.7	2.1	3.1	4.3	4.6	6.5	7.2	8.6	8.9
2.5 Footwear (SITC 85)	1.0	2.2	3.2	1.6	1.2	1.1	1.0	0.8	0.8	0.7
2.6 Jewellery (SITC 8971 and 8972)	0.7	2.6	1.9	1.6	1.7	1.6	1.5	1.5	1.7	1.5

Source: United Nations Comtrade database (Rev.1), downloaded September 2008.

Based on four indicators of basic infrastructure, namely, electricity production per head of population; telephone lines per 1,000 people; improved water source; and percentage share of research and development (R&D) expenditure to GDP for the 1990s, Thailand is behind Malaysia and Singapore in the first three respects, especially electricity and telephone services. However, the availability of infrastructure services in Thailand is better than in Indonesia and the Philippines, especially as far as electricity supply is concerned. In terms of public R&D expenditure to GDP, Thailand is also below the average of other middle-income developing countries. This is even true when compared with the ASEAN-4.

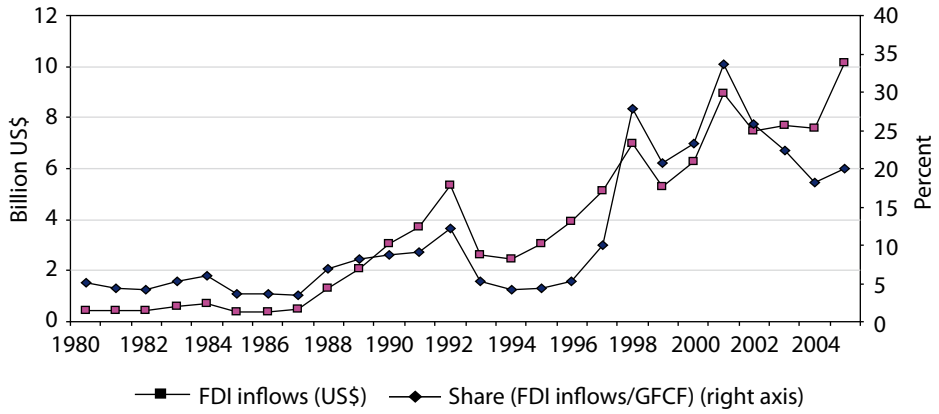
However, over the past four decades, the Thai government has maintained a firm commitment to the ideology of private-sector-led industrialization and foreign-investment-friendly environment, combined with prudent public investment in infrastructure and macroeconomic stability, especially price stability. In particular, the trade policy regime has changed from import substitution as implemented in 1960 to the early 1980s, to export promotion since the late 1980s. The most comprehensive plan of tariff restructuring was proposed in 1990 and implemented in 1995 and 1997. This involved tariff reduction and rationalization, wherein maximum tariffs were reduced from 100% to 30%. As well, in the mid-1980s, the investment promotion regime changed from promoting import-substituting industries to encouraging export-oriented industries. The key importance of this change is the introduction of tariff exemption by the Board of Investment (BOI) on imported raw materials as an additional privilege for export-oriented promoted firms (i.e., for an export–sale ratio of greater than 30%). This was supplemented by two more tariff exemptions: the tariff exemption/drawback (Section 19 of the Custom Laws) administered by the Department of Customs, and the tax rebate scheme of the Fiscal Policy Offices. However, privileges from BOI tend to be superior to those from Section 19 of the Custom Laws. This is because after receiving approval from the BOI, firms are automatically allowed to access their imports without delay to calculate and pay levies. This reduces custom procedures that were considered unusually cumbersome and which imposed costs on importers. All in all, the ideology of private-sector-led industrialization, foreign-investment-friendly environment, combined with relatively sound macroeconomic management and prudent investment in infrastructure, have helped to attract more MNCs and expand export production in the country.

In response to the policy environment in Thailand, FDI inflows have increased noticeably since the late 1980s. The dollar value of FDI (net) inflows increased from annual averages of US$0.3 billion during the period 1981–1985 to US$1.4 billion and US$1.8 billion during the period 1987–1990 and 1991–1995, respectively (Figure 1). Even though there was a financial crisis during 1997–1998, FDI inflows continuously increased to US$8 billion during the period 2000–2005, which was in contrast to other forms of capital flows that declined significantly during this period. The share of FDI inflows to gross fixed capital formation increased from an annual rate of 5.4% in the 1980s to 12.3% and 30% in the 1990s and the early 2000s, respectively. It is clear that FDI inflows increased

sharply after the mid-1980s when export promotion strategy was implemented. In other words, an export promotion strategy tends to attract more FDI than does an import substitution regime.

The manufacturing sector has been the largest destination of direct investment, particularly after the mid-1980s. It accounted for 32% from 1986 to the present, followed by trade (26%) and financial institutions (15%) (Table 2). The influx of manufacturing FDI was a result of export-oriented, labor-intensive FDI, especially from East Asian direct investors. This increased importance of North East Asian investors in Thailand was consistent with the experience of other Southeast Asian countries (Hill and Athukorala 1998, 33–4).

Figure 1: Foreign Direct Investment Inflows and Percentage Share to Gross Fixed Capital Formation



Sources: Gross fixed capital formation data are from the National Economic and Social Development Board online database (available: www.nesdb.go.th, downloaded June 2008). FDI inflows are from Bank of Thailand online database (available: www.bot.or.th, downloaded June 2008).

The sectoral breakdown of manufacturing FDI has coincided with the Thai industrialization process. Manufacturing FDI inflows from 1970 to the mid-1980s were mainly in import-substituting industries such as textiles, automobiles, and chemicals (Table 2). FDI inflows to textiles, electrical machinery and appliances, chemicals, and foods and sugars accounted for 32%, 17%, 14%, and 11%, respectively, of total manufacturing FDI inflows between 1970 and 1980. A key incentive for manufacturing FDI inflows during this period was the highly protected domestic market owing to an import-substitution industrialization strategy. Manufacturing FDI inflows were typically market-seeking FDI (Akira 1989). The highly protected domestic market encouraged MNCs to establish affiliates in host countries and produce for the local market instead of producing in home countries and exporting to host countries. From the mid-1980s onward, foreign firms shifted their interest from import-substituting industries to traditional labor-intensive

manufacturing industries such as clothing, footwear, and toys classified in other manufacturing industries. More recently, labor-intensive assembly activities in machinery and transportation equipment and in electronic appliances have been the main attraction for foreign investors. The share of these two items in total manufacturing FDI inflows increased to 51% in 2001–2005.

