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Factors affecting the export participation and performance of Thai manufacturing small and medium sized Enterprises (SMEs)

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Abstract

This paper employed the 2007 Thai Industrial Census to empirically examine the effects of firm-specific and industry factors on a firm's decision to export and the export performance of 65,111 Thai manufacturing SMEs which are classified into eight submanufacturing groups. Six econometric models are indentified to capture linear and nonlinear effects of firm-specific factors as well as to analyze each industry effect for Thai manufacturing SMEs. Four limited dependent variable models (i.e., the probit model, the logit model, the linear probability model, and the Tobit model) are used to study the factors affecting a firm's export decision and its export performance. Estimation techniques were used to check the statistical confidence of the results for this study. With regards to firmspecific factors which exert an influence on a firm's decision to export and its export performance, firm size, firm age, and labour productivity, government assistance, foreign investment (ownership), municipal location, research and development, and skilled labour were found to be significantly and positively related to a firm's export participation and its export performance. Significant and negative non-linear results were also found for firm size, firm age, and labour productivity in this study. Focusing on the effects of industry sectors on a firm's decision to export and its export performance, producer concentration was found to have a significant and positive effect on a firm's export decision and its export performance but a significant and negative result was found for the capital - labour ratio. Finally, evidence-based policies are provided to facilitate improvement in the international competitiveness of Thai manufacturing SMEs and in their export performance.

Keywords

enterprises, sized, medium, small, manufacturing, thai, performance, participation, export, affecting, smes, factors

Disciplines

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FACTORS AFFECTING THE EXPORT PARTICIPATION AND PERFORMANCE OF THAI MANUFACTURING SMALL AND MEDIUM SIZED ENTERPRISES (SMEs)

Yot Amornkitvikai[a], Charles Harvie[b], and Teerawat Charoenrat [c]

ABSTRACT

This paper employed the 2007 Thai Industrial Census to empirically examine the effects of firm-specific and industry factors on a firm's decision to export and the export performance of 65,111 Thai manufacturing SMEs which are classified into eight sub-manufacturing groups. Six econometric models are indentified to capture linear and non-linear effects of firm-specific factors as well as to analyze each industry effect for Thai manufacturing SMEs. Four limited dependent variable models (i.e., the probit model, the logit model, the linear probability model, and the Tobit model) are used to study the factors affecting a firm's export decision and its export performance. Estimation techniques were used to check the statistical confidence of the results for this study. With regards to firm-specific factors which exert an influence on a firm's decision to export and its export performance, firm size, firm age, and labour productivity, government assistance, foreign investment (ownership), municipal location, research and development, and skilled labour were found to be significantly and positively related to a firm's export participation and its export performance. Significant and negative non-linear results were also found for firm size, firm age, and labour productivity in this study. Focusing on the effects of industry sectors on a firm's decision to export and its export performance, producer concentration was found to have a significant and positive effect on a firm's export decision and its export performance but a significant and negative result was found for the capital - labour ratio. Finally, evidence-based policies are provided to facilitate improvement in the international competitiveness of Thai manufacturing SMEs and in their export performance.

Key words: Export Participation; Export Performance; Small and Medium Sized Enterprises; Thai Manufacturing

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I. INTRODUCTION

Strong export performance is usually known as one of the important factors in driving a country's economic growth, since exports can improve a firm's production efficiency to overcome higher trade barriers and address different market tastes in competitive international markets. Thai small and medium sized enterprises (SMEs), however, are still not fully competitive, especially in foreign markets which require efficient production, good management structures, market capabilities, product and service development to meet international standards, high quality of labour, up-to-date technologies, consumer and environmental accountability and strong networks in conducting business operations. More importantly, the competitiveness of Thai industry, particularly SMEs, has traditionally relied on low-cost labour and natural resource (raw materials) advantages rather than technological capability or qualified human capital. Thai business segments, nevertheless, are now under the "*Nut-Crackers Effect*" (OSMEP, 2007). This effect implies that Thailand is now stuck between countries with greater price competitiveness, such as China, Vietnam and Indonesia, and countries which can differentiate their outputs by concentrating in higher value-added products and services, such as Italy, Japan, South Korea and Taiwan. In addition, more skilled labour and higher productivity can be observed in these countries.

There are a number of empirical works, such as Jongwanich and Kohpaiboon (2008), Althukorala *et.al*. (1995), Kokko, *et al*. (2001), and Dueñas-Caparas (2006), which aim to investigate the effects of firm-level and industry-level factors on a firm's export decision and its export performance. As suggested by Althukorala *et al*. (1995) and Maddala (1983), a firm's export behaviour is considered to involve two decisions. First, whether or not to export, and this can be illustrated by a binary export variable (a firm exports or does not export) and introduced the dependent variable in the models. Second, what proportion of a firm's output is to be exported. This two-part decision making process is commonly observed in many areas of decision making in economics, and, in the econometric literature, is known as the sample selection (or selectivity) model (Althukorala *et al*., 1995). As a result, the Limited Dependent Variable Models, such as (i) the Probit model, (ii) the Logit model, and (iii) the linear probability model, can be employed to test the first part of the exporting decision process in this study. The Tobit model can also be used to examine the second part of the export decision process which aims to capture the effects of firm-level and industry-level factors on a firm's export intensity. More importantly, no empirical study has been

conducted to investigate the effects of firm-level and industry-level factors on a firm's export decision and its export performance for the case of Thai manufacturing SMEs. Jongwanich and Kohpaiboon (2008) only investigated the first part of the export decision making process for all Thai manufacturing enterprises, and utilized the 1997 Industry Census, but the comprehensive data of the 2007 Thai Industrial Census conducted by the National Statistical Office (NSO)[1] will be used for the empirical analysis in this paper.

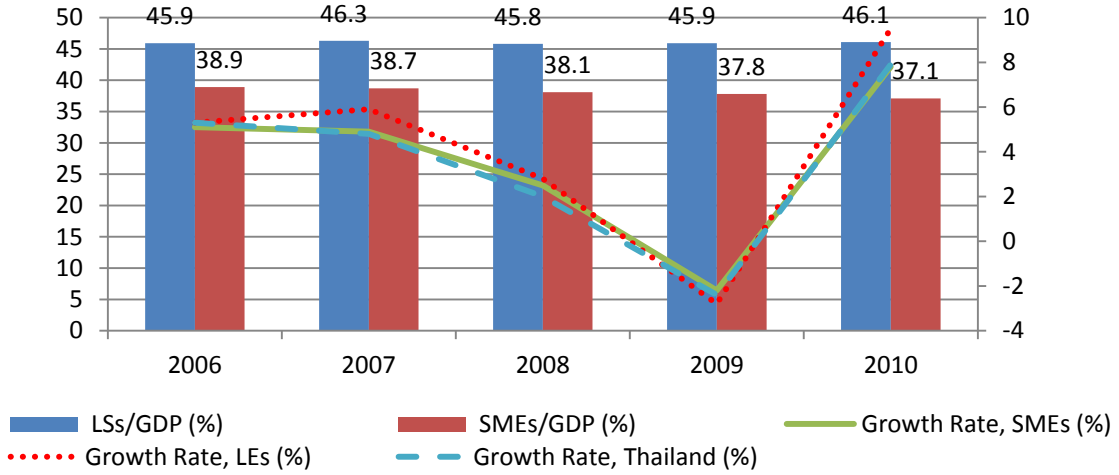
As a result, the objectives of this paper are to examine possible sectors that contribute significantly to the export participation and performance of Thai manufacturing SMEs, and provide empirical based policies which aim to strengthen the ability of Thai manufacturing SMEs to participate in the international market. The structure of this paper is organized as follows: Section II provides an overview of Thai small and medium sized enterprises (SMEs). Section III provides a review of the literature. Sector IV describes the data source. Section V presents the empirical models used for this paper. The empirical results are discussed in Section VI. Implications from the results and some conclusions are also provided in the final section.

II. AN OVERVIEW OF THAI SMES

SMEs are key drivers of the Thai economy, contributing significantly to social and economic development (Brimble *et al*., 2002). They represent 99.6 percent of business establishments in the country, employ more than 10.51 million workers, and accounted for 77.86 percent of total employment in 2010 (OSMEP, 2010). SMEs accounted for 38.9 percent of GDP in 2006, falling to 37.1 percent of GDP in 2010 (see Figure 1). The contribution of SMEs to Thai GDP, however, is still lower than large enterprises' contribution to the country's GDP. SMEs play significant roles and functions in assisting large enterprises, particularly in the context of regional production networks (Mephokee, 2003). More importantly, SMEs are crucial factors in linking all important units of industry together, and filling gaps in industrial clusters which may not be completed by large enterprises alone (Regnier, 2000). They are also key sources of supply of goods, services, information, and knowledge for large enterprises, and play a pivotal role in the production process of export goods (Tapaneeyangkul, 2001).

[11] The 2007 Thai Industrial Census is the most updated data, which will be conducted again in 2017.

