The University of Nottingham

research paper series

Globalisation, Productivity and Technology

Research Paper 2008/13

Firm Heterogeneity and Export Participation: A New Asian Tiger Perspective

by

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The Centre acknowledges financial support from The Leverhulme Trust under Programme Grant F114/BF

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Leverhulme Centre for Research on Globalisation and Economic Policy

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Acknowledgements
The authors gratefully acknowledge the support of Leverhulme Trust grant number F/00094/AG and comments Eric Strobl and from participants at the ETSG conference in Athens 2007. The usual disclaimer applies.

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Abstract

This paper investigates the relationship between firm heterogeneity and a firm's decision to export, using the annual survey of Thai manufacturing firms from 2001 to 2004. A significant contribution of this paper is that we are, for the first time, able to break down FDI by country of origin to observe whether the behavior of MNEs differs by region of origin. We find that entry sunk costs and firm characteristics are important factors in explaining a firm's decision to export. Another important determinant is the ownership structure of the firm, with foreign owned firms having a higher probability of exporting than domestically owned firms although this differs across country of ownership with potentially important policy implications. Export platform FDI is used to explain the behavior of foreign firms that invest in Thailand. Using three measures of total factor productivity, we also find that highly productive firms self-select into the export market. The implication for governments of developing countries is the need to think carefully about how and to whom they target their inward FDI policies as a means of growth. The heterogeneous behavior of multinationals from different nations means that policies targeting specific regions or countries may be preferable to general tax concessions or the implementation of special economic zones that are open to all.

JEL classification: D21, D24, F14, F23, O12, O14, O53

Keywords: FDI, exports, firm heterogeneity, development

Outline

Non-Technical Summary

As the world economy becomes more closely integrated as a result of the pervasive forces of globalisation, there is continued interest from both academics and policymakers in the growth strategies of developing and newly industrialised countries (NICs). Development through exporting is a widely recognised route by which small open economies, and especially the so-called Asian Tigers, have managed to grow rapidly.

Although exports are generally seen as beneficial to the exporting country, it is recognised that by no means all firms export and that the decision to enter the export market is determined by a range of factors. To date, the majority of studies examine the export decision of firms in developed countries with far fewer studies looking at the developing countries and even less from the perspective of one of the new Asian Tigers. This is surprising given the nature of the export driven development in this region that involves significant competition for foreign direct investment. Multinationals from Japan in particular have used East Asian countries as an export platform to market their products globally, a strategy that led to rapid growth in Thailand.

This paper employs a firm-level dataset for Thailand between 2001 and 2004 to investigate the determinants of Thai firms' decision to participate in the export market. A significant contribution of this paper is that we are, for the first time, able to break down FDI by country of origin to observe whether the behavior of MNEs differs by region of origin. We show that a firm's decision to export is determined by the level of sunk entry costs, structure of ownership, productivity, firm size and location. Our results are broadly consistent with those of developed countries and other developing countries although, as we might have expected given the nature of Thailand's economy, past export performance, foreign ownership and product quality generally have stronger effects for Thailand. When we distinguish between different countries of ownership our results show that US, UK, Singaporean, Japanese and Chinese ownership results in an increased propensity to export whilst other Korean and Southeast Asian ownership has a negative impact.

The implication of our results for governments of developing countries is the need to think carefully about how and to whom they target their inward FDI policies as a means of growth. The heterogeneous behavior of multinationals from different nations means that policies targeting specific regions or countries may be preferable to general tax concessions or the implementation of special economic zones that are open to all.

1. Introduction

As the world economy becomes more closely integrated as a result of the pervasive forces of globalisation, there is continued interest from both academics and policymakers in the growth strategies of developing and newly industrialised countries (NICs). Development through exporting is a widely recognised route by which small open economies, and especially the so-called Asian Tigers, have managed to grow rapidly.[1] A number of studies have now demonstrated a clear link between a country's openness and its productivity growth (Edwards 1993 and 1998).

Although exports are generally perceived to be beneficial to the exporting country, it is recognised that by no means all firms export and that the decision to enter the export market is determined by a range of different factors. To date, the majority of studies have examined the export decision of firms from developed countries (Bernard and Jenson 1999, 2004, Girma *et al*. 2004, Greenaway and Kneller 2004, Greenaway *et al*. 2005, Greenaway *et al*. 2007 and Kimura and Kiyota 2006) with fewer studies looking at the developing country experience (Roberts and Tybout 1997, Clerides *et al*. 1998, Van Biesebroeck 2005, Sjöholm 2003, and Alvarez and López 2005).