Table 2: Sectoral Composition of FDI Inflows in Thailand, 1970–2005 (percent)

	1971–75	1976–80	1981–85	1986–90	1991–95	1996–00	2001	2002	2003	2004	2005
Manufacturing	**26.0**	**16.1**	**25.2**	**44.2**	**31.0**	**44.5**	**44.3**	**26.3**	**27.2**	**28.3**	**16.0**
Food and sugar	3.0	1.5	2.6	3.7	1.8	2.3	1.3	0.5	1.6	2.9	0.5
Textiles	10.2	4.0	2.1	3.6	1.4	1.3	0.7	0.4	0.6	0.3	0.5
Metal and nonmetallic	1.5	0.7	2.9	5.3	2.7	5.3	4.3	4.2	3.1	3.3	1.3
Electrical appliances	2.6	4.5	5.2	13.6	9.4	13.9	16.0	8.3	7.3	3.9	2.6
Machinery and transport equipment	0.7	1.4	1.9	2.0	2.7	9.4	7.2	5.2	7.9	9.9	4.5
Chemicals	3.3	2.5	2.9	6.0	4.9	5.2	4.4	3.2	1.8	0.8	1.6
Petroleum products	3.5	0.7	6.4	2.4	2.6	2.5	6.6	0.5	0.1	1.5	0.1
Construction materials	0.5	0.1	0.2	0.1	0.3	0.5	0.1	0.3	0.2	0.1	0.1
Others	0.7	0.8	1.0	7.5	5.0	4.0	3.6	3.6	4.7	5.7	5.0
Financial institutions	**24.1**	**57.2**	**30.2**	**14.8**	**20.5**	**5.8**	**0.5**	**0.7**	**1.2**	**1.5**	**9.5**
Trade	**20.8**	**10.0**	**12.7**	**17.2**	**14.5**	**23.4**	**24.3**	**50.5**	**46.7**	**45.5**	**16.4**
Construction	**11.7**	**5.7**	**10.5**	**8.4**	**5.8**	**2.7**	**0.1**	**0.3**	**0.6**	**1.3**	**0.5**
Mining and Quarrying	**9.2**	**3.3**	**14.3**	**1.8**	**2.8**	**1.4**	**21.0**	**2.6**	**2.3**	**2.6**	**0.5**
Agriculture	**0.2**	**0.5**	**0.4**	**1.6**	**0.4**	**0.0**	**0.0**	**0.0**	**0.3**	**0.1**	**0.0**
Services	**6.1**	**6.1**	**4.7**	**4.5**	**2.8**	**7.4**	**3.2**	**11.7**	**3.7**	**4.9**	**2.8**
Investment	**0.0**	**0.0**	**0.0**	**0.0**	**1.6**	**7.0**	**1.9**	**0.7**	**6.1**	**2.8**	**4.3**
Real Estate	**2.0**	**1.0**	**2.1**	**7.0**	**19.8**	**5.4**	**1.6**	**1.3**	**3.0**	**2.6**	**11.0**
Others	0.0	0.0	0.0	0.5	0.8	2.4	3.0	5.9	9.0	10.5	39.0

FDI = foreign direct investment.
Source: Bank of Thailand online database (available: www.bot.or.th, downloaded June 2008).

The Thai Industrial Census 1997 (data for 1996), the only comprehensive industrial census in Thailand, shows the vital role of MNCs in manufacturing production and exports.[3] Almost 50% of gross output was manufactured by foreign plants, accounting for 48% of total manufacturing value-added (Table 3). Measured in terms of exports, the level of foreign presence was even higher than gross output and value-added. Foreign plants accounted for 59% of manufacturing exports. Hence, foreign plants tend to be more export-oriented than local ones. Nonetheless, in terms of employment share, foreign presence was less important, with foreign plants accounting for only 35% of manufacturing employment. Their relatively lesser importance in terms of employment reflects the capital-intensive nature of foreign firms as widely observed in many developing countries.

[3] See a full discussion of the Thai Industrial Census 1997 in Section V.

Subsidiaries of MNC tend to play an important role in electrical machinery, glass products, professional and scientific equipment, transport equipment, and beverages, with the output share of foreign plants to total industry (covering both foreign and local plants) accounting for more than 70% of total industry. The share of foreign plants measured in terms of employment, export, and value-added to some extent displays a similar pattern. In these industries, production technology *per se* seems to be a proprietary asset and is dominated by a handful of multinational firms. This is in contrast to industries like ceramic products, footwear, furniture and woods products, toys, processed foods, and leather products where production technology is relatively stable and widely available. The output share of foreign plants in the latter industries ranges from 5.5% to 35%.

Table 3: Measures of Foreign Presence and Industrial Characteristics of Thai Manufacturing

	Foreign Presence (percent to total industry)			
Description	**Output**	**Employment**	**Export**	**Value-Added**
Electrical machinery	85.0	67.4	88.1	82.3
Glass and products	76.2	49.2	72.2	72.5
Professional and scientific equipment	73.4	61.5	90.9	80.6
Transport equipment	71.3	39.8	86.4	66.4
Beverages	70.5	85.6	44.1	72.6
Jewelry	64.6	42.6	60.8	56.7
Other chemicals	61.2	36.0	59.9	53.0
Machinery, except electrical	58.6	41.5	74.6	57.2
Textiles	58.4	43.0	66.4	64.3
Rubber products	55.4	37.4	48.0	53.9
Fabricated metal products	55.2	34.9	77.5	60.9
Paper and products	53.3	23.6	61.2	48.2
Petroleum refineries	49.2	59.6	50.2	37.2
Industrial chemicals	42.8	49.7	64.2	42.5
Iron and steel	42.2	32.2	52.1	48.1
Plastic products	40.4	28.0	51.5	35.8
Wearing apparel, except footwear	35.5	18.5	44.1	32.7
Leather products	35.2	24.4	53.5	47.8
Furniture, except metal	34.1	15.5	47.7	29.0
Food products	30.8	21.5	37.3	29.2
Toys	23.9	18.7	36.1	31.1
Wood products, except furniture	20.1	8.3	28.1	17.5
Footwear, except rubber or plastic	18.4	24.7	47.4	30.7
Ceramic products	5.5	14.5	32.9	32.5
Tobacco	4.6	8.9	18.4	2.8
Manufacturing	48.3	34.9	58.9	48.3

Source: 2006 data compiled from the *Industry Census 1997* (National Statistics Office 1997).

III. Analytical Framework: Export Performance, MNCs, and Market Structure

A. MNCs and Export Performance

The presence of MNCs could generate positive effects on overall export performance. Multinational firms are widely acknowledged as having firm-specific advantages that allow them to overcome a potentially disadvantaged position with respect to domestic counterparts in the foreign market (Greenaway et al. 2004). Such advantages take the form of knowledge-based assets such as proprietorial information relating to product or process technology, managerial know-how, quality of the workforce, marketing, and branding. As pointed out by Clerides et al. (1998) and Greenaway et al. (2004), entering the export market incurs sunk costs (i.e., market research has to be done; option appraisals completed; existing products modified; new distribution networks set up) so firms must have sufficient profits to cover the sunk costs. Therefore, MNCs, which already have knowledge and experience operating in foreign markets and can benefit from network economies and know-how of managing the international marketing, distribution, and servicing of their products, could cover sunk costs and access into foreign markets easier than domestically owned firms, thereby expanding a country's export performance.