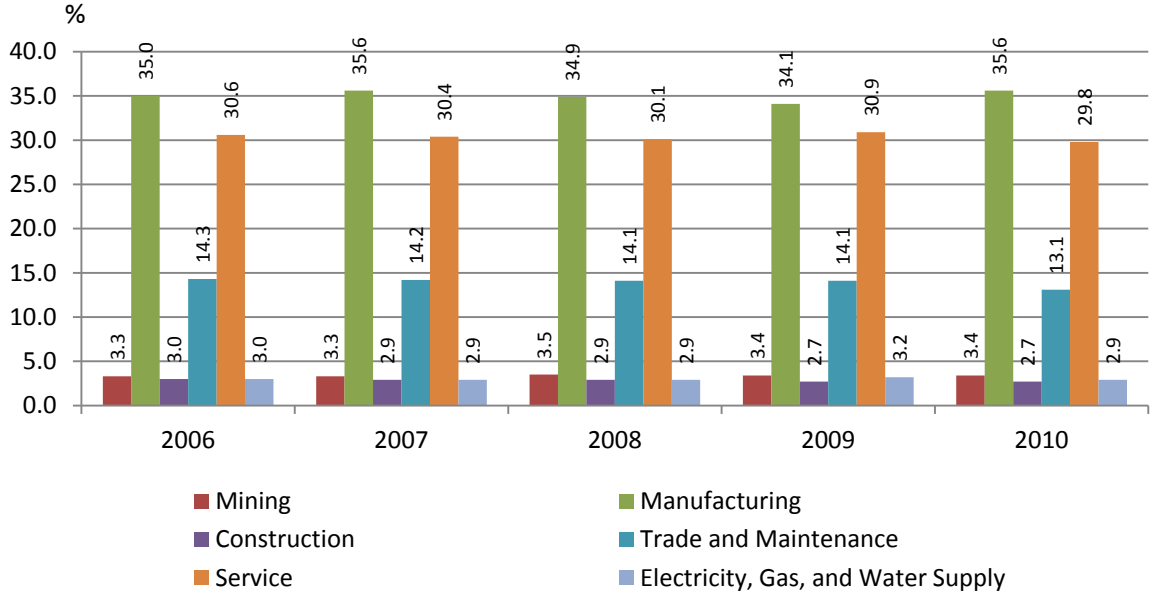
Figure 1: Trends in the Proportion of SMEs'in GDP and the Growth Rate of GDP Based on Size of Enterprise (2006 - 2010)



Source: The Office of SMEs Promotion (2010)

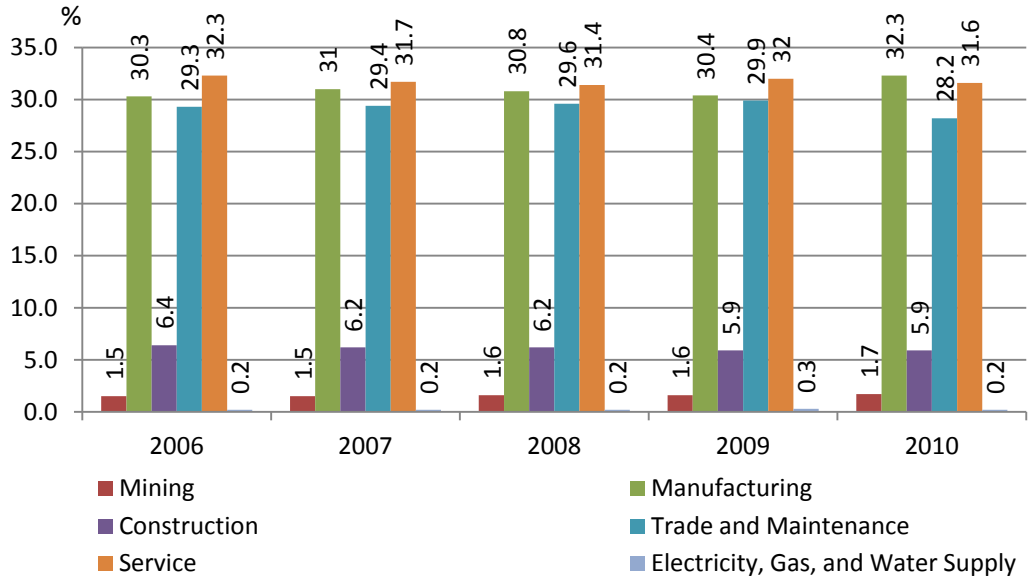
The manufacturing sector has been categorized as the most important industrial sector in the country, constituting 35.0 percent of Thai GDP in 2006 rising to 35.6 percent of Thai GDP in 2010 (See Figure 2). Similarly, Thai manufacturing SMEs have played a leading role in the economy, accounting for 30.3 percent of Thai SME GDP in 2006 and 32.3 percent of Thai SME GDP in 2010 (see Figure 3).

Figure 2: GDP Structure of the Country Categorized by Economic Activity (2006 - 2010)



Source: The Office of SMEs Promotion (2010)

Figure 3: GDP Structure of SMEs Categorized by Economic Activity (2006 - 2010)



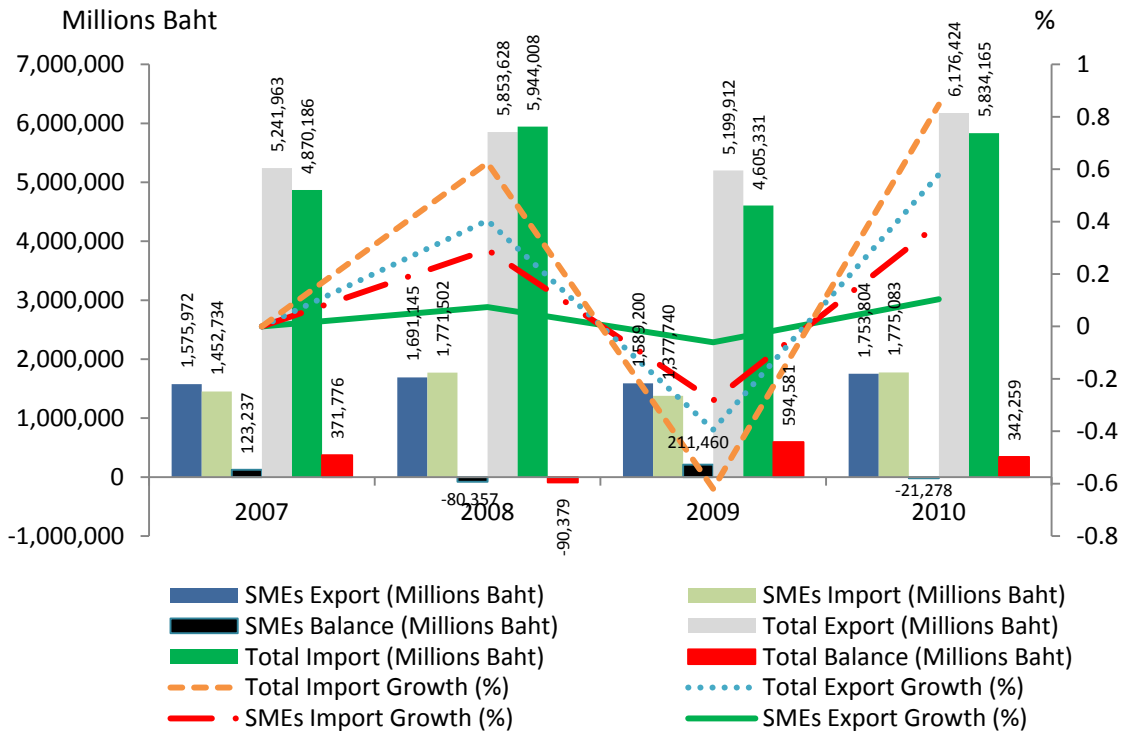
Source: The Office of SMEs Promotion (2010)

The highest numbers of Thai SMEs are Thai manufacturing SMEs, accounting for 17.90 percent of total SMEs in 2010. They also contribute significantly to the country's employment, accounting for 25.23 percent of total employment or 32.40 percent of total SME employment in 2010 (OSMEP, 2010).

As shown in Figure 4, the growth rate of exports in Thailand has expanded from 11.16 percent in 2008 to 18.78 percent in 2010. However, the country's export growth rate turned negative in 2009 (-11.17 percent) due to the world economic slowdown. With regard to the proportion of exports to overall GDP the Thai economy relies greatly on exports, accounting for 61.45 percent of the country's GDP in 2007 and 61.13 percent of GDP in 2010. In terms of contribution to exports Thai SMEs, however, have become less important compared with large enterprises whose exports accounted for 31.39 percent of GDP in 2007 and 32.73 percent in 2010. Thai SME exports, however, only accounted for 30.06 percent of GDP in 2007 and 28.40 percent of GDP in 2010 even though the number of SMEs accounted for 99.60 of all enterprises in Thailand at the end of 2010.

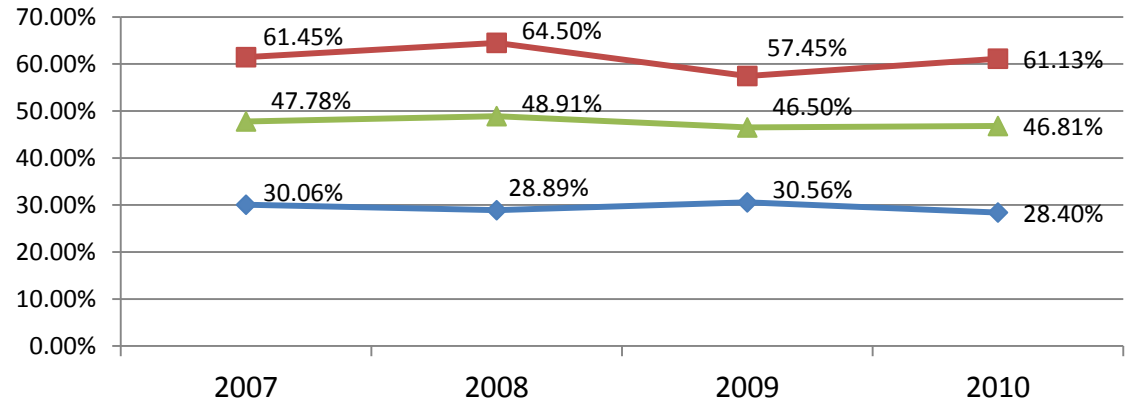
This implies that large enterprises play a leading role in the country's international trade even though they only accounted for 0.4 percent of the country's business establishments in 2010. The Office of SMEs Promotion (2011) also stated that the country's exports primarily rely on large enterprises, and therefore both the public and private sectors should pay attention to promoting greater international trade participation by SMEs.