Studies that examine the export decision of firms from the perspective of one of the new Asian Tigers are limited. The only papers we are aware of are for Indonesia (Sjöholm 2003, Blalock and Gertler 2004 and Blalock and Roy 2007). This is rather surprising given the nature of the development strategy of this region that is export driven and involves significant competition for foreign direct investment (FDI). Multinationals from the developed world, Japan in particular, have used East Asian countries as an export platform to market their products globally, a strategy that led to rapid growth in Thailand. Moreover, the manufacturing sectors of the majority of NICs still constitute a large proportion of national output in contrast to countries such as the UK and US where the manufacturing sector now typically accounts for less than 20% of GDP.

In this paper we employ a detailed firm-level dataset for Thailand between 2001 and 2004 to investigate the determinants of Thai firms' decisions to participate in the export market. One

[1] Traditionally, the Asian Tigers were thought to consist of the countries of South Korea, Hong-Kong, Singapore and Taiwan. The new Asian Tigers are considered to be Malaysia, Thailand, the Philippines and Indonesia. Together, the "new" and "old" Asian Tigers are characterised by export-driven economic development and industrial policies aimed at encouraging inward foreign direct investment.

significant contribution of this paper is that we are able for the first time to break down FDI by country and region of origin. We show that a firm's decision to export is determined by the level of sunk entry costs, structure of ownership, productivity, firm size and location. Our results are broadly consistent with those of developed countries and other developing countries although, as we might have expected given the nature of Thailand's economy, past export performance, foreign ownership and product quality generally have stronger effects for Thailand than the US, UK and other developing countries. As well as being one of the first studies of this kind for a new Asian Tiger economy, and the first for Thailand, by distinguishing between different countries of ownership we are able to identify whether the nationality of a firm's ownership in any way influences the likelihood of that firm to export. Our results show that US, UK, Singaporean, Japanese and Chinese ownership results in an increased propensity to export whilst Korean and other Southeast Asian ownership has a negative impact. This has potentially important policy implications for developing country governments looking to attract FDI as a means to future growth.

The remainder of this paper is organised as follows: In Section 2, we provide an overview of Thailand's export performance and discuss the importance of manufacturing exports to the Thai economy. In Section 3 we review the theoretical and empirical literature. Section 4 describes our econometric specification and discusses our estimation techniques. Our results are presented in Section 5 while Section 6 concludes.

2. Thailand's Export Performance

Thailand has been the third largest exporter from the Southeast Asian region for the last 10 years (ASEAN Statistical Yearbook, 2005). As an ASEAN member Thailand shares in the benefits of the ASEAN Free Trade Area which aims to eliminate tariff and non-tariff barriers in both manufacturing and agricultural sectors among member countries.[2] As a result the ASEAN region remains a major export market for Thailand. Table 1 reveals that after 2003 ASEAN replaced the US as Thailand's largest export market with an export share to ASEAN in 2006 of about 20.8% of total exports with 15% and 13% exported to the US and EU15

[2] Attempts at organised regional co-operation between South-East Asian countries dates to August 1967 when the ASEAN was established with original members Indonesia, Malaysia, the Philippines, Singapore and Thailand. Expansions to ASEAN were Brunei in 1984, Vietnam in 1995, Myanmar and Laos in 1997 and Cambodia in 1999.

respectively. Since 1999 the total export value has increased dramatically reaching US$ 129,744.1 million in 2006. The manufacturing sector still dominates, accounting for 77% of total exports in 2006.

Table 2 illustrates the level of exports for a selection of Thai industries. Sectors with large export volumes tended to be high-technology products such as computers (and parts), automobiles (and parts) and integrated circuits. The production of computers and parts has been Thailand's leading industrial export sector for many years accounting for 11.47 percent of the country's total exports in 2006. The other leading export industry is the automotive industry with numerous foreign automotive manufacturers from Japan, the US and Europe using Thailand as an export platform to sell their products worldwide. Other prominent export sectors include more labor-intensive products such as gems, jewellery and garments.[3]

Given the importance of the export sector and Thailand's continued export driven development policies it is important to have an understanding of the factors that influence a firm's decision to participate in the export market. Specifically, it is important to know whether there are any significant differences in the factors influencing the decision to export within Thai firms in comparison with the experience of firms from economies at different stages of development.