In addition to the potential direct impact of MNCs on trade performance in the host country through their own exporting activity, the indirect effect through their impact on domestically owned firms could occur. The indirect effect of MNCs on domestically owned firms is generally referred to as export spillovers. There are three key channels through which export spillovers could take place. One immediate channel is by domestic firms learning from the export activities of foreign subsidiaries through information externalities (Aitken et al. 1997, Greenaway et al. 2004). As pointed out, exporting involves fixed costs that relate to establishment of distribution networks; investment in advertising to gain public exposure; and research about foreign markets to gain intelligence on consumers' tastes, market structure, competitors, and regulations. Multinational firms tend to have easier access to information on foreign markets because they form part of multinational enterprises that have knowledge and experience from operating in foreign markets. Since such information has certain public good qualities that cannot be fully internalized, this information could spill over to domestic firms. The spillovers from foreign multinationals would lower the sunk costs associated with export market entry and offer the expansion of sales in foreign markets. 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 markets, or provide channels through which products are distributed.

Multinationals can also be another source of information not directly related to exporting—such as technologies and management techniques—from which domestically owned firms

can benefit through demonstration and imitation. This includes providing new technologies and management techniques. Subsidiaries tend to have more advanced production technology than local firms. While such technology associated with foreign firms has also certain public good qualities, the localization of the foreign firm could potentially generate positive externality in terms of technological benefit to the local firm. Since the market success of each firm depends on the level of technology it employs, this encourages the local firm to learn the associated superior technology.[4]

Affiliates of foreign firms could affect the export decision of domestic firms by increasing the level of competition. This forces 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 barriers to entry or with more oligopolistic market structures (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 leaner production techniques, which in turn facilitate entry into foreign markets.

However, the role of MNCs in expanding exports and generating export spillovers to domestically owned firms is conditioned on the trade policy regime. A restricted trade policy regime could encourage multinational firms to produce and sell in domestic markets to enjoy benefits from the highly protected domestic market. This is particularly the case where the domestic market is large. In addition, the trade policy regime influences cost effectiveness in the learning activities of 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. This is 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 to the 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 local firms. In this environment, it is more difficult for the local firm to learn the advanced technology.

By contrast, a high level of policy neutrality results in a higher likelihood for MNCs becoming involved with the host country's production to pursue their strategy of maintaining a competitive position in international markets. 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 1998, Kohpaiboon 2006).

[4] Note that the effort of learning and adopting the associated technology is linked to a dollar cost, so the local firm has to decide whether or not to learn the associated advanced technology.

So far, empirical evidence on firms' export decisions and export spillovers is limited and the results are mixed. Aitken et al. (1997) uses panel data on Mexican manufacturing plants during the period 1986–1990 and tests the impact of MNCs on the domestic firm's decision to export, controlling for the local concentration of MNC's export activity, sectoral concentration of export activity in general, and overall geographic concentration of economic activity. Their results support the hypothesis of export spillovers. Kokko et al. (2001) examine export spillovers using a cross-section of manufacturing firms in Uruguay in 1988. A probit model was estimated using firm-level as well as sector-level variables as regressors, including a measure of the impact of foreign MNCs at the sector level. The results suggest that the likelihood of exporting has increased with the presence of foreign MNCs since 1973, the more outward-oriented period in Uruguay. Furthermore, Greenaway et al. (2004), using firm-level panel data for the United Kingdom, investigate whether spillovers affect a firm's export intensity. Two channels are considered for MNC spillovers, namely, the MNCs' export activities and R&D activities in the sector. They find that MNCs' exports have a positive effect on the probability of domestic firms becoming exporters but they do not find evidence that such spillovers impact on the export ratio of domestic firms. On the other hand, there are R&D spillovers from multinational firms to domestic firms that affect positively both the decision to export and the choice of export ratio.

Positive spillovers to domestic firms have not been found in all contexts. Barrios et al. (2003) examine the importance of a firm's own R&D activity and intrasectoral spillovers on the decision to export and on export intensity, using firm-level panel data for Spain for the period 1990–1998. The effect of spillovers from MNCs is examined separately for both foreign and domestic firms, providing evidence for significant difference between the two firm types. The results from this study do not provide any evidence that there are spillovers from the export activities of MNCs on domestic firms in the same sector. However, this study indicates that foreign firms benefit from the export activities of MNCs in the same sector. This suggests that foreign firms have a better ability to absorb knowledge in terms of exporting than domestic firms. Ruane and Sutherland (2005) investigate how export decisions of host-country enterprises are associated with the presence and export intensity of foreign-owned enterprises in an export-platform economy using firm-level data for the manufacturing sector in Ireland. The results show that the decision by host-country enterprises to enter the export market is positively associated with the presence of foreign-owned enterprises in their sector. However, the export intensity of host-country enterprises is negatively associated with the export sales ratios of foreign-owned enterprises.

B. Market Structure and Export Performance

In terms of industrial market structure, as pointed out by White (1974) and Utton and Morgan (1983), firms that tend to enjoy some degree of domestic market power would face a negative relationship between their domestic sales and the price they can charge

domestic customers. Under profit maximization, firms may be willing to sell products in the domestic market to enjoy their market power. Thus, the negative relationship between a heavily concentrated industry and exports is evident. However, when there is some protection from imports, firms could have an incentive to increase exports by allowing prices to discriminate between the home and foreign markets. In other words, in industries with high tariff rates under which firms tend to be domestic-oriented, a domestic policy of fostering mergers that create market power at home may indeed help to encourage firms' export decisions benefit from price discrimination.

This policy would in most contexts be classified as dumping, and therefore subject to special policy treatment. It may in practice be difficult to pin down and continue for some time although exports in such a circumstance could be associated with welfare loss induced by price discrimination in the domestic economy. Whereas price discrimination in a purely domestic context may frequently be condemned by policy makers, where exports are concerned, they may take a quite different view (Utton and Morgan 1983, White 1974). Thus, for the same reason, the antitrust policies of many countries give special exemptions for cartels that deal solely with exports, and may even encourage (or not deter) mergers between firms that are expected thereafter to be in a stronger position in the world market.

All in all, price discrimination between the domestic and foreign markets leads to a higher volume of exports than if the domestic market is monopolized but unprotected. Thus, given the existence of trade barriers, mergers that create market power may indeed help to increase exports but at the expense of domestic consumers. In other words, we might expect the level of exports to be higher in heavily concentrated industries, which could lead to pricing policies approaching monopoly level, than in less concentrated industries. Note that under circumstances where price discrimination is ruled out, for example, as in dumping by international agreement, the monopolist has the choice of either giving up exports all together or exporting the same amount as a competitive industry, depending on the producer's surplus. Therefore, exports in heavily concentrated industries may not be different from those in less concentrated industries.

IV. Empirical Model of Firms' Export Decisions

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 (Kokko et al. 2001). It may be premature to claim that there is an established theory to explain interfirm differences in export behavior, but there seems to be a consensus that both industry characteristics related to comparative advantages and individual firm characteristics matter. Based on previous empirical studies, the determinants of firms' export decisions are founded on profit maximization, where a firm

faces the choice between serving the domestic market, exporting, or both, to maximize its profit. Generally, to export, the *expected* return from the foreign market must be higher than that from the domestic market. Based on the previous literature, there are four firm-level factors and three industry-level factors affecting the *expected* return of firm *j* in both domestic and foreign markets.