Figure 4: International Trade Value (2007 – 1010)



Source: The Office of SMEs Promotion (2010)

Figure 5: Ratio of SME Exports to International Trade of Thailand and GDP (2006 - 2010)



Source: The Office of SMEs Promotion (2010)

Punyasavatsut (2007) also acknowledged that Thai manufacturing SMEs were not ready to face the rigours of "*international competition*" in competitive global markets arising from the country's increased opening and economic integration, and more intense competition from lower labour cost countries. More importantly, Thai business segments, particularly Thai SMEs, are now under

the "*Nut-Crackers Effect*" which implies that Thailand is now trapped between countries with lower price competitiveness (e.g., China, Vietnam and Indonesia) and countries with higher value added production and services (e.g., Italy, Japan, South Korea and Taiwan). Therefore, examining possible significant factors which influence the export decision and export performance of Thai manufacturing SMEs is crucial to be able to compete with foreign firms and also alleviate the "*Nut-Crackers Effect*" of the country. A review of the literature is provided in the next section before conducting the empirical analysis of this study.

III. LITERATURE REVIEW

This section provides a review of the empirical literature regarding firm-level and industry-level factors that significantly affect the export decision and performance of enterprises, such as firm size, productivity, government assistance, foreign investment, municipal area, research and development (R&D), the share of skilled workers to total workers, producer concentration, and capital to labour ratio.

Firm-Level Factors

Firm Size

A number of empirical studies have examined both linear and non-linear relationships between firm size and their export decision or export performance (see Jongwanich and Kohpaiboon, 2008; Dueñas-Caparas, 2006; Althukorala et.al., 1995). Jongwanich and Kohpaiboon (2008) employed the 1997 Thai industrial census to investigate the determinants of a firm's export decision in the manufacturing sector in Thailand. They found that firm size, as measured by sales, has a linearly significant and positive effect on a firm's export decision, indicating that there are typically significant sunk costs related to the export decision. Therefore, larger firms are likely to gain more advantages in entering foreign markets. A non-linear relationship between firm size and its export decision, however, was not found from their study. Dueñas-Caparas (2006) examined the determinants of export performance of the Philippine manufacturing sector. Their study indicated both a positive linear and negative non-linear relationship between firm size and export performance as measured by export sales to total sales for the Philippine clothing sector, but the results were not statistically significant in the food processing and electronics sectors. Athukorala *et.al.* (1995) used firm level data from the Sri Lankan Survey of Manufacturing in 1981 and found that firm size is significantly and positively related with the export decision of 111 Sri Lankan manufacturing

firms. They explained that firm size can also be an important determinant of export participation where scale or size economies exist. Reaching an adequate size may be crucial for achieving success in export markets, since exporting is a costly and risky activity. Therefore, smaller firms may be at a disadvantage in gathering market information, introducing overseas sales-promotion campaigns, withstanding exchange rate and other risks, and adapting their products to foreign markets. However, they revealed an insignificant result between firm size and the level of exports (export intensity) for the case of Sri Lankan manufacturing firms.

Firm Age

Firm age, indicating a learning-by-doing experience, can also significantly affect firm export decisions, since old firms are able to participate in competitive foreign markets due to their cumulative experience, business networks and reputation. Aggrey *et al*. (2010), however, pointed out that young firms are more proactive, flexible, and aggressive compared to old firms. As a result they are more willing to adopt modern technology, but old firms are stuck with outdated physical capital. Kokko *et al.* (2001) employed a firm survey of 1,243 Uruguayan manufacturing firms in 1988 to investigate the effects of significant determinants on the export decision of 763 locally-owned firms. They revealed a significant and positive relationship between firm age and the export decision to neighbouring countries for 763 Uruguayan locally-owned manufacturing firms, but a significant and negative relationship was found for the case of firm age and the export decision to the rest of the word. Focusing on empirical studies, Jongwanich and Kohpaiboon (2008) found that firm age has a significant and positive linear effect on exporting for the case of Thai manufacturing enterprises, implying that older firms are likely to have more operating experience and greater efficiency through their leaning-by-doing process than younger firms. A negative and significant non-linear effect, however, was also found for the case of Thai manufacturing enterprises, indicating that after a certain threshold a firm's experience does not exert a positive effect on its export performance. This implies that older firms can easily sell almost all their output in the domestic market due to their business reputation, leading to their ignorance in participating in foreign markets. However, Dueñas-Caparas (2006) found a positive linear and negative non-linear relationship between firm age and export performance for the Philippine clothing and electronics sectors, but an insignificant result was found for the case of the food processing sector.

Foreign Investment (Foreign Ownership)

A number of empirical studies have found a significant and positive association between foreign investment (foreign ownership) and firm export participation (Greenaway *et al*., 2007; Jongwanich and Kohpaiboon, 2008; Aggrey *et al*., 2010). For example, Greenaway *et al*. (2007) found that foreign ownership had a significant and positive effect on export participation for 9,292 UK manufacturing firms during the period 1993 to 2003. For Thailand, Jongwanich and Kohpaiboon (2008) used the 1997 Thai manufacturing census and found that foreign ownership has a significant and positive impact on export participation for Thai manufacturing enterprises. This positive result implies that an increase in foreign participation also encourages firms to participate in export markets, since foreign partners bring access to new foreign markets and distribution facilities, new products, managerial know how, and advanced production technology (Jongwanich and Kohpaiboon, 2008). Jongwanich and Kohpaiboon (2008, p21) also pointed out that foreign owned firms can cover sunk costs and enter into foreign markets more easily than domestically owned firms.

Firm Productivity

Firm productivity is one of the factors which could affect the export decision. There exists strong evidence that the self selection hypothesis, where only more efficient firms can participate in the export market, can be observed in several countries. Bernard and Jensen (1999) used unbalanced panel data for over 50,000-60,000 U.S. manufacturing plants during the period 1984 to 1992, to investigate whether highly productive firms become exporters or whether exporting improves a firm's performance. As part of their results, total factor productivity (TFP) was found to be statistically significant in explaining a firm's decision to export. Bernard and Wagner (1997) find that German manufacturing firms had to be successful before beginning exporting. In other words, highly productive firms most certainly become exporters. Cherides *et al*. (1996) revealed that relatively efficient firms will be exporters, but previous export participation does not affect the unit costs of firms. Therefore, the efficiency gap between non-exporters and exporters is because the more efficient firms self-select into the export market, rather than learn by exporting. Baldwin and Gu (2003) also found that more productive firms were likely to participate in the export market for Canadian manufacturing firms during the period 1990 to 1996. Their results revealed that firms that start exporting have higher labour productivity than non - exporters, and exporters that exit from export markets have lower labour productivity than continuing exporters. Hallward-Driemeier *et al*. (2002) studied the patterns of manufacturing productivity for Indonesia,

Korea, Malaysia, the Philippines, and Thailand during the period 1996 to 1998. They explained that firms can export after improving their technologies and production processes, making new investments to improve their efficiency, training their work force, and using external auditing. A series of these decisions, therefore, raise their productivity. Jongwanich and Kohpaiboon (2008) also found that firm productivity has a significant and positive linear effect on their export decision, but such a significant and negative non-linear relationship between firm productivity and export decision was not found for the case of Thai manufacturing enterprises.

Skilled Labour

Similarly, skilled manpower is also one of the important determinants of a firm's export decision, since higher skilled labour is associated with higher labour productivity which will affect a firm's export decision. Dueñas-Caparas (2006) found that skilled manpower, as measured by the share of skilled workers to total workers, has a significant and positive effect on the export decision for firms in the Philippine food processing sector, but insignificant results were found for the clothing and electronics sectors. Roper and Love (2002) also investigated determinants of the export performance of the Irish manufacturing sector over the period 1996 to 1999. They found that plants with more highly skilled workforces, especially more graduate employees, were likely to become more successful in export markets. Focusing on research and development (R&D), Dueñas-Caparas (2006) found that research and development, as measured by the share of R&D expenditure to total sales, has a significant and positive effect on a firm's export decision for the Philippine electronics industry but a significant and negative relationship was found for the Philippine clothing industry. Roper and Love (2002) also revealed that the export propensity of small Irish manufacturing plants was positively affected by both informal and formally organised R&D activity, but only more formally organised R&D was useful for large plants.

Firm Location

Location is also another important factor, since the export decision by firms in different locations may be affected due to transport costs, infrastructure, spillover effects and natural resources (Aggrey *et al*., 2010). Roper and Love (2002) revealed that Irish manufacturing plants in the Republic of Ireland have significantly higher export propensity than similar plants in Northern Ireland. They also explained that Republic of Ireland plants may enjoy a better international image than Northern Ireland plants. Aggrey *et al*. (2010),

however, found that the export decision by manufacturing firms was significantly related to their location in different cities in Kenya and Uganda.

Government Assistance

Government assistance can be, for instance, in the form of financial support (e.g., credit assistance, income tax exemption or reduction, and exemption from import duty on essential raw materials) and non-financial support (e.g., managerial and technical assistance, and training support). The coefficient estimates of the government support variable have been found to be positive in a number of studies. For example, Wu and Cheng (1999) studied determinants of the export performance of China's township-village enterprises, and found that government financial support contributes positively towards the international competitiveness of township and village enterprise's export performance.