[3] After 2004 export growth from the textile industry fell as a result of the elimination of quota restrictions in early 2005 and increased competition in the garment sector from China, Vietnam and India (Bank of Thailand, 2006).

Table 1: Major Export Markets

Export Markets	Value : US$ million							
	1999	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006 (Jan-Dec)***
ASEAN	10,871.60	13,482.20	12,599.10	13,568.90	16,486.00	21,241.00	24,397.70	27,040.00
EU-15	9,828.70	11,001.30	10,551.90	10,214.60	11,747.70	13,815.80	14,294.30	16,873.80
Japan	8,261.30	10,232.40	9,945.40	9,950.00	11,356.20	13,498.50	15,096.80	16,430.60
US	12,654.30	14,870.10	13,199.60	13,509.40	13,596.20	15,508.50	16,996.80	19,454.00
Others	41,615.90	49,586.00	46,296.00	47,242.90	53,186.10	64,063.80	70,785.60	79,798.40
World	58,463.40	69,624.20	65,183.20	68,156.30	80,040.00	96,531.00	110,953.30	129,744.10

Note: * Preliminary Figures.

Source: Department of Trade Negotiations, Ministry of Commerce

Table 2: Fifteen Major Export Commodities in Thai Manufacturing Sector during 1999-2006.

Rank		Product	Value : US$ million							
2006	2003		1999	2000	2001	2002	2003	2004	2005	2006 (Jan-Dec)*
1	1	Computer machinery, parts and accessories	8,121.60	8,739.50	7,947.50	7,430.30	8,189.60	9,185.70	11,848.00	14,876.30
2	3	Automobile, parts and accessories	1,902.30	2,419.40	2,655.00	2,919.70	3,965.50	5,495.60	7,745.50	9,540.80
3	2	Integrated circuits	2,944.60	4,484.00	3,512.20	3,308.00	4,624.60	4,902.80	5,950.60	7,028.70
4	7	Plastic pellets	1,215.30	1,865.60	1,615.00	1,775.20	2,148.40	3,105.20	4,198.50	4,500.70
5	5	Gems and Jewellery	1,766.30	1,741.80	1,837.20	2,169.30	2,514.50	2,645.60	3,232.70	3,644.30
6	8	Iron and steel products	954.30	1,399.20	1,091.40	1,249.70	1,687.20	2,478.10	2,898.00	3,527.10
7	6	Radio, television and parts	1,346.50	1,964.90	1,692.80	2,094.60	2,501.80	3,225.10	3,141.80	3,462.50
8	9	Chemicals	908.00	1,248.10	1,015.10	1,193.00	1,581.40	2,059.20	2,646.80	3,443.20
9	4	Garments	2,915.60	3,132.70	2,914.40	2,721.50	2,760.20	3,092.60	3,150.60	3,204.70
10	10	Rubber products	875.00	1,060.40	1,095.10	1,260.30	1,556.40	1,944.60	2,351.20	3,090.00
11	15	Electrical appliances	545.10	901.10	873.60	957.90	1,080.00	1,935.40	2,301.80	2,746.00
12	13	Machinery and components	613.90	801.40	861.00	930.30	1,245.10	1,672.00	2,113.90	2,659.10
13	11	Air Conditioning machine and parts	895.50	1,079.60	1,160.50	1,108.30	1,430.30	1,997.80	2,201.40	2,289.30
14	14	Plastic products	758.10	894.20	860.30	954.40	1,236.20	1,410.90	1,774.70	1,886.50
15	29	Reciprocating internal combustion engine and components	187.70	327.40	287.00	346.00	547.80	1,245.40	1,380.00	1,569.10

Total Top 15	25,949.80	32,059.30	29,418.10	30,418.50	37,068.90	46,395.80	56,935.60	67,468.20
Total Others	32,513.60	37,564.90	35,765.10	37,737.80	42,971.10	50,135.20	54,017.80	62,275.90
Total	58,463.40	69,624.20	65,183.20	68,156.30	80,040.00	96,531.00	110,953.30	129,744.10

Note: * Preliminary Figures.

Source: Department of Trade Negotiations, Ministry of Commerce

3. Literature Review

3.1 Sunk Entry Costs and the Decision to Export

The costs to a firm of becoming and remaining an exporter are composed of two components: sunk costs and fixed costs. The former refer to the costs that arise before a firm enters the export market; the latter occur as long as a firm remains in the export market, e.g. transport and service costs and marketing costs.