A. Firm-Level Factors

The first factor that could have implications on a firm's export decision is firm size (*size*). As mentioned earlier, there are typically significant fixed costs related to establishing export markets. Thus, larger firms are more likely to be involved in exporting. In other words, entering the export market incurs sunk costs so that larger firms are likely to get sufficient profits to cover the sunk costs. The positive relationship between the firm's size and its export decision is expected. The second variable is firm age (*age*). In contrast to size, the coefficient corresponding to firm age in determining the firm's export decision is inconclusive. On one hand, according to Roberts and Tybout (1996), older firms are more likely to be good performers and be more efficient than younger firms so that such firms are more likely to have higher export activity than younger firms. In addition, firms would accumulate knowledge through experience (the learning by doing argument by Barrios et al. 2003) so that older firms tend to be more efficient and better performers in terms of export activity than younger firms. On the other hand, if firms were first established mainly to supply the local market, and diversification into exports does not occur until opportunities to expand domestically have been exhausted, the negative relationship between age and export activity is expected. In other words, younger firms may be more likely to export since they were established during a more outward-oriented period. It is important to note that the impact of size and age is not necessarily linear. As pointed out by Power (1998) and Barrios et al. (2003), it is possible that after a certain threshold, the firm's experience ceases to exert a positive influence on its efficiency and performance. Thus, this study allows the effect of firm size and age to be nonlinear by including both variables squared, i.e., $size^2$ and age^2.

Firm productivity (*VD*) is another variable that could affect export activity. As pointed out by Clerides et al. (1998) and Greenaway and Kneller (2007) firms have to raise productivity before they enter the world market so that there would be a direct and positive connection between productivity and export decision.[5] As in the case of size and age, it is possible that once a certain level of productivity is reached, productivity has no influence on determining the firms' export activity. The squared variable of *VD* (VD^2) is included to capture the nonlinear relationship between productivity and export activity.

[5] Note that after firms enter the 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 the export market.

Finally the firm's ownership (*Own*) could also influence its export activity. As mentioned in Section III, MNCs are likely to export more than local firms as they have advantages in the form of knowledge-based assets, particularly proprietorial information relating to product or process technology, managerial know-how, international marketing, and distribution. Multinational firms could, therefore, cover sunk costs and access into foreign markets easier than domestically owned firms. However, as mentioned earlier, the presence of MNCs in generating export activity also depends on the country's trade policy. Thus, an interaction term between the presence of MNCs and trade policy regime is introduced in this study, i.e, $Own \cdot ERP$.

B. Industry-Level Factors

Three industry-specific factors, namely, effective rate of protection (*ERP*), producer concentration (*CR*4), and capital–labor ratio (*KL*), are introduced in this study. The role of protection obviously determines export activity. That is, export activity tends to deteriorate under a restricted trade policy regime. The direct negative relationship between protection and export activity is expected. Producer concentration is included to capture the effect of industrial market structure to export activity. As mentioned in Section III, the high level of producer concentration could, to some extent, reflect market power in the domestic economy so that firms may decide to sell their products in the domestic market and enjoy their monopolist power. The negative relationship between producer concentration and firms' export decision is expected. However, as mentioned earlier, when there is some protection from imports, firms could have an incentive to increase exports by pursuing price discrimination between the home and foreign markets. Thus, the role of industrial market structure is conditioned on the trade policy regime. The interaction term between *CR*4 and *ERP* is introduced ($CR4 \cdot ERP$) and a positive sign between this term and export activity is expected.

The capital–labor ratio (*KL*) is included to capture industry characteristics and the country's comparative advantages. In developing countries where labor is relatively cheap compared to capital, a lower capital–labor ratio in an industry reflects an ability of firms to manufacture products aligned to a country's comparative advantage. Thus, exports are likely to be higher in an industry that has a low capital–labor ratio. 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:

$$X_{ij} = f\begin{pmatrix} size_{ij}, & size_{ij}^2, & age_{ij}, & age_{ij}^2, & VD_{ij}, & VD_{ij}^2, & Own_{ij}, & Own_{ij} \cdot ERP_j, \\ (+) & (-) & (+/-) & (-) & (+) & (-) & (+) & (-) \\ \\ ERP_j, & CR4_j, & CR4_j \cdot ERP_j, & KL_j & & & & \\ (-) & (-) & (+) & (-) & & & & \end{pmatrix} \quad (1)$$

where

X_{ij} = export decision of firm i in industry j, which takes the value 1 for firms that export and 0 for firms that sell in the domestic market. Both MNCs and domestically owned firms are included in equation (1)

$size_{ij}$ = size of firm i in industry j

age_{ij} = years of operation of firm i in industry j

VD_{ij} = productivity of firm i in industry j

Own_{ij} = presence of multinational firms, which takes the value 1 for firms involved with MNCs and 0 otherwise

ERP_j = trade and investment protection in industry j

$CR4_j$ = producer concentration in industry j

KL_j = capital–labor ratio in industry j

C. Export Spillovers

While equation (1) examines the role of multinational firms (MNCs) and industrial market structure to overall export activity in a country, such equation needs to be slightly modified to investigate the role of MNCs on export spillovers. While equation (1) includes both multinational firms and domestically owned firms, to examine export spillovers, multinational firms need to be excluded from the empirical model. In addition, ownership (Own_{ij}), which takes value of 1 for firms involved with MNCs and 0 otherwise, is replaced by the role of MNCs in a particular industry (For_j). If the coefficient associated with For_j is positive, it shows that MNCs could positively influence the domestically owned firm's export decision. In other words, MNCs could generate export spillovers to domestically owned firms. Equation (1) can be modified to equation (2) as follows:

$$X_{ij}^{*} = f\left(\begin{array}{llllllll} size_{ij}, & size_{ij}^2, & age_{ij}, & age_{ij}^2, & VD_{ij}, & VD_{ij}^2, & For_j, & FOR_j \cdot ERP_j, \\ (+) & (-) & (+/-) & (-) & (+) & (-) & (+/-) & (-) \\ & & & & & & & \\ ERP_j, & CR4_j, & CR4_j \cdot ERP_j, & KL_j & & & & \\ (-) & (-) & (+) & (-) & & & & \end{array}\right) \quad (2)$$

where

X^{*}_{ij} = export decision of domestically owned firm i in industry j, which takes the value 1 for firms where their products are exported, and 0 for firms where their products are sold in the domestic market

For_j = presence of multinational firms in industry j

V. Data and Econometric Procedure

A. Data and Variable Measurements

The ideal data set for examining determinants of export decision is the panel data set compiled by pooling cross-industry and time-series data. In particular, in the nature of export decision that involves a time-consuming process to cover sunk costs, panel data are more appropriate. Unfortunately, given the nature of data availability in Thailand, this preferred data choice is not possible. The second best available is the 1997 industrial census, primarily because this is by far the most comprehensive source available to date (Ramstetter 2006, 117). Even though there are alternative data sets available (e.g., industrial surveys in 1998 and 2000 by NSO, and those in 2001–2004 by the Office of Industrial Economics, their coverage is far shorter than that in the 1997 census. For example, the 2001–2004 industrial survey by the Office of Industrial Economics covered 3,000 plants, accounting around 35% of the estimated manufacturing valueadded from the National Accounts. Hence, the 1997 census is our preferred data set.