Industrial-Level Factors

The Capital-Labour Ratio

The capital–labour ratio can be included in the model since it captures the characteristics of an industry and also the country's comparative advantage, especially in developing nations in which labour is relatively cheap compared with capital. A low capital - labour ratio means that more labour is utilized, since it is relatively cheap compared with capital. A lower capital - labour ratio in an industry, therefore, indicates that firms, which produce labour - intensive products, are likely to compete with foreign firms in the international market due to their cheap labour supply aligned with the country's comparative advantage. Jongwanich and Kohpaiboon (2008) also found that there is a significant and negative relationship between the capital-labour ratio and export participation for Thai manufacturing enterprises. This result implies that an industry that has a low capital - labour ratio tends to participate in foreign markets, since it competes with foreign firms by supplying cheap labour-intensive products. However, Athukorala *et.al.* (1995) used firm level data from the Sri Lankan Survey of Manufacturing in 1981 and found that the capital intensity variable is significantly and positively related with the export decision of 111 Sri Lankan manufacturing firms. They explained that their finding is not surprising in the context of the Sri Lankan economy where factors such as subsidies on capital and wage rigidities have distorted the incentive structure of manufacturing industries. With respect to Kokko *et. al.* (2001), an insignificant relationship was found between the capital – labour ratio and the export decision for the case of 763 Uruguayan locally-owned manufacturing firms

Producer Concentration

Finally, producer concentration has also been emphasized in the literature since an industry that has a high value of producer concentration is unlikely to engage in exports, since firms, which are in an industry with high producer concentration, will benefit from their domestic market power. They, therefore, are likely to produce and sell in the local market. Jongwanich and Kohpaiboon (2008) revealed a significant and negative relationship between producer concentration and export participation for Thai manufacturing enterprises. This result implies that the possibility of a firm's decision to export declines when the firm has market power (producer concentration) in the industry.

IV. DATA

The 2007 Thai Industrial Census is used to conduct the empirical analysis for this study, which consists of 73,931 enterprises across all regions in Thailand. This Industrial Census is normally conducted by the National Statistical Office (NSO) every 10 years, and consists of six parts: (i) general information on establishments, (ii) persons engaged and remuneration, (iii) cost of production and expenditure of establishments, (iv) production and receipts of establishments, (v) fixed assets of establishments, and (vi) research and development and laboratory spending and activities.

Thailand's small and medium sized enterprises (SMEs) can be defined using two measures: (i) the number of employees or (ii) the level of fixed assets. Focusing on the Thai manufacturing sector, an enterprise which either employs at most 50 workers or has fixed assets with a value not exceeding 50 million baht is considered as a small enterprise. In addition, an enterprise which either employs between 51 and 200 workers or has fixed assets with a value between 51 and 200 million baht is defined as a medium sized enterprise. With respect to this criteria, enterprises which have 200 or less workers are selected as SMEs for this study. As a result, 70,355 enterprises are defined as SMEs, accounting for 95.16 percent of total manufacturing enterprises. One of the firm specific factors used to determine the export participation of Thai SMES is labour productivity, and, therefore 5,244 negative value-added observations are deleted from the data sample. As a result of this 65,111 Thai SMEs are used to conduct the empirical analysis for this study. The classification of sub-manufacturing sectors used in the empirical analysis is also based on the Thailand Standard Industrial Classification (TSIC), 23 divisions of TSIC are grouped into 8 groups as indicated in Table 1.

Table 1: Thailand standard industrial classification (2-digits TSIC)

Division of TSIC	Division of Industry	Groups
15	Manufacture of food products and beverages	1
16	Manufacture of tobacco products	1
17	Manufacture of textiles	2
18	Manufacture of wearing apparel; dressing and dyeing of fur	2
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	2
20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	3
21	Manufacture of paper and paper products	3
22	Publishing, printing and reproduction of recorded media	3
23	Manufacture of coke, refined petroleum products and nuclear fuel	4
24	Manufacture of chemicals and chemical products	4
25	Manufacture of rubber and plastics products	4
26	Manufacture of other non-metallic mineral products	5
27	Manufacture of basic metals	5
28	Manufacture of fabricated metal products, except machinery and equipment	5
29	Manufacture of machinery and equipment n.e.c.	6
30	Manufacture of office, accounting and computing machinery	6
31	Manufacture of electrical machinery and apparatus n.e.c.	6
32	Manufacture of radio, television and communication equipment and apparatus	6
33	Manufacture of medical, precision and optical instruments, watches and clocks	6
34	Manufacture of motor vehicles, trailers and simi-trailers	7
35	Manufacture of other transport equipment	7
36	Manufacture of furniture; manufacturing n.e.c.	8
37	Recycling	8

Source: The 2007 Thai Industrial Census, National Statistic Office of Thailand

V. EMPIRICAL MODELS

A binary variable for “export participation” is used as the dependent variable in this study. Therefore, the Limited Dependent Variable Models such as (i) the Probit model, (ii)

the Logit model, and (iii) the linear pobability model can be conducted for this study, which can be illustrated as follows (Wooldridge, 2006):

Probit Model

Logit Model

Linear Probability Model

Where:

is the standard normal density which is given by

For Probit and Logit models the relationship between dependent and independent variables is assumed to be an increasing function. For the binary response model, Wooldridge (2006, p256, 582) also mentioned that the Probit and Logit models can overcome certain drawbacks from the linear probability model (LPM), since the LPM model violates the homoskedasticity assumption which is important for justifying the t and F statistics. The assumption of linear parameters between the dependent and independent variables is also generally required for the LPM model under the OLS estimation. The Probit model is also more popularly compared with the Logit model, since economists are likely to favour the normality assumption of the Probit model (Wooldridge, 2006, p385). In addition, the method of maximum likelihood estimation[2] of the Probit and Logit models automatically accounts for the heteroskedasticity problem. However, these three estimation models are used to check the sensitivity of the results for this study (see Jongwanich and Kohpaiboon, 2008). The question for the export decision of all firms can be written as follows

+

Where is export decision of firm *i* in industry *j*

[2] Under the method of maximum likelihood estimation the probability distribution of the error terms must only be assumed (Gujarati 2003, p.113). The assumptions underlying OLS, therefore, are not required for the ML method; these OLS assumptions include (i) linearity in the parameter, (ii) random sampling, (iii) no perfect collinearity (no perfect linear associations among the explanatory variables), (iv) zero conditional mean (the error term has an expected value of zero, given any values of the explanatory variables), (v) homoskedasticity (the error term has a constant variance, given any values of the explanatory variables), (vi) normality (e.g., the error term is independent of the explanatory variables, and normally distributed with zero mean and variance and (vi) no serial correlation (the error terms in two different time periods are uncorrelated) (Wooldridge 2006, pp347-354).

is an unknown parameter to be estimated for each independent variable

an independent variable *i* in industry *j*

is the random error

Furthermore, the Maximum Likelihood two-limit Tobit model is adopted when export performance as indicated by the ratio of exports to total sales is used as the dependent variable, where its values are normally bounded between zero and one. Applying the method of Ordinary Least Squares (OLS) with such a dependent variable where its values are bounded between zero and one will lead to biased and inconsistent estimators, since the OLS method is likely to estimate the values which are greater than one (Kumbhakar and Lovell, 2000; Coelli *et al*., 2005; Hoff, 2006; McDonald, 2009). The Maximum Likelihood two-limit Tobit Model can be written as follows:

+

Where:

= Unobserved export performance of firm *i* in industry *j*

= Observed export performance of firm *i* in industry *j*

= Unknown parameter to be estimated for each independent variable

= Independent variable *i* in industry *j*

= Random error ( ))

Six equations for the export decision and export performance of all firms are identified and examined by four estimation techniques as follows:

Equation 1:

Equation 2:

+ +

Equation 3:

+ +

Equation 4:

Equation 5:

Equation 6:

+ +

Where

Dependent variables:

Dummy for export participation

= Dummy for export participation:
= 1 if firm *i* in industry *j* exports in foreign markets
= 0, otherwise

Export performance

= Export performance of firm *i* in industry *j*, represented by total exports to total sales

Independent variables:

= Size of firm *i* in industry *j*, represented by the book value of fixed assets in the natural logarithm form

= Labour productivity of firm *i* in industry *j*, represented by the value added by total workers in the natural logarithm form

= Dummy for government assistant:
= 1 if firm *i* in industry *j* receives privileges from the Board of Investment (BOI)
= 0, otherwise

= Foreign Investment of firm *i* in industry *t*, represented by the percentage of equity held by foreign investors.

= Dummy for municipal area:
= 1 if firm *i* in industry *j* is located in the municipal area
= 0, if firm *i* in industry *j* is located in the non-municipal area

= Research and development (R&D), represented by the cost of research and development to administrative expenses of firm *i* in industry *j*.

= Age of firm *i* at time *t*, represented by the number of operating years

= Proportion of skilled workforce of firm *i* in industry *j*, represented by the share of skilled workers to total workers.

= Producer Concentration in industry *j*, represented by sum of the five largest firm sales to total industrial sales.

= Capital to Labour Ratio of firm *i* in industry *j*, represented by the book value of fixed assets to total workers in the natural logarithm form.

= Dummy for SMEs classified in group 1, represented by firms which are in TSIC 15 and 16

= Dummy for SMEs classified in group 3, represented by firms which are in TSIC 20, 21 and 22

= Dummy for SMEs classified in group 4, represented by firms which are in TSIC 23, 24 and 25

= Dummy for SMEs classified in group 5, represented by firms which are in TSIC 26, 27 and 28

= Dummy for SMEs classified in group 6, represented by firms which are in TSIC 29, 30, 31, 32, and 33

= Dummy for SMEs classified in group 7, represented by firms which are in TSIC 34 and 35

= Dummy for SMEs classified in group 8, represented by firms which are in TSIC 36 and 37.

Basic descriptive statistics and correlation matrix for all variables used in this study are also provided in Appendices 1 and 2.

VI. EMPIRICAL RESULTS

Six econometric models were identified, which aim to test the effects of significant firm-level and industry-level factors on a firm's export decision and its export performance. A firm's export behaviour can be considered to involve the two-part decision making process which firstly focuses on the possibility of a firm to export, and then considers a firm's export intensity as suggested by Althukorala *et al*. (1995) and Maddala (1983). Moreover, linear and non-linear effects of some variables on a firm's export decision and its export performance were also investigated in this study. The effects of industry dummy variables on an industry's decision to export and its export performance were also examined so that the possibility of each industry's decision to export can be orderly ranked. Six equations were tested by a series of estimation techniques such as (i) the probit model, (ii) the logit model, (iii) the linear probability model (OLS), and (iv) the tobit model. The use of these estimation techniques is aimed at increasing the confidence of the empirical results as illustrated in Table 2.