More specifically, sunk costs are defined as an initial large and one-off investment faced by a firm in order to enter the export market. Such a cost can be considered as a combination of R&D spending to improve product quality in order, for example, to conform to standards and safety regulations of a target country, and the setting up of business and marketing connections in foreign countries. Baldwin (1988) describes sunk costs as the costs of establishing a distribution and service network, and the costs of launching product or brand advertising.

Each individual firm faces a different sunk entry cost which will depend upon firm specific characteristics including geographical location. However, when a firm that has previously exited a market wants to re-enter, it will still face a sunk cost which will vary depending on how long it has been absent from the market. Theoretically, we follow Roberts and Tybout (1997).

For a given firm, the export status of firm i is given by Y_{it} where Y_{it} equals 1 if firm i exports at time t, and 0 otherwise. The export experience of firm i through period t is given by $Y_{i(t-j)} \mid j \geq 0$. In the current period, a firm chooses the infinite sequence of values of $Y_{i(t+j)} \mid j \geq 0$ that maximises the expected present value of revenue. The function of the maximised revenue can be written as:

$$V_{it}(\Omega_{it}) = \max_{Y_{i(t+j)} \mid j \geq 0} E_t\left(\sum_{j=t}^{\infty} \delta^{j-t} R_{ij} \mid \Omega_{it}\right) \qquad (1)$$

where $j = t$, $R_{ij} = R_{it}$, and thus R_{it} is the current revenue of firm i. Ω_{it} is the current specific information set of firm i. E_t represents the expected value in the current period which is conditional on the firm specific information set of firm i available in period t and

δ is the discount rate. By applying Bellman's equation to the export decision, the current export status of firm i written as Y_{it} satisfies:

$$V_{it}(\Omega_{it}) = \max_{Y_{it}} \left(R_{it}(Y_{i(t-j)|j\geq 0}) + \delta E_t(V_{i(t+1)}(\Omega_{i(t+1)}) \mid Y_{i(t-j)|j\geq 0}) \right) \qquad (2)$$

From the maximisation of the revenue equation (2), we can define the current profit function $(\hat{\pi}_{it})$ as current revenue plus the difference in the expected value of the maximised revenue of firm i, conditional on the firm's export status. Thus, $\hat{\pi}_{it}$ can be written as:

$$\hat{\pi}_{it} \equiv R_{it} + \delta\left[\left[E_t(V_{i(t+1)}(\Omega_{i(t+1)}) \mid Y_{it} = 1)\right] - \delta\left[E_t(V_{i(t+1)}(\Omega_{i(t+1)}) \mid Y_{it} = 0)\right]\right] \qquad (3)$$

where $\Omega_{i(t+1)}$ is the information set of firm i in period $t+1$.

In each period, firm i has to decide whether to export or not. Firm i exports in period t if the expected gross profit and revenue of firm i at time t $(\hat{\pi}_{it})$ exceeds the current period cost (c_{it}) including the sunk entry cost (S_i). Otherwise, firm i chooses not to export. The export decision by firm i is therefore represented as:

$$Y_{it} = \begin{cases} 1 \text{ if } \hat{\pi}_{it} > c_{it} + S_i * (1 - Y_{i(t-1)}) \\ 0 \text{ otherwise} \end{cases} \qquad (4)$$

Sunk entry costs (S_i) are varied across firms, so previous experience including the characteristics of each particular firm affects a firm's decision to export.

Since the main aim of this paper is to examine the factors that influence the export decision of a firm, firm characteristics are included in the empirical model in order to identify the probability of exporting. We therefore specify the export decision model as:

$$Y_{it} = \begin{cases} 1 \text{ if } \beta Z_{it} - S_i * (1 - Y_{i(t-1)}) + \varepsilon_{it} > 0 \\ 0 \text{ otherwise} \end{cases} \qquad (5)$$

where Z_{it} represents a vector of firm specific characteristics. Details on the variables we include in vector Z are discussed in the next section.

3.2 Empirical Analysis of Firm Heterogeneity, Sunk Entry Costs and the Decision to Export

A number of studies have examined the factors that affect a firm's decision to export. The increased availability of firm-level data has led to a number of empirical studies that examine a country's exports from a firm-level perspective. The primary question these studies attempt to answer is whether good firms become exporters or whether exporters become good firms. López (2005), Wagner (2007), and Greenaway and Kneller (2007) provide detailed surveys of the firm heterogeneity and international market participation literature.