The census covers 32,489 plants, belonging to 125 4-digit industries of the Thai Standard of Industry Classification (TSIC). Of these, 23,677 plants responded to the questionnaire. The census was cleaned up, first, by deleting plants that had not responded to one or more of the key questions, and which had provided seemingly unrealistic information such as negative value-added. As had been described in more detail elsewhere (Ramstetter 2001 and 2004), there are some duplicated records in the survey returns, presumably because plants belonging to the same firm filled out 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 10 key variables of interest in this study as one record.[6] Excluded are 12 industries, namely:

(i) those that serve niches in the domestic market, processing of nuclear fuel-TSIC 2330, manufacture of weapons and ammunition-TSIC 2927

[6] See footnote 5in Ramstetter (2004). 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).

(ii) those in the service sector, e.g., reproduction of recorded media-TSIC 2230, publishing of recorded media-TSIC 2213, building and repairing of ships-TSIC3512

(iii) those 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

As a consequence, the final data set contains 8,471 plants (1,684 foreign-owned plants and 6,787 domestic owned plants) in 113 industries.

Despite being far more comprehensive than alternative sources, the coverage of the industrial census estimates reported only 1.8 million workers or 39% of corresponding estimates from labor force surveys. Similarly the gross output and value-added reported in the census was only 76% and 59% of their corresponding estimates in National Accounts reported by the National Economics and Social Development Board (NESDB).

For the firm's export decision (X_{ij} and X_{ij}^{*}), the dummy variable that takes the value of 0 represents firms that serve only in the domestic market, or which do not export. The choice of cut-off point is dictated by data availability in the census; census information on the firm's market orientation as reported in five wide ranges; and percentage of exports (less than 50%, 50%, less than 100%, and 100% percent exports). In other studies such as Greenway et al. (2004), export propensity of firms is applied as a dependent variable. However, as information of firms' exports is reported in a wide range, it is unlikely to get an appropriate measure of export propensity. The firm size (*size*) is measured by total sales while the firm age (*age*) is the period a firm has been in operation.

Productivity (*VD*) in this study is measured by value-added per worker. Previous studies (Barrios et al. 2003) proxy productivity by the ratio of R&D expenditure over total sales while Greenaway et al. (2004) use average wage of an industry to reflect a level of skilled labor in the United Kingdom in addition to value-added per worker. These two variables are likely to have a positive relationship with export activity. However, due to data limitations, i.e., no appropriate data on R&D expenditure in the census, these variables are not captured in this study.

Firm ownership (*Own*) is a binary dummy variable, which equals 1 for foreign firms and 0 otherwise. 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 firms. The cut-off point (0%) is higher than the 10% widely used by the International Monetary Fund (IMF), Organization for Economic Co-operation and Development, US Department of Commerce, as well as several scholars studying multinational firms (IMF 1993 and Lipsey 2001). However, the choice is dictated by data availability since information on foreign ownership

in the census is reported within a wide range, i.e., from 0%, less than 50%, greater than 50%, and 100% foreign shares. In terms of export spillovers in equation (2), foreign presence (*For*) is measured by the ratio of sales of foreign firms to total sales (local and foreign). In some previous empirical studies, employment or capital shares have been used to measure foreign presence. Expressing foreign presence as an employment share tends to underestimate the actual role of foreign affiliates because MNC affiliates tend to be more capital-intensive than locally nonaffiliated firms. In terms of capital share, foreign presence can be easily distorted by the presence of foreign ownership restrictions. Such a restriction was in effect in Thailand during the study period (Kohpaiboon 2006). Hence output share is the preferred proxy.

The trade policy regime is proxied by effective rate of protection (*ERP*). Even though there is no consensus between *ERP* and nominal rate of protection (*NRP*) among economists as to choice of one over the other (Corden 1966 and Cheh 1974), Jongwanich and Kohpaiboon (2007) argue that political bargains in Thai manufacturing are struck over *ERP* rather than *NRP* (data on ERP estimates are from Athukorala et al. 2004). Athukorala et al. reflect the protection structure in 1997. Even though *ERP* estimates mainly capture only tariff protection, this is not a major limitation because there are not many quantitative restrictions 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, 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 no 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.

Estimating producer concentration (*CR4*) is difficult in the Thai case. The only known official time series on industry output (revenue) comes from National Accounts' estimates made by the NESDB, and the only known comprehensive industrial census is for 1996 from the NSO. Unfortunately, however, estimates of industry output from these two sources differ greatly for a number of industries in 1996.[7] In order to circumvent this constraint, we use data on large corporations from Business On-Line (2008), supplemented by a large number of related sources, to estimate sales of the largest firms in each industry. This firm-level compilation is of course very different than corresponding compilations from the industrial census and the National Accounts.[8] Because the data for the largest firms and industry output are not compiled consistently in Business On-Line, it is impossible to consistently calculate four-firm concentration ratios that cover all of

[7] The NSO also provides estimates extrapolated from sample surveys for 1998, 1999, 2000, and 2002 (NSO, various years) but these estimates also differ greatly from corresponding NESDB estimates in many industries.

[8] The existence of multiplant firms can create large differences between firm-level compilations and plant-level compilations such as in the industrial census. The methodology for constructing national accounts estimates differs from either firm- or plant-level compilations.

Thai manufacturing in 1996. Hence, producer concentration in this paper is calculated as the share of the largest four firms in the sales of all large firms in our database.[9] See Appendix I for summary data of *CR*4 and *ERP*.

B. Econometric Procedure

To examine the firm's export decision, three econometric procedures are applied in order to check the sensitivity of the results. The first procedure is ordinary least square (OLS), which takes into account the problem of outliers and heteroskedasticity. For detecting outliers, Cook's distance is applied.[10] However, there are two key problems relating to OLS estimation under binary dependent variable (1 for firms that export and 0 otherwise). Firstly, the predicted value of the dependent variable under OLS could be higher than 1 or could become negative. Secondly, the linear relationship between dependent and independent variables is generally assumed. However, the relationship between probability to export and explanatory variables could be nonlinear. To limit the predicted value of the dependent variable between 0 and 1, Probit and Logit models are applied. Under these two models, the relationship between dependent and independent variables is assumed to be the increasing function $G(\cdot)$ that lies between 0 and 1, i.e., $0 \leq G(\cdot) \leq 1$. The Probit and Logit models are as follows:

$$X_{ij} = G(Z) \tag{3}$$

$$G(Z) = \begin{cases} Z & \text{OLS model} \\ e^{Z} \Big/ \left(1 + e^{Z}\right) & \text{Logit model} \\ \int_{-\infty}^{Z} \phi(v)dv & \text{Probit model} \end{cases} \tag{4}$$

where $\phi(z) = (2\pi)^{-1/2} e^{\left(-z^2/2\right)}$ and Z_{ij} for equation (1) and (2), respectively, are as follows.