Table 2: Factors affecting the export decision and performance of Thai manufacturing SMEs

Model	Model 1				Model 2			
	OLS	Probit	Logit	Tobit	OLS	Probit	Logit	Tobit
Dependent Variable:								
Export Dummy/Export Intensity								
Obs Dep=0	61370	61370	61370		61370	61370	61370	
Obs Dep =1	3741	3741	3741		3741	3741	3741	
Independent Variable:								
C	-0.03590*	-4.94250*	-10.92855*	-1.90427	-0.03532*	-6.87343*	-18.16859*	-3.17109*
	(0.00233)	(0.13878)	(0.30943)	(0.04797)	(0.00464)	(0.76848)	(2.11633)	(0.23442)
Size	0.00974*	0.40274*	0.99504*	0.15857	0.00961*	0.39576*	0.97189*	0.15686*
	(0.00049)	(0.01686)	(0.03742)	(0.00616)	(0.00051)	(0.01675)	(0.03724)	(0.00614)
$Size^2$								
Labour_Product	0.00205*	0.10255*	0.23964*	0.03135*	0.00163	0.44506*	1.50352*	0.26063*
	(0.00020)	(0.01130)	(0.02646)	(0.00362)	(0.00100)	(0.13194)	(0.35860)	(0.03998)
$Labour\_Product^2$					0.00002	-0.01523	-0.05511	-0.01013
					(0.00006)	(0.00562)	(0.01514)	(0.00169)
Government_Assist	0.94363*	4.02101*	7.85963*	1.25850*	0.94341*	4.02457*	7.88996*	1.25720*
	(0.00313)	(0.06534)	(0.16706)	(0.01397)	(0.00314)	(0.06597)	(0.16986)	(0.01391)
Foreign_Own	0.00026*	0.00273*	0.00524**	0.00092*	0.00026*	0.00317*	0.00661*	0.00111*
	(0.00008)	(0.00130)	(0.00279)	(0.00023)	(0.00008)	(0.00131)	(0.00281)	(0.00023)
Municipal_ Area	0.00706*	0.34740*	0.91077*	0.12530*	0.00708*	0.32571*	0.84118*	0.11260*
	(0.00081)	(0.03756)	(0.09181)	(0.01154)	(0.00080)	(0.03762)	(0.09139)	(0.01151)
R&D	0.00063*	0.00464	0.00529	-0.00114	0.00065*	0.00707	0.01144	-0.00054
	(0.00025)	(0.00449)	(0.00820)	(0.00185)	(0.00025)	(0.00456)	(0.00860)	(0.00180)
Age	0.00027*	0.00553*	0.01199*	-0.00007	0.00068*	0.02183*	0.05353*	0.00323*
	(0.00004)	(0.00142)	(0.00314)	(0.00058)	(0.00009)	(0.00431)	(0.01019)	(0.00149)
Age^2					-0.00001*	-0.00036*	-0.00088*	-0.00008*
					(0.00000)	(0.00009)	(0.00020)	(0.00003)
Skilled_Labour	-0.00598*	0.12552*	0.36144*	0.08694*	-0.00601*	0.11986*	0.35267*	0.08178*
	(0.00120)	(0.04922)	(0.11556)	(0.01645)	(0.00120)	(0.05010)	(0.11765)	(0.01680)
Concentration_Ratio	0.00170	0.01125**	0.01987*	0.00624*	0.00170	0.01166**	0.02082*	0.00644*
	(0.00162)	(0.00681)	(0.00970)	(0.00243)	(0.00162)	(0.00677)	(0.00953)	(0.00237)
Capital/Labour	-0.00961*	-0.40616*	-1.01035*	-	-0.00951*	-0.40254*	-0.99420*	-0.16308*
	(0.00051)	(0.02085)	(0.04683)	(0.00688)	(0.00053)	(0.02102)	0.04688	(0.00692)
SME_G1								
SME_G3								
SME_G4								
SME_G5								
SME_G6								
SME_G7								
SME_G8								
R^2/ Mc-Fadden R^2	0.821	0.798	0.797	-	0.821	0.799	0.799	-
F-statistic	29835	22849	22836	20340	24873	22877	22877	20405
Prob (F - statistic)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Model	Model 3				Model 4			
	OLS	Probit	Logit	Tobit	OLS	Probit	Logit	Tobit
Dependent Variable:								
Export Dummy/Export Intensity								
Obs Dep=0	61370	61370	61370		61370	61370	61370	
Obs Dep =1	3741	3741	3741		3741	3741	3741	
Independent Variable:								
C	-0.03201*	-7.53189*	-20.80911*	-3.51414*	-0.03677*	-5.12236*	-11.43774*	-1.95355*
	(0.00539)	(0.92486)	(2.53437)	(0.24574)	(0.00236)	(0.15506)	(0.34835)	(0.04885)
Size	0.00882*	0.55624*	1.51422*	0.25510*	0.00980*	0.40315*	0.98411*	0.15590*
	(0.00087)	(0.07958)	(0.18714)	(0.01908)	(0.00049)	(0.01688)	(0.03754)	(0.00588)
$Size^2$	0.00003	-0.00529*	-0.01774*	-0.00322*				
	(0.00003)	(0.00255)	(0.00597)	(0.00058)				
Labour_Product	0.00166**	0.40086*	1.37708*	0.22315*	0.00239*	0.12146*	0.29356*	0.04247*
	(0.00100)	(0.12410)	(0.35110)	(0.03707)	(0.00021)	(0.01219)	(0.02904)	(0.00376)
$Labour\_Product^2$	0.00001	-0.01277*	-0.04812*	-0.00811*				
	(0.00006)	(0.00530)	(0.01478)	(0.00158)				
Government_Assist	0.94318*	4.04250*	7.94219*	1.26017*	0.94202*	4.04053*	7.95006*	1.21863*
	(0.00316)	(0.06582)	(0.17231)	(0.01394)	(0.00316)	(0.06757)	(0.17166)	(0.01370)
Foreign_Own	0.00026*	0.00353*	0.00778*	0.00131*	0.00026*	0.00248*	0.00532**	0.00107*
	(0.00008)	(0.00133)	(0.00284)	(0.00023)	(0.00008)	(0.00132)	(0.00287)	(0.00022)
Municipal_ Area	0.00710*	0.31293*	0.80471*	0.10259*	0.00638*	0.30472*	0.80385*	0.09392*
	(0.00080)	(0.03765)	(0.09103)	(0.01146)	(0.00080)	(0.03812)	(0.09258)	(0.01107)
R&D	0.00065*	0.00808**	0.01328	0.00003	0.00066*	0.00660	0.00974	0.00065
	(0.00025)	(0.00465)	(0.00891)	(0.00177)	(0.00025)	(0.00459)	(0.00835)	(0.00174)
Age	0.00068*	0.02264*	0.05477*	0.00354*	0.00030*	0.00701*	0.01469*	0.00051
	(0.00009)	(0.00431)	(0.01018)	(0.00146)	(0.00004)	(0.00142)	(0.00309)	(0.00055)
Age^2	-0.00001*	-0.00037*	-0.00089*	-0.00008*				
	(0.00000)	(0.00009)	(0.00020)	(0.00003)				
Skilled_Labour	-0.00595*	0.11408*	0.32023*	0.07484*	-0.00619*	0.09007**	0.27823*	0.07299*
	(0.00120)	(0.05058)	(0.11910)	(0.01684)	(0.00122)	(0.05003)	(0.11633)	(0.01603)
Concentration_Ratio	0.00170	0.01190*	0.02095*	0.00669*	0.00195	0.01428*	0.02450*	0.00743*
	(0.00162)	(0.00688)	(0.00978)	(0.00237)	(0.00162)	(0.00676)	(0.01008)	(0.00227)
Capital/Labour	-0.00932*	-0.43228*	-1.06875*	-0.18168*	-0.00943*	-0.39280*	-0.96234*	-0.15530*
	(0.00056)	(0.02083)	(0.04642)	(0.00752)	(0.00051)	(0.02148)	(0.04980)	(0.00655)
SME_G1					-0.00907*	-0.34401*	-0.89650*	-0.12500*
					(0.00116)	(0.06432)	(0.15592)	(0.01976)
SME_G3					-0.00930*	-0.38679*	-0.98743*	-0.12492*
					(0.00135)	(0.06884)	(0.16049)	(0.02203)
SME_G4					-0.00685*	-0.25034*	-0.63920*	-0.17822*
					(0.00219)	(0.06329)	(0.14888)	(0.02090)
SME_G5					-0.00946*	-0.34733*	-0.86388*	-0.19124*
					(0.00131)	(0.05963)	(0.14438)	(0.02044)
SME_G6					-0.00617*	-0.25077*	-0.62853*	-0.17597*
					(0.00243)	(0.07801)	(0.18683)	(0.02295)
SME_G7					-0.00873*	-0.29679*	-0.74310*	-0.15802*
					(0.00420)	(0.12180)	(0.28505)	(0.03427)
SME_G8					0.00730*	0.27928*	0.65753*	0.15337*
					(0.00196)	(0.05894)	(0.13254)	(0.01981)
R^2/ Mc-Fadden R^2	0.821	0.799	0.800	-	0.821	0.803	0.803	-
F-statistic	22960	22893	22901	20464	17613	23000	23002	20740
Prob (F - statistic)	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000