Developed Countries

For the US Bernard and Jensen (1999) investigate the factors that affect a firm's export decision using plant-level characteristics and lagged endogenous variables as independent regressors finding evidence to suggest that good firms become exporters. The statistical significance of entry sunk costs indicates that firms who have had previous export experience (either one or two years ago) seem to re-enter and remain as exporters in the following year. Firm size, wage, and productivity, all significantly increase the probability of exporting. Applying alternative estimation techniques including a linear probability model without plant effects, a linear probability model with fixed effects and GMM in first differences, Bernard and Jensen (2004) extend their 1999 model to include foreign ownership, spillovers and subsidies. Sunk entry costs are generally positive and significant. The results from the spillover variables are of limited economic significance. Equally, expenditure on state level export promotion appears to have no effect on the probability of exporting. In terms of plant characteristics, the size of the firm is a significant indicator and is consistent across all three estimation techniques.

For the UK, Greenaway and Kneller (2004) find that lagged exports have a positive and significant effect on the probability of a firm exporting. Firm size and wage are also positive and significant determinants. They also find that more productive firms are more likely to enter the export market. One additional result of interest is that both industrial and geographical agglomerations are significant determinants of entry into export markets.

In a more recent paper, Greenaway *et al.* (2007) examine a firm's export decision using firm-level financial indicators instead of lagged export status to explain the significance of

sunk entry costs. The hypothesis is that the stronger the financial health of the firm, the more likely a firm is to enter the export market. Consistent with the results of other studies, they also find that small and domestic firms are less likely to export rather than large and foreign firms. However, in contrast to other UK studies, total factor productivity (TFP) is insignificant and the sign on wage is negative.

In a further study for the UK, Kneller and Pisu (2004) examine the export behavior of foreign firms. Their results suggest that foreign firms appear to export more than domestic firms. Other results reveal a positive relationship between the decision to export and firm size, the proportion of the workforce that is skilled and productivity. One interesting result is that the origin of ownership of the firm is found to be important. The significance of several country groupings is consistent with the export-platform FDI hypothesis with firms, for example from the US and Canada being more likely to export rather than those from Australia.

To test more accurately the self-selection and learning-by-exporting hypotheses, Girma *et al.* (2004), Greenaway *et al.* (2005) and Arnold and Hussinger (2005) apply matching techniques to examine the export performance of firms from the UK, Sweden and Germany respectively.[4] The predicted current probability of exporting is determined by size, age and productivity. Young firms are also more likely to become exporters. In the case of the UK and Germany, the results show that more productive firms export. Once UK firms enter the export market, their productivity tends to be increased further but this does not apply to German firms for whom productivity does not improve. The results for Sweden differ from those for the UK and are partially consistent with those for Germany. For Sweden there is no evidence of differences in productivity between exporters and non-exporters affecting pre- or post-export market entry. Bernard and Wagner (2001) in a study of German firms provide consistent findings.

Fariñas and Martín-Marcos (2007) use data from the Spanish manufacturing sector to analyse the difference in performance of exporting and non-exporting firms. Exporting is positively correlated with productivity size, wages and innovation. Prior to entering an export market, new-entry exporters have a better performance than non-exporters. Fariñas and Martín-Marcos (2007) also provide evidence to support the proposition that firms self-select to exit export markets because continuing exporters have a higher performance than

[4] A single index identifying the probability of entry that captures all information about the characteristics of the firm pre-entry is based on the use of matching techniques.

firms which exit. These results are consistent with the self-selection hypothesis which suggests that efficient firms self-select into export markets, a result also found in Taiwanese firms by Aw *et al.* (2000 and 2007). Aw *et al.* (2007) show that the export decision is positively and significantly determined by factors such as firm productivity, export experience and R&D investment.

Developing countries

Robert and Tybout (1997) investigate the factors that affect the export decision of Colombian firms using firm-level data from 1981 to 1989. They build a dynamic discrete-choice model as a theoretical explanation of a firm's behavior in entering and exiting export markets where firms are prone to enter an export market if current net operating profit exceeds sunk costs. In determining the export decision, sunk costs and a vector of firm specific characteristics are included in the dynamic model. The empirical analysis confirms the existence of sunk entry costs. It indicates that firms who incur sunk costs in the previous period are expected to export in the current period. Importantly, unobserved plant heterogeneity is used to determine the probability of exporting.