For equation (1): export decision of all firms

$$Z_{ij} = \beta_0 + \beta_1 size_{ij} + \beta_2 size_{ij}^2 + \beta_3 age_{ij} + \beta_4 age_{ij}^2 + \beta_5 VD_{ij} + \beta_6 VD_{ij}^2 + \beta_7 Own_{ij} + \beta_8 (Own_{ij} \cdot ERP_j) + \beta_9 ERP_j + \beta_{10} CR4 + \beta_{11} (CR4 \cdot ERP) + \beta_{12} KL_j$$

[9] 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 sample were clearly not engaged in manufacturing and were omitted from the sample. Moreover, if two or more majority-owned firms belonging to the same corporate group were included in an industry, data for these firms were combined and the combined entity was treated as a single firm. See Appendix A in Kohpaiboon and Ramstetter (2008) for more details.

[10] Cook's (1977) distance takes into account both the studentized residuals, or the residual divided by its standard error) as well as the estimated variances of the residuals to identify outliers. For details see Belsley et al. (1980) and Barnett and Lewis (1994).

For equation (2): export spillovers

$$Z_{ij} = \beta_0 + \beta_1 size_{ij} + \beta_2 size_{ij}^2 + \beta_3 age_{ij} + \beta_4 age_{ij}^2 + \beta_5 VD_{ij} + \beta_6 VD_{ij}^2 + \beta_7 For_j + \beta_8 (For_j \cdot ERP_j) + \beta_9 ERP_j + \beta_{10} CR4 + \beta_{11} (CR4 \cdot ERP) + \beta_{12} KL_j$$

VI. Results

The determinants of export decision are reported in Table 3. Column A is the estimation result based on OLS estimation, which excludes outliers and corrects for heteroskedasticity while columns B and C are the estimation results based on Probit and Logit models, respectively. Heteroskedasticity and outlier problems are also taken into account in these two models.[11] The signs and magnitudes of all independent variables across these three models are comparable, but based on the standard error of regression and Akaike information criterion, the Probit model is chosen in this study.

Firm ownership (*Own*), which equals 1 for foreign firms and 0 otherwise, is positive and statistically significant. This supports the hypothesis that MNCs are likely to export more than domestic firms. The result also confirms that MNC affiliates tend to have advantages not only in terms of advanced production technology, which seems to be a proprietary asset and is dominated by a handful of multinational firms, but also managerial know-how, international marketing, and distribution. MNCs could cover sunk costs and access into foreign markets easier than domestically owned firms. The interaction term between firm ownership and trade protection (*Own*·*ERP*) becomes negative although the statistical significance is relatively weak in Probit models, compared to the OLS and Logit models. However, this implies that the decision of foreign firms to export is still conditioned on the nature of the trade policy regime in the country. In an industry that has high tariff protection, foreign firms tend to produce and sell in domestic markets to enjoy benefits from the highly protected domestic market. Thus, restricted trade policies discourage foreign firms to export.

The negative and statistical significance of producer concentration (*CR*4) indicates that export activity tends to be less in an industry that has a high value of producer concentration. Firms would enjoy domestic market power so that they tend to produce and sell in the domestic market. However, the interaction term between producer concentration and trade protection (*CR*4·*ERP*) is positive and statistically significant. This shows that when there is some protection from imports, firms in Thai manufacturing could have an incentive to increase exports by allowing prices to discriminate between the home and foreign markets. Export activity in such circumstances is, however, associated with welfare loss induced by price discrimination behavior (Utton and Morgan 1983 and White 1974).

[11] Note that estimation results between with and without outliers are comparable but the adjusted R2 and standard error of regression are better when the outliers are excluded from the model.

Although trade restrictions could help heavily concentrated firms to expand their exports, i.e., the interaction term of *CR*4 and *ERP* is positive, the negative coefficient of *ERP* clearly shows that a restricted trade policy, especially the setting of high tariff rates, would distort a firm's decision to export. The negative effect of tariff on export activity is found in previous studies such as Athukorala et al. (1995) for Sri Lanka.

Coefficients associated with *sale*, *age,* and *VD* are positive and statistically significant at the 1% level. The positive coefficient associated with *sale* clearly shows that there are typically significant sunk costs related to exporting in Thai manufacturing. Thus, larger firms tend to have more advantages in entering the international market. In other words, larger firms could earn sufficient profits easier to cover sunk costs. In terms of firm age, the positive coefficient reveals that older firms are more likely to have more experience and be more efficient in the leaning by doing process than younger firms. This is in contrast to results revealed by Kokko etal. (2001), who found a negative relationship between age and export activity. This implies that there is no evidence that firms in Thai manufacturing were first established mainly in order to supply the local market, and that diversification into exports does not occur until opportunities to expand domestically have been exhausted. Interestingly, the squared term of age is statistically significant and has a negative sign. This implies that beyond a certain threshold, the firm's experience ceases to exert a positive influence on its efficiency, and has no influence on export activity. The nonlinear relationship between age and export activity is also found in Barrios et al. (2003). As well, the positive coefficient of *VD* confirms that firms that have higher productivity tend to be involved in export activity. This result is found in other empirical studies such as Bernard and Jensen (1999) and Kokko et al. (2001). Meanwhile the negative and statistical significance of value-added per worker squared reflects the nonlinear relationship between productivity and export activity.

The negative relationship between capital–labor ratio (*KL*) and export activity reflects the structure of domestic resources in determining export activity. As Thailand is classified as a labor-abundant country and labor costs are relatively cheaper than capital costs, an industry that produces labor-intensive products is likely able to compete with other countries in the international market. In other words, export activity tends to be higher in an industry that has a low capital–labor ratio. This result is also revealed in Athukorala et al. (1995), who find that based on comparative advantage in developing countries, a negative relationship between capital–labor ratio and export activity exists.

Table 3: Estimation Results on Firms' Export Decisions

	Column A OLS	Column B Probit	Column C Logit
Intercept	−0.96	−6.31	−10.73
	(−3.01)*	(−4.50)*	(−4.49)*
$Sale_{ij}$	0.13	0.50	0.85
	(42.24)*	(36.12)*	(34.45)*
Age_{ij}	0.10	0.50	0.81
	(6.11)*	(6.12)*	(5.79)*
Age_{ij}^2	−0.03	−0.12	−0.20
	(−6.36)*	(−6.41)*	(−6.10)*
VD_{ij}	0.29	1.25	2.13
	(5.90)*	(5.69)*	(5.70)*
VD_{ij}^2	−0.01	−0.06	−0.11
	(−7.33)*	(−6.82)*	(−6.80)*
OWN_{ij}	0.42	1.35	2.31
	(26.27)*	(22.37)*	(21.68)*
$OWN_{ij} \cdot ERP_j$	−0.20	−0.44	−0.84
	(−2.93)*	(−1.32)***	(−1.45)***
$CR4_j$	−0.45	−1.74	−3.12
	(−8.20)*	(−7.50)*	(−7.63)*
$CR4_j \cdot ERP_j$	2.53	9.32	16.23
	(8.84)*	(8.79)*	(8.87)*
ERP_j	−0.66	−2.58	−4.46
	(−4.75)*	(−5.05)*	(−5.09)*
KL_j	−0.21	−0.85	−1.42
	(−4.68)*	(−4.72)*	(−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

* = 1% significance, *** = 15% significance (two-tails)
Note: The value in parenthesis is t-ratio for OLS and z-ratio for Probit and Logit model.
Source: Authors' estimates.