Model	Model 5				Model 6			
	OLS	Probit	Logit	Tobit	OLS	Probit	Logit	Tobit
Dependent Variable:								
Export Dummy/Export Intensity								
Obs Dep=0	61370	61370	61370		61370	61370	61370	
Obs Dep =1	3741	3741	3741		3741	3741	3741	
Independent Variable:								
C	-0.03467*	-7.06614*	-18.62277	-3.19183*	-0.02861*	-7.47539*	-20.74273*	-3.42585*
	(0.00467)	(0.79851)	(2.17927)	(0.23671)	(0.00541)	(0.96175)	(2.56768)	(0.25036)
Size	0.00963*	0.39517*	0.95795	0.15377*	0.00820*	0.49787*	1.38907*	0.22165*
	(0.00051)	(0.01673)	(0.03744)	(0.00586)	(0.00085)	(0.07995)	(0.17921)	(0.01814)
$Size^2$					0.00005**	-0.00339	-0.01410*	-0.00223*
					(0.00003)	(0.00258)	(0.00572)	(0.00056)
Labour_Product	0.00162	0.46355*	1.54264*	0.26536*	0.00168**	0.43188*	1.43497*	0.23832*
	(0.00101)	(0.13571)	(0.36831)	(0.04035)	(0.00101)	(0.12907)	(0.36290)	(0.03828)
$Labour\_Product^2$	0.00004	-0.01518*	-0.05443*	-0.00980*	0.00002	-0.01352*	-0.04878*	-0.00839*
	(0.00006)	(0.00578)	(0.01555)	(0.00170)	(0.00006)	(0.00549)	(0.01528)	(0.00162)
Government_Assist	0.94176*	4.04603*	7.98228*	1.21680*	0.94133*	4.05589*	8.02178*	1.21966*
	(0.00318)	(0.06836)	(0.17465)	(0.01365)	(0.00320)	(0.06841)	(0.17729)	(0.01369)
Foreign_Own	0.00026*	0.00299*	0.00687*	0.00127*	0.00025*	0.00321*	0.00768*	0.00140*
	(0.00008)	(0.00134)	(0.00289)	(0.00022)	(0.00008)	(0.00135)	(0.00290)	(0.00022)
Municipal_ Area	0.00641*	0.28273*	0.73618*	0.08208*	0.00644*	0.27631*	0.71247*	0.07646*
	(0.00079)	(0.03823)	(0.09238)	(0.01107)	(0.00079)	(0.03845)	(0.09239)	(0.01113)
R&D	0.00068*	0.00916**	0.01589**	0.00114	0.00067*	0.00964*	0.01683**	0.00143
	(0.00025)	(0.00470)	(0.00891)	(0.00171)	(0.00024)	(0.00477)	(0.00917)	(0.00168)
Age	0.00074*	0.02577*	0.06137*	0.00420*	0.00072*	0.02614*	0.06183*	0.00437*
	(0.00009)	(0.00438)	(0.01036)	(0.00139)	(0.00009)	(0.00438)	(0.01034)	(0.00138)
Age^2	-0.00001*	-0.00041*	-0.00098*	-0.00008*	-0.00001*	-0.00041*	-0.00098*	-0.00009*
	(0.00000)	(0.00009)	(0.00020)	(0.00003)	(0.00000)	(0.00009)	(0.00020)	(0.00003)
Skilled_Labour	-0.00621*	0.08521**	0.27341*	0.06908*	-0.00610*	0.08146	0.24563*	0.06445*
	(0.00122)	(0.05090)	(0.11863)	(0.01635)	(0.00122)	(0.05151)	(0.12041)	(0.01645)
Concentration_Ratio	0.00196	0.01474*	0.02529*	0.00767*	0.00195	0.01475*	0.02498*	0.00778*
	(0.00162)	(0.00677)	(0.01000)	(0.00222)	(0.00162)	(0.00686)	(0.01021)	(0.00222)
Capital/Labour	-0.00929*	-0.38858*	-0.94450*	-0.15404*	-0.00895*	-0.40689*	-0.99718*	-0.16671*
	(0.00053)	(0.02164)	(0.05015)	(0.00661)	(0.00055)	(0.02062)	(0.04617)	(0.00705)
SME_G1	-0.00905*	-0.33619*	-0.86460*	-0.12226*	-0.00914*	-0.32110*	-0.83149*	-0.11295*
	(0.00116)	(0.06413)	(0.15439)	(0.01982)	(0.00116)	(0.06324)	(0.15407)	(0.01975)
SME_G3	-0.00935*	-0.39497*	-1.00486*	-0.13073*	-0.00947*	-0.38745*	-0.99035*	-0.12700
	(0.00136)	(0.06916)	(0.15919)	(0.02222)	(0.00135)	(0.06917)	(0.16040)	(0.02222)
SME_G4	-0.00681*	-0.25150*	-0.63415*	-0.17271*	-0.00706*	-0.24007*	-0.60827*	-0.16335*
	(0.00220)	(0.06341)	(0.14766)	(0.02075)	(0.00220)	(0.06307)	(0.14738)	(0.02063)
SME_G5	-0.00955*	-0.35674*	-0.87881*	-0.19603*	-0.00972*	-0.34356*	-0.84574*	-0.18808*
	(0.00131)	(0.05958)	(0.14302)	(0.02038)	(0.00130)	(0.05907)	(0.14200)	(0.02032)
SME_G6	-0.00634*	-0.25967*	-0.64315*	-0.18107*	-0.00647*	-0.24670*	-0.61135*	-0.17423*
	(0.00243)	(0.07806)	(0.18589)	(0.02293)	(0.00243)	(0.07666)	(0.18101)	(0.02276)
SME_G7	-0.00880*	-0.30422*	-0.73465*	-0.16426*	-0.00902*	-0.28995*	-0.68970*	-0.15588*
	(0.00420)	(0.12187)	(0.28198)	(0.03429)	(0.00419)	(0.12050)	(0.27735)	(0.03411)
SME_G8	0.00739*	0.28533*	0.66358*	0.14980*	0.00738*	0.28528*	0.65573*	0.14850*
	(0.00196)	(0.05975)	(0.13296)	(0.02018)	(0.00196)	(0.05995)	(0.13290)	(0.02027)
R^2/ Mc-Fadden R^2	0.821	0.804	0.805	-	0.821	0.804	0.805	-
F-statistic	15766	23031	23045	20803	14978	23037	23059	20833
Prob (F - statistic)	0.00000	0.0000	0.000000	0.00000	0.00000	0.00000	0.00000	0.00000

Note: White heteroskedasticity-consistent standard errors (S. E.) are in parentheses for OLS; For logit and probit models Huber/White robust standard errors (S.E.) are in parentheses; * and ** indicate that the coefficients are statistically significant at the 5% level and 10 % levels, respectively; For the Tobit model left censored observations are 61, 370, right observations are zero, uncensored observations are 3,740, and total observations are 65,111.

Firm Size

The empirical results strongly reveal that firm size has a significantly positive and linear effect on the export decision as measured by a dummy variable for exports and tested by a series of estimation techniques, such as (i) the probit model, (ii) the logit model, (iii) the linear probability model (OLS) for Thai manufacturing SMEs. Firm size is also significantly and positively related with its export performance as measured by the ratio of export sales to total sales and tested by the Tobit model for Thai manufacturing SMEs. These results strongly imply that large firms are likely to participate in the international market, since they can cover sunk costs necessary to enter into export markets (Greenaway *et al*., 2007). In other words, large firms can earn sufficient profits to cover their sunk costs incurred during exporting. This empirical evidence is consistent with the finding of Jongwanich and Kohpaiboon (2008). Moreover, larger firms are likely to have better export performance as measured by the ratio of export sales to total sales.

The non-linear effect of firm size on the export decision and export performance was examined in the 3rd and 6th models. Focusing on the 3rd model firm size was also found to have a significant and negative non-linear effect on the export decision and export performance, except the OLS estimation for the case of Thai manufacturing SMEs. Indicating that after a certain threshold, larger firms do not exert a positive influence on the export decision and export performance. Similarly, a significant and negative non-linear relationship was also found in the 6th model estimated by the Logit and Tobit estimations. This empirical finding is contradicted by the insignificant finding of Jongwanich and Kohpaiboon (2008) and the significant and negative finding of Dueñas-Caparas (2006).

Firm Age

Firm age was also found to be statistically and positively related to a firm's export decision and its export performance in all models estimated by all statistical techniques, except in the 1st and 4th models estimated by the Tobit estimation. This result implies that

older firms can compete with foreign companies due to their cumulative experience, business networks and reputation. In other words, older firms tend to have more experience and be more efficient through their learning-by-doing process than younger firms. This result is consistent with the finding of Jongwanich and Kohpaiboon (2008). In addition, older firms are likely to have better export performance for the case of Thai manufacturing SMEs.

A significant and negative non-linear relationship between firm age and its export decision as well as export performance was strongly found in all models estimated by all statistical techniques for the case of Thai manufacturing SMEs. This is because after a certain threshold older firms might not be able to participate in foreign markets and they might not have a better export performance, since they are stuck with outdated physical capital, but young firms are more proactive, flexible, and aggressive than older firms (Aggrey *et al*., 2010). These results are also consistent with the finding of Jongwanich and Kohpaiboon (2008).

Productivity

Productivity as measured by labour productivity was found to be significantly and positively related with a firm's export decision and its export performance in all models, except in the 2nd and 5th models estimated by OLS[3]. This implies that only more efficient firms will self-select into the export market and have better export performance, since the most productive firms can survive in highly competitive foreign markets, resulting in a higher level of export performance. The reason is that there exist additional costs in exporting to foreign countries. These costs include transportation costs, marketing costs, or production costs in developing existing products for foreign customers, which obstruct small or less successful firms becoming new exporters (Wagner, 2005). The significant and negative non-linear relationship between a firm's export decision as well as its export performance was found in the 3rd, 4th, and 5th models using almost all estimation techniques, except for the OLS estimation. This empirical findings indicate that after a certain threshold, firm productivity does not exert a positive influence on a firm's export decision and its export performance. Insignificant results, however, were found in the 2nd model. These significant

[3] However, the OLS estimation under the LPM is not reliable compared with other estimation techniques, since the LPM model violates the homoskedasticity assumption which is important for justifying the t and F statistics (see Section IV).

and positive linear and negative non-linear results for a firm's export decision are consistent with the results of Jongwanich and Kohpaiboon (2008).