Clerides *et al.* (1998) study the export participation and the importance of learning-by-exporting in Colombia, Mexico, and Morocco. They investigate whether marginal costs affect the export decision of the firm and whether the export experience has an effect on the firm's costs. The results can be interpreted as saying that plants with low marginal costs and a large capital stock are more likely to export. Moreover, past export experience also appears to determine current export participation. There is also some evidence of geographic spillovers for Colombian plants.

López (2004) and Alvarez and López (2005) examine Chilean manufacturing plants from 1990 to 1996 and investigate whether firms self-select into export markets or whether firms learn by exporting. Total factor productivity is found to be important, indicating that firms learn to export and also suggesting that firms invest in technology in order to be able to produce high quality export goods which lead to productivity upgrading in the pre-entry period. As productivity improves, firms are then able to enter the export market. In addition, Alvarez and López (2005) find some evidence of learning-by-exporting by which productivity increases after the firm becomes an exporter.

Van Biesebroeck (2005) focuses on nine sub-Saharan African countries in order to observe the export performance of firms from low-income countries.[5] The analysis reveals significant evidence to support both the self-selection and learning-by-exporting hypotheses. For self-selection, high productivity firms are more likely to become exporters. The significance of sunk entry costs is another important indicator of the decision to participate in the export market. Furthermore, after firms became exporters, their productivity improvements tend to increase which is further support for the learning-by-exporting hypothesis.

Finally, there are three recent studies that examine Indonesian firms. Sjöholm (2003) emphasises different types of foreign network to explain the determinants of exporting by using a probit model estimation. Imports and foreign ownership significantly increase the probability of a firm exporting. However, spillovers from FDI have no significant effect on the decision to start exporting. Other variables such as size, the share of skilled labor, capital stock per worker, and R&D expenditure appear to be positive and significant which is consistent with the results from other developed and developing countries. Blalock and Gertler (2004) find some evidence of an increase in productivity after entering into export market thereby supporting learning-by-exporting rather than the self-selection hypothesis. When considering the effect of the Asian crisis on exports, Blalock and Roy (2007) discover that the devaluation of the Indonesian currency caused an increase in the rate of entry to, and exit from, export markets. Continuing exporters were found to be those firms that were owned by foreign investors, that engaged in R&D and that also carried out considerable staff training.

In summary, there is some evidence to support the new trade theory of heterogeneous firms outlined by Melitz (2003) and Helpman *et al.* (2004) that highly-productive firms self-select into export markets while low-productive firms produce to serve only domestic market. This suggests that good firms become exporters. The empirical results also support the proposition that those firms that export become more productive. In this paper, we focus on the question of whether good firms become exporters and what determines whether a firm will self-select into the export market.

[5] The sub-Saharan countries include Burundi, Cameroon, Cote d'Ivoire, Ethiopia, Ghana, Kenya, Tanzania, Zambia, and Zimbabwe.

4. Model Specification and Data

4.1 Model

In this section we identify those factors that are believed to affect a firm's export decision building on best practice from the existing theoretical and empirical literature for both developed and developing countries. Differences in firms' characteristics determine the individual performance and the capacity of a firm to export. In addition, sunk entry costs are included to investigate the link between sunk costs and exporting. The model we test specifies the relationship between the export decision and various factors given by:

$$EX = f(Z) \tag{6}$$

where EX is the export decision of the firm.

Z is a vector of firm characteristics.

All independent variables are lagged by one year to control for potential endogeneity problems whereby previous characteristics of the firm determine the export decision in the current period. We include the lagged dependent variable to capture the effect of sunk entry costs:

$$EX_{it} = \alpha + \delta EX_{i(t-1)} + \beta_X \ln(Z_{i(t-1)}) + \varepsilon_{it} \tag{7}$$

where ε is the error term.