In terms of export spillovers (X_{ij}^*), the estimation results provided by OLS, Probit, and Logit models are comparable, but as in the equation of export decision, the Probit model tends to be superior to other models in terms of standard error of regression and Akaike information criterion. Thus, the results presented in this study are based on the Probit model, which takes into account heteroskedasticity and outlier problems. Table 4 reports the estimation results of export spillovers, where column A is the result of the OLS model, and columns B and C are the results of Probit and Logit models, respectively.

The positive and statistical significance of foreign firms (*For*) at 1% level clearly supports the hypothesis that foreign presence would generate indirect impact by enhancing domestically owned firms' performance, thereby increasing their probability to export. In other words, the positive coefficient of *For* confirms the role of foreign presence in generating export spillovers to local firms. Even though there are three channels that export spillovers could take place (see Section III), in the context of Thai manufacturing, information externalities and demonstration effects are the key channels. In particular, 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 markets; or provide channels through which products are distributed. Export spillovers tend to occur in an industry that has a limited domestic market such as canned tuna and canned pineapple (Kohpaiboon 2006).

Table 4: Estimation Results of MNC Export Spillovers on Local Firms

	Column A OLS	**Column B Probit**	**Column C Logit**
Intercept	**−1.45**	**−9.91**	**−15.94**
	(−3.62)*	(−5.31)*	(−5.02)*
$Sale_{ij}$	**0.15**	**0.53**	**0.91**
	(41.63)*	(34.03)*	(32.28)*
Age_{ij}	**0.12**	**0.75**	**1.26**
	(6.87)*	(7.23)*	(6.81)*
Age_{ij}^2	**−0.03**	**−0.18**	**−0.30**
	(−6.79)*	(−7.54)*	(−7.14)*
VD_{ij}	**0.36**	**1.77**	**2.88**
	(5.67)*	(5.95)*	(5.69)*
VD_{ij}^2	**−0.02**	**−0.08**	**−0.14**
	(−6.91)*	(−6.76)*	(−6.47)*
For_j	**0.11**	**0.47**	**0.75**
	(2.68)*	(2.61)*	(2.38)*
$For_j \cdot ERP_j$	**−0.48**	**−1.63**	**−2.66**
	(−1.64)**	(−1.46)***	(−1.37)***
$CR4_j$	**−0.55**	**−2.30**	**−4.20**
	(−8.81)*	(−8.39)*	(−8.60)*
$CR4_j \cdot ERP_j$	**3.18**	**11.58**	**20.51**
	(9.77)*	(9.60)*	(9.95)*
ERP_j	**−0.77**	**−2.82**	**−5.10**
	(−4.65)*	(−4.49)*	(−4.79)*
KL_j	**−0.19**	**−0.79**	**−1.37**
	(−3.57)*	(−3.93)*	(−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

MNC = multinational corporation.
* = 1% significance, *** = 15% significance (two-tails).
Note: The value in parenthesis is t-ratio for OLS and z-ratio for Probit and Logit model.
Source: Authors' estimates.

Even though there is a relatively weak significance (at 15%) of the interaction term between the presence of foreign firms and trade protection (*For*·*ERP*), the negative coefficient corresponding with this variable implies that the role of MNCs in generating export spillovers to domestically owned firms still depends on the trade policy regime. Policy neutrality would result in a higher likelihood for MNCs to become involved with production in the host country to serve their strategy of 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.

For other explanatory variables, the sign of its influence on export activity of domestically owned firms is the same as described earlier (when both foreign and domestic firms are included in the sample set). For example, the negative coefficient of producer concentration (*CR*4) shows that when local firms have market power, the probability of a firm's decision to export tends to decline. However, the positive coefficient corresponding to the interact term between producer concentration and trade protection (*CR*4·*ERP*) confirms that local firms have an incentive to increase exports under a restricted trade policy regime by allowing prices to discriminate between home and foreign markets. However, 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. As well, the positive and statistical significance of *sale*, *age,* and *VD* is also found in determining the probability of local firms to export. The nonlinear relationship is revealed in the cases of age and productivity, reflecting a certain threshold where firms' experience and efficiency ceases to exert a positive influence on the export activity of local firms. Meanwhile, the negative coefficient of capital–labor ratio (*KL*) indicates that the probability of local firms to export tends to be higher in an industry that has a low capital–labor ratio or which produces labor-intensive products.

VII. Conclusion

This paper examines the determinants of a firm's export decision and the role of multinational firms in generating export spillovers to domestically owned firms basing on Thai manufacturing data. In addition to the role of MNCs, this study investigates the role of market structure in determining a firm's export decision. Cross-sectional econometric analysis of firms is undertaken using 1997 industrial census, the only census available so far in Thailand. Based on model selection criteria, the econometric results are based on the Probit model. The key finding is that MNCs tend to play a crucial role not only in enhancing export activity in Thai manufacturing but also in generating export spillovers

to domestically owned firms. However, the impact of MNCs on export activity/spillovers is not automatic, but depends on the trade policy regime. A restricted trade policy, especially in terms of high tariff protection, could retard the process of MNCs enhancing export spillovers and overall export activity. In other words, although high levels of MNC participation can result in a high probability of export decision and export spillovers, competition fostered by open trade policies would be required if high levels of MNCs participation are to be translated into higher export activity/spillovers. Even though high tariff protection allows heavily concentrated firms to observe price discrimination between domestic and foreign markets and to increase exports, the negative direct effect of high tariff rates on export activity/spillovers highlights the relative importance of trade policy neutrality on firms' export decisions and export spillovers.

In addition to the role of MNCs, trade policy regime, and market structure, this paper found that a firm's size, age, and productivity are important in determining the firm's export decision. An increase in these factors could increase the probability of the firm's decision to export. In contrast to size, a nonlinear relationship is found in terms of the firm's age and productivity. As well, the statistical significance of capital–labor ratio indicates that a firm's export decision in Thai manufacturing is comparable to the country's comparative advantage. That is, the probability of a firm's decision to export in labor-intensive industry, i.e., low capital–labor ratio, tends to be higher than that in capital-intensive industry.

The results from this paper point out that policy aiming to attract investment from MNCs could enhance overall export activity and benefit domestically owned firms in terms of export spillovers. In addition to orienting trade policy reform toward neutrality, government should provide sufficient infrastructure, create a sound investment climate, and ensure political and macroeconomic stability. These policies are vital in attracting FDI inflows and enhancing the benefit from MNCs' participation in the export sector.