Government Assistance

Government assistance was strongly found to have a significant and positive effect on a firm's export decision and its export performance in all models estimated by all statistical techniques for Thai manufacturing SMEs. This empirical finding implies that government assistance through the BOI's privileges can help support Thai manufacturing SMEs to participate in the international market, leading to a higher level of export performance. In other words, government assistance through financial support (e.g., credit assistance, income tax exemption or reduction, and exemption from import duty on essential raw materials) and non-financial support (e.g., managerial and technical assistance, and training support) is necessary to promote the export participation of Thai manufacturing SMEs as well as their export performance. This significant result for a firm's export decision is also consistent with the finding of Wu and Cheng (1999).

Foreign Investment (Ownership)

Foreign investment (Ownership) was found to be significantly and positively related to a firm's export decision and its export performance in all models estimated by all statistical techniques. This significant positive result implies that foreign ownership helps local firms to export to foreign markets, resulting in better export performance. It also strengthens their export performance, since foreign partners bring new foreign markets and distribution outlets, new products, managerial know how and advanced production technology (Jongwanich and Kohpaiboon, 2008). This significant result for a firm's export decision is also consistent with other empirical studies (Greenaway *et al*., 2007; Jongwanich and Kohpaiboon, 2008; Aggrey *et al*., 2010).

Firm Location

Municipal area was strongly found to have a significant and positive impact on a firm's export decision and its export performance in all models estimated by all statistical techniques. This finding shows that Thai manufacturing SMEs which are located in municipal areas are more likely to participate in foreign markets, resulting in a higher level of export performance, since they gain more advantages in terms of transport costs,

infrastructure, spillover effects, labour, and natural resources in exporting than firms which are located in non-municipal areas.

Skilled Labour

Skilled labour was found to be significantly and positively related with a firm's export decision and its export performance for Thai manufacturing SMEs. This significant and positive result was only found when the Logit, Probit, and Tobit estimations were adopted in all models. This significant and positive result for a firm's export decision is consistent with the findings of Dueñas-Caparas (2006) and Roper and Love (2002) who show that higher skilled manpower is likely to be positively related with a higher level of a firm's exports. A significant and negative result was also found when the OLS estimation was used for all models. This result, however, seems to be less important compared with other estimation techniques due to unjustified t and F statistics of the OLS estimation under the LPM (see Section V).

Research and Development (R&D)

Research and development (R&D) expenditure was found to have a positive effect on a firm's export decision and its export performance. However, a significant result was only found for the OLS estimation in all models and the Probit estimation in the 5th and 6th models. This significant and positive result indicates that R&D helps improve the quality of a firm's products so that it is able to engage in foreign markets. This positive result for a firm's export decision is consistent with the finding of Roper and Love (2002).

Capital-Labour Ratio (K/L ratio)

The capital to labour ratio was found to be significantly and negatively related with an industry's decision to export as well as its export performance in all models estimated by all statistical techniques for Thai manufacturing SMEs. This result implies that Thai manufacturing SMEs in an industry that has a low capital-labour ratio is likely to participate in the international market, resulting in a higher level of export performance, since they utilize the supply of cheap labour in the country as their comparative advantage over other countries in order to produce labour-intensive products. This significant and negative result for a firm's export decision is consistent with the result of Jongwanich and Kohpaiboon (2008), but is contradict the results of Athukorala *et.al.* (1995) and Kokko *et. al.* (2001).

Producer Concentration (CR 5*)*

Finally, producer concentration, as measured by the top five highest firm sales to total industry sales, was found to have a significant and positive impact on a firm's decision to export as well as its export performance in all models and statistical techniques, except those estimated by the OLS which produces a positive result but it is statistically insignificant. However, this result contradicts the findings of Jongwanich and Kohpaiboon (2008). They concluded that the possibility of a firm's decision to export declines when the firm's market power (producer concentration) exists in an industry. Unlike their result, this study only captures Thai manufacturing SMEs, and therefore large enterprises are excluded from the study. Those large enterprises are likely to dominate most sales of an industry. This is the reason why the top-five largest values of sales by SMEs are not comparable with the top-five largest value of sales by large enterprises. This is why Thai manufacturing SMEs are forced to expand their sales by exporting in foreign markets.

Industry Dummy

The empirical results for all models estimated by all statistical techniques show that all variables for all SME groups are statistically significant, indicating that Thai manufacturing SMEs in group 8 are likely to participate more in foreign markets and have a better export performance than those in group 2 as the base group. In addition, SMEs in groups 1, 3, 4, 5, 6, and 7 tend to engage less in export activity and have a lower export performance than those in group 2 as the base group. With respect to the magnitude of each estimated industry coefficient, Thai manufacturing SMEs in group 8 are likely to have the highest likelihood of exporting as well as the best export performance over other SME groups, followed by SMEs in group 2. This result implies that SMEs which are in TSIC 36 (manufacture of furniture and manufacturing n.e.c.) and TSIC 37 (Recycling) perform the best in terms of export activity. They are also followed by SMEs in group 2 which are in TSIC 18 (manufacture of textiles), TSIC 19 (manufacture of wearing apparel, dressing and dyeing of fur), and TSIC 20 (tanning and dressing of leather, manufacturer of luggage, handbags, saddler, harness and footwear). However, the results of the estimated coefficients' size for SMEs in groups 1, 3, 4, 5, 6, and 7 are not consistent in each model and statistical technique, and therefore the ranking among SMEs in groups 1, 3, and 4 cannot be derived from this study.

This result indicates that SMEs in group 8 and 2 produce more labour-intensive products compared with the other SME groups. This is also consistent with the finding of the significant and negative relationship between the capital to labour ratio and a firm's decision to export as well as its export performance, implying that Thai manufacturing SMEs are able to compete with other foreign firms in other countries by employing cheap labour as the key source of comparative advantage in the country as suggested by Jongwanich and Kohpaiboon (2008). Moreover, this result can be related with the finding of the significant and positive association between the use of skilled labour and a firm's decision to export as well as its export performance. This is because those SMEs in groups 8 and 2 normally require skilled labour for their production which leads to a higher level of export performance.

VII. CONCLUSIONS AND POLICY IMPLICATIONS

This paper has examined the effects of both firm-specific and industry factors on a firm's decision to export as well as its export performance. The OLS, Probit, and Logit estimation techniques were used to investigate the effects of these variables on a firm's export decision through six econometric models, except the Tobit estimation technique which was only employed to evaluate the case of a firm's export performance. Moreover, the study used different estimation techniques aimed at increasing the reliability of the empirical result of the study. Cross-sectional econometric analysis of firms was undertaken employing the 2007 Thai Industrial Census which is the most updated industrial census available in Thailand. 65,111 Thai manufacturing SMEs were finally selected for this study.

The key findings are that there exist a number of firm-specific factors which are significantly and positively related with a firm's export decision and its export performance, such as (i) firm size, (ii) firm age, (iii) labour productivity, (iv) government assistance, (v) foreign investment (ownership), (vi) municipal location, and (v) skilled labour. Significant and negative non-linear results were also found for (i) firm size, (ii) firm age, and (iii) labour productivity, implying that after a certain threshold, firm size, firm age, and labour productivity would cause a firm's export decision and its export performance to decline.

With regards to the effects of industry factors on a firm's export decision and its export performance, the significant and negative result for the capital – labour ratio indicates that the likelihood of a firm's decision to export and its export performance in labour-intensive industry is likely to be higher than that in a capital-intensive industry, which is

comparable to Thailand's comparative advantage in utilizing cheap labour-abundant supply over some other countries[4]. Furthermore, producer concentration has a significant and positive impact on a firm's decision to export and its export performance for Thai manufacturing SMEs. Unlike Thai manufacturing large enterprises, this statistically significant and negative finding implies that Thai manufacturing SMEs which have the top five highest sales still cannot dominate the market, forcing them to expand their sales to foreign markets. Focusing on sub-manufacturing groups of SMEs, Thai manufacturing SMEs in group 8 (consisting of TSIC 36 (manufacture of furniture and manufacturing n.e.c.) and TSIC 37 (recycling)) tend to have the highest probability of exporting and also perform the best in terms of exports, followed by SMEs in group 2 (consisting of TSIC 18 (manufacture of textiles), TSIC 19 (manufacture of wearing apparel, dressing and dyeing of fur), and TSIC 20 (tanning and dressing of leather, manufacturer of luggage, handbags, saddler, harness and footwear)).

Empirically Based Policy Implications

With respect to the empirical results an increase in firm size should be promoted for the case of Thai manufacturing SMEs, since large firms can earn sufficient profits to cover their sunk costs incurred during exporting. The government may encourage Thai manufacturing SMEs to increase their size, which can be made by a number of means such as (i) facilitating them to have access to bank loans with affordable interest payments or an equity increase through listing in the Market Alternative Investment (MAI) or with support from the Office of Small and Medium Enterprises Office, and (ii) encouraging them to increase their investment which can be made through tax and non-tax incentives[5] approved by the Board of Investment (BOI). These suggestions are aimed at reaching an adequate size of Thai manufacturing SMEs, since larger firms may be at an advantage in gathering market information, launching overseas

[4] However, this advantage has eroded considerably with the rise of less expensive labour countries such as China and Vietnam.