Appendix I: Producer Concentration and Effective Rate of Protection in Thai Manufacturing

ISIC	Description	*CR4*	*ERP*
1511	Meat products	56.1	–13.0
1512	Fish products	35.2	–7.9
1513+1514	Fruit & vegetable products	25.4	27.1
152	Dairy products	78.1	12.2
1531	Grain mill products	63.4	14.5
1532+1533	Starches, animal feeds	75.2	–7.8
154	Other food products	34.6	37.8
155	Beverages	73.2	45.9
171	Textiles spinning and weaving	47.3	16.6
172	Other textiles	49.4	16.6
173	Knitted fabrics	61.5	27.0
181	Apparel	42.1	45.3
1911	Leather tanning and dressing	46.9	–25.7
1912	Luggage, handbags, etc.	37.8	25.3
192	Footwear	60.7	6.2
201	Wood sawmilling and planing	62.7	2.0
202	Other wood products	44.2	13.9
210	Paper products	64.0	7.8
221	Publishing	81.5	13.4
222	Printing	52.1	17.3
232	Recorded media	86.1	3.7
2411+2412	Basic chemicals	63.5	6.9
2413	Primary plastics	55.9	15.8
242	Other chemical products	43.9	2.1
243	Synthetic fibers	76.0	–9.8
2511	Rubber tyres and tubes	82.1	33.3
2519	Other rubber products	59.4	16.5
252	Plastic products	41.9	14.7
261	Glass products	70.7	2.6
269	Nonmetallic mineral products	74.9	4.3
271	Ferrous metals	45.3	6.2
272	Nonferrous metals	48.5	–0.5
273	Metals' casting	71.9	0.0
281	Structural metal products	46.0	11.8
289	Other metal products	34.5	0.8
291	General purpose machinery	51.0	8.9
292	Special purpose machinery	66.4	1.6
293	Domestic appliances	64.4	5.1
300	Office and computing machinery	75.5	–0.3
311	Electric motors, etc.	55.3	0.3

continued.

Appendix. *continued.*

ISIC	Description	CR4	ERP
312	Electricity distribution machinery	87.1	−0.8
313	Insulated wire and cable	98.7	6.4
314	Batteries, etc.	76.1	−6.6
315	Electric lamps	75.9	4.1
319	Other electrical machinery	50.0	4.5
321	Electronic components	44.1	1.8
322	Radio and TV transmitters, etc.	66.8	−0.1
323	Radio and TV receivers, etc.	66.5	−0.1
331	Medical machinery	75.1	−2.2
332	Optical and photographic machinery	68.7	−0.2
333	Watches and clocks	71.9	−2.2
341	Motor vehicle assembly, etc.	81.4	0.2
342	Motor vehicle bodies, trailers, etc.	67.7	−0.4
343	Motor vehicle parts	46.0	22.3
359	Other transportation machinery	90.6	46.9
361	Furniture	46.5	21.3
3691	Jewelry	50.8	6.3
3692+3693+3694+3699	Miscellaneous manufacturing	82.1	32.8
	Average	61.2	9.2

Sources: CR4 from Kohpaiboon and Ramstetter (2008); ERP from Athukorala et al. (2004).

Appendix II: Summary Data and Correlation Coefficients

Summary Data

Appendix Table 1: Firm's Export Decision

Variables		Mean	Median	Maximum	Minimum	Std Dev.	Observations
X_{ij}	0 or 1	0.37	0.00	1.00	0.00	0.48	8106
$Sale_{ij}$	Natural Logarithm	3.83	3.64	11.06	0.00	1.64	8106
Age_{ij}	Natural Logarithm	2.10	2.08	4.39	0.00	0.80	8106
VD_{ij}	Natural Logarithm	11.98	11.91	17.66	7.21	1.02	8106
Own_{ij}	0 or 1	0.19	0.00	1.00	0.00	0.39	8106
$Own_{ij} \cdot ERP_j$		0.02	0.00	0.45	−0.30	0.07	8106
$CR4_j$	Percent	2.51	2.51	2.90	1.96	0.10	8106
$CR4_j \cdot ERP_j$		0.44	0.42	0.69	0.23	0.11	8106
ERP_j	Percent	0.06	0.05	0.32	−0.11	0.06	8106
KL_j	Natural logarithum	0.12	0.13	0.58	−0.30	0.12	8106

Appendix Table 2: Export Spillovers

Variables		Mean	Median	Maximum	Minimum	Std Dev.	Observations
X_{ij}	0 or 1	0.26	0.00	1.00	0.00	0.44	6473
$Sale_{ij}$	Natural Logarithm	3.53	3.37	9.31	0.00	1.47	6473
Age_{ij}	Natural Logarithm	2.12	2.08	4.50	0.00	0.80	6473
VD_{ij}	Natural Logarithm	11.91	11.85	17.66	8.29	0.96	6473
For_j	Ratio	0.34	0.31	0.69	0.00	0.15	6473
$For_j \cdot ERP_j$		0.04	0.03	0.21	−0.07	0.05	6473
$CR4_j$	Percent	2.50	2.50	2.90	2.07	0.10	6473
$CR4_j \cdot ERP_j$		0.44	0.42	0.69	0.23	0.11	6473
ERP_j	Percent	0.06	0.05	0.32	−0.11	0.06	6473
KL_j	Natural logarithum	0.12	0.13	0.58	−0.30	0.12	6473

Correlation Coefficients

Appendix Table 3: Firm's Export Decision

	X_{ij}	$Sale_{ij}$	Age_{ij}	VD_{ij}	Own_{ij}	$Own_{ij} \cdot ERP_j$	$CR4_j$	$CR4_j \cdot ERP_j$	ERP_j	KL_j
X_{ij}	1									
$Sale_{ij}$	0.47	1								
Age_{ij}	0.05	0.17	1							
VD_{ij}	0.08	0.47	0.03	1						
Own_{ij}	0.45	0.38	−0.07	0.15	1					
$Own_{ij} \cdot ERP_j$	0.31	0.21	−0.01	0.06	0.64	1				
$CR4_j$	0.05	0.28	−0.02	0.37	0.17	0.05	1			
$CR4_j \cdot ERP_j$	−0.01	−0.03	−0.04	0.01	−0.02	0.06	−0.04	1		
ERP_j	0.11	−0.06	−0.01	−0.08	−0.04	0.28	−0.17	0.42	1	
KL_j	0.10	−0.06	−0.01	−0.08	−0.05	0.29	−0.14	0.21	0.94	1

Appendix Table 4. Export Spillovers

	X_{ij}	$Sale_{ij}$	Age_{ij}	VD_{ij}	Own_{ij}	$Own_{ij} \cdot ERP_j$	$CR4_j$	$CR4_j \cdot ERP_j$	ERP_j	KL_j
X_{ij}	1									
$Sale_{ij}$	0.40	1								
Age_{ij}	0.09	0.19	1							
VD_{ij}	0.03	0.45	0.04	1						
Own_{ij}	0.02	−0.05	−0.03	−0.03	1					
$Own_{ij} \cdot ERP_j$	0.14	−0.07	−0.04	−0.08	0.29	1				
$CR4_j$	−0.03	0.21	0.01	0.32	−0.06	−0.15	1			
$CR4_j \cdot ERP_j$	−0.01	−0.04	−0.05	0.01	−0.07	0.25	−0.03	1		
ERP_j	0.16	−0.05	−0.03	−0.08	−0.04	0.86	−0.16	0.43	1	
KL_j	0.15	−0.04	−0.03	−0.07	−0.07	0.86	−0.14	0.22	0.95	1

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About the Paper

Juthathip Jongwanich and Archanun Kohpaiboon examine factors that determine a firm's export decisions and the role of multinational corporations in generating export spillovers to domestically owned firms in Thailand. The results highlight the relative importance of trade policy neutrality on firms' export decisions and spillovers. Trade policy openness could promote the role of multinational corporations in generating export activity and spillovers.

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