[5] Tax incentives are as follows: (i) Exemption/reduction of import duties on machinery, (ii) Reduction of import duties for raw or essential materials, (ii) Exemption of juristic person's income tax and dividends, (iii) a 50 percent reduction of the juristic person's income tax, (iv) double deductions from the costs of transportation, electricity and water supply, (v) Additional 25 percent deduction of the cost of installation or construction of facilities, (vi) Exemption of import duty on raw or essential materials for use in production for export. Moreover, non-tax incentives are as follows: (i) Permit for foreign nationals to enter the Kingdom for the purpose of studying investment opportunities, (ii) permit to bring into the Kingdom skilled workers and experts to work in investment promoted activities, (iii) permit to own land, and (iv) Permit to take out or remit money abroad in foreign currency (see BOI (2012)).

sales-promotion campaigns, bearing exchange rate and other risks, and adapting their products to foreign markets as suggested by Athukorala *et.al.* (1995).

Labour productivity should also be strengthened in Thai manufacturing SMEs, since the most productive firms can compete in highly competitive markets. As a result, the government can encourage Thai manufacturing SMEs to launch worker training programs within their organizations. This can be achieved, for example, by allowing actual worker training programs' expenditure to be double, and then used it for the corporate tax reduction. The government can also develop the mentoring and consulting system and the labour standard certification within formal and informal systems. Human resource development should be emphasized to be in line with real demand of the manufacturing sector and cooperative network building among educational institutions. Moreover, enhancement of the working place environment and social welfare will assist in promoting the productivity of workers in SMEs due to an increase in work loyalty.

Similarly, skilled labour might be promoted for the case of Thai manufacturing SMEs, and therefore programs to upgrade knowledge and skills of entrepreneurs and employees might be emphasized by (i) developing learning mechanisms to enhance their capabilities, (ii) providing facilities which can enhance knowledge among employees, such as on-the-job training programs, e-learning school or university programs

With respect to the significant and positive result of firm age and its export decision, policies which aim to help young manufacturing SMEs to participate in foreign markets are also necessary, such as (i) promoting cross-learning linkages between young firms and old firms, (ii) providing technological service support, (iii) providing the support of counseling and mentoring, knowledge and skills upgrading, (iv) promoting the knowledge on production, management, finance and marketing, and (v) providing a tax holiday[6] for young firms. However, after a certain threshold, firm size, firm age, and labour productivity will not help a firm's export participation and its export performance. In other words, after a certain threshold, firms which are too large may be obstructed by "diseconomies of scale" in their production, and therefore public programs through the Board of Investment (BOI) and the Office of Small and Medium Enterprises Promotion (OSMEP) might be introduced to assist

[6] In Thailand, a tax holiday currently refers to tax privileges that firms obtain from the Board of Investment (BOI).

them to enhance their export activity. Similarly, cross-cultural training programs between young and old firms might be useful, since, after a certain threshold, older firms might not be able to engage in export activity, since they are stuck with outdated physical capital and traditional management styles, but younger firms are more proactive, flexible, and aggressive than older firms. Regarding the significant and negative non-linear result of labour productivity, training programs for workers or the use of capital such as machinery and equipment might be necessary to maintain a firm's export participation and its export performance.

In addition, government assistance through the BOI's privileges[7] is also useful for Thai manufacturing SMEs, since the BOI privileges as previously discussed can help them contribute positively towards the international competitiveness of Thai manufacturing SMEs' export performance in the short run. In order to alleviate the nut-cracker effect faced by Thai manufacturing SMEs as identified previously in Section 1, the government should also support Thai manufacturing SMEs to move to higher value adding of their products and also create product differentiation. This can be implemented by encouraging the development of production structures from the role of original equipment manufacturers (OEM) to the role of original design manufacturers (ODM) and eventually to the role of original brand manufacturers (OBM).

Encouraging foreign investment (ownership) is also useful for the case of Thai manufacturing SMEs, since foreign partners bring new foreign markets and distribution outlets, financial support, new products, managerial know how, and advanced production, and therefore help local firms participate in foreign markets. Moreover, research and development (R&D) is necessary for Thai manufacturing SMEs, since it helps contribute positively towards their export participation and competitiveness. Thai manufacturing SMEs which are located in municipal areas gain more advantages in terms of transport costs, infrastructure, spillover effects, labour, and natural resources. Therefore, policies, which focus on improving the country's infrastructure and facilities necessary for exporting, should be undertaken.

[7] This is because the BOI's support was introduced as a proxy for government assistance.

Finally, the supply of skilled labour is the key comparative advantage of the country as indicated by the significant and negative sign of the capital - labour ratio, but the significant and positive sign was found for skilled labour and labour productivity. Similarly, SMEs in group 8 mostly participate in foreign markets, followed by SMEs in group 2, implying that these SME groups can participate in foreign markets due to the supply of labour - intensive products. Therefore, promoting the skills of labour as well as skill or knowledge – based products of the country is necessary to maintain its comparative advantage in the future.

APPENDIX

Appendix 1: Descriptive Statistics

Variables	Mean	Median	Max	Min	Obs.	Unit of Measurement
Dependent Variables:						
Export Decision	0.0575	0.0000	1.0000	0.0000	65111	Dummy
Export Performance	0.0269	0.0000	1.0000	0.0000	65111	Ratio
Independent Variables:						
Size	13.4452	13.4254	24.4609	0.0000	65111	Natural Logarithm
Labour Productivity	10.5051	11.0000	19.0000	-3.0000	65111	Natural Logarithm
Government Assistance (BOI)	0.0489	0.0000	1.0000	0.0000	65111	Dummy
Foreign Investment (Ownership)	1.5056	0.0000	100.0000	0.0000	65111	%
Municipal Area	0.4410	0.0000	1.0000	0.0000	65111	Dummy
R&D	0.1845	0.0000	77.0000	0.0000	65111	%
Age	10.7542	8.0000	99.0000	1.0000	65111	Year
Skilled Labour /Total Labour	0.3862	0.3300	1.0000	0.0000	65111	Natural Logarithm
Producer Concentration (CD 5)	0.2277	0.1865	100.0000	0.0228	65111	Ratio
Capital / Labour	11.4331	11.8180	20.1010	-5.1930	65111	Natural Logarithm
SMEs in Group 1	0.2293	0.0000	1.0000	0.0000	65111	Dummy
SMEs in Group 2*	0.1954	0.0000	1.0000	0.0000	65111	Dummy
SMEs in Group 3	0.1184	0.0000	1.0000	0.0000	65111	Dummy
SMEs in Group 4	0.0783	0.0000	1.0000	0.0000	65111	Dummy
SMEs in Group 5	0.2051	0.0000	1.0000	0.0000	65111	Dummy
SMEs in Group 6	0.0557	0.0000	1.0000	0.0000	65111	Dummy
SMEs in Group 7	0.0187	0.0000	1.0000	0.0000	65111	Dummy
SMEs in Group 8	0.0990	0.0000	1.0000	0.0000	65111	Dummy

Source: Authors' estimates

Note: * SMEs in Group 2 are used as the base group to avoid the problem of the dummy trap

Appendix 2: Correlation Matrix Table

	Export Decision	Export Perform	Size	Labour Product	Govt Assist	Foreign Invest	Muni Area	R&D	Age	Skilled L /Total L.	CD 5	K/L	SMEs G1	SMEs G2	SMEs G 3	SMEs G 4	SMEs G5	SMEs G 6	SMEs G7	SMEs G8
Export Decision	1.00																			
Export Perform	0.78	1.00																		
Size	0.28	0.22	1.00																	
Labour Product	0.22	0.17	0.48	1.00																
Govt Assist	0.90	0.71	0.27	0.21	1.00															
Foreign Invest.	0.35	0.32	0.19	0.16	0.37	1.00														
Municipal Area	0.06	0.05	0.15	0.27	0.03	0.02	1.00													
R&D	0.08	0.05	0.06	0.05	0.08	0.04	0.03	1.00												
Age	0.09	0.06	0.16	0.17	0.08	0.01	0.14	0.03	1.00											
Skilled L/Total L	0.13	0.11	0.32	0.15	0.12	0.07	0.12	0.02	0.06	1.00										
CD 5*	0.02	0.03	0.01	0.01	0.02	0.03	-0.01	0.00	0.00	0.00	1.00									
K/ L	0.12	0.09	0.86	0.43	0.12	0.10	0.12	0.02	0.11	0.07	0.01	1.00								
SMEs G1	-0.07	-0.05	-0.04	-0.03	-0.06	-0.06	-0.07	-0.01	0.01	-0.12	0.03	0.02	1.00							
SMEs G2	-0.02	0.00	-0.13	-0.22	-0.03	-0.04	-0.03	-0.01	-0.07	-0.01	-0.03	-0.15	-0.27	1.00						
SMEs G3	-0.03	-0.02	-0.03	-0.03	-0.03	-0.03	0.02	-0.01	0.02	-0.03	-0.01	-0.02	-0.20	-0.18	1.00					
SMEs G4	0.11	0.06	0.16	0.12	0.11	0.08	0.02	0.06	0.03	0.07	0.00	0.07	-0.16	-0.14	-0.11	1.00				
SMEs G5	-0.04	-0.05	0.07	0.12	-0.04	-0.01	0.01	-0.01	0.02	0.07	-0.01	0.10	-0.28	-0.25	-0.19	-0.15	1.00			
SMEs G6	0.08	0.04	0.08	0.13	0.08	0.11	0.05	0.02	0.03	0.05	0.03	0.06	-0.13	-0.12	-0.09	-0.07	-0.12	1.00		
SMEs G7	0.05	0.03	0.07	0.07	0.05	0.08	0.03	0.01	0.02	0.04	0.09	0.04	-0.08	-0.07	-0.05	-0.04	-0.07	-0.03	1.00	
SMEs G8	0.03	0.07	-0.08	-0.03	0.02	0.00	0.02	-0.02	-0.03	-0.01	-0.03	-0.06	-0.18	-0.16	-0.12	-0.10	-0.17	-0.08	-0.05	1.00

Source: Author's estimates

Note: CD 5 is producer concentration

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