Our vector of firm characteristics is based on the previous literature. Our final specification is therefore:

$$\begin{aligned} EX_{it} = {} & \beta_0 + \beta_1 EX_{i(t-1)} + \beta_2 FOREIGN_{i(t-1)} + \beta_3 TFP_{i(t-1)} + \beta_4 SMALL_{i(t-1)} \\ & + \beta_5 LARGE_{i(t-1)} + \beta_6 VLARGE_{i(t-1)} + \beta_7 wage_{i(t-1)} + \beta_8 SKILL_{i(t-1)} \\ & + \beta_9 TRAIN_{i(t-1)} + \beta_{10} RDPRODUCT_{i(t-1)} + \beta_{11} RDPROCESS_{i(t-1)} \\ & + \sum_{r=1}^{5} \beta_r REGION_r + \varepsilon_{it} \end{aligned} \tag{8}$$

where EX is the export dummy of firm i.

$FOREIGN$ is a dummy to indicate the structure of foreign ownership where a dummy equals 1 if least 10% of the firm's shares are foreign owned.

TFP is total factor productivity of the firm.

$SMALL$ is a dummy variable to represent a small firm.

$LARGE$ is a dummy variable to indicate whether the firm is large.

$VLARGE$ is a dummy variable to represent a very large firm.

$wage$ is measured by the log of wages per employee.

$SKILL$ is the ratio of skilled labor to total labor.

$TRAIN$ represents the training dummy.

$RDPRODUCT$ is a dummy variable to indicate whether the firm engages in product development R&D.

$RDPROCESS$ is a dummy variable to indicate whether the firm engages in production process R&D.

$REGION$ is a vector of five regional dummies which indicate the regional location of a firm.

4.2 Variables

The detailed definitions of all variables are presented in Table A1 of Appendix A. The dependent variable is the export dummy (EX_{it}) which equals 1 if there is positive export within the firm, and 0 otherwise. Our independent variables are as follows:

Sunk entry cost $(EX_{i(t-1)})$ is the lagged dependent variable and represents a barrier to a firm entering the export market. The lagged dependent variable can also be used to capture the previous export experience of a firm. Firms that have learned from their past experiences and exported in the previous year tend to also export in the current year. We expect a positive relationship between sunk entry cost and the decision to export.

Foreign ownership $(FOREIGN_{i(t-1)})$ captures the structure of a firm's ownership. A firm is defined as foreign if at least 10% of its shares are foreign owned. In this case, we generate a dummy equal to 1 if a firm is foreign owned and 0 otherwise. In our sensitivity analysis we define our foreign ownership dummy at 25% and 50% levels. We expect foreign ownership to have a positive effect on the decision to export.

In this paper we measure total factor productivity $(TFP_{i(t-1)})$ using three different methods. The first technique employs the semi-parametric approach of Levinsohn and Petrin (2003) by taking unobserved firm-specific productivity shocks into account where the unobserved shock is measured by the use of intermediate inputs. The second method is the estimation of

a semi-parametric and nonlinear least square regression of Buettner (2003) which also considers endogenous R&D in the TFP calculation. Finally, we measure productivity using a simple labor productivity measure which is calculated from the log of value added over total labor. TFP is an indicator of plant success and is based on the argument that good firms become exporters (Bernard and Jensen, 2004). Assuming firms with high TFP levels export, we expect to see a positive relationship between the two variables.

Firm size is another important determinant of exporting as it is an indication of a firm's capacity to export. Large firms tend to have higher productivity and are therefore more likely to engage in export activity. In this paper we categorise firm size into small, medium, large and very large. Small firm $(SMALL_{i(t-1)})$ is a dummy variable that equals 1 if the total number of workers in firm i at time $t-1$ is in the first quartile distribution of the total workforce for all firms operating in the same two-digit International Standard Industrial Classification (ISIC) level (Revision 3) as firm i at time $t-1$. Medium $(MEDIUM_{i(t-1)})$, large $(LARGE_{i(t-1)})$ and very large firm $(VLARGE_{i(t-1)})$ are calculated using the same principle for the second, third and fourth quartile of the total worker distribution respectively. *MEDIUM* is the omitted category.

Wage $(wage_{i(t-1)})$ is the log of wages per employee where wages per employee are calculated from the ratio of total wage payments to total workers less owners who do not receive a wage. Wage is employed as an indicator of labor quality. An increase in wages follows an increase in the quality of labor. Firms which pay high wages are expected to have a higher probability of exporting.

Skilled labor $(SKILL_{i(t-1)})$ is the ratio of professional and skilled worker to total worker and is another proxy for workforce quality within a firm. In general, export goods are assumed to have a higher quality than domestically produced goods (to meet the standard qualifications of import countries). The higher the quality of workers, therefore, the better the quality of goods can be produced. Thus, we expect the share of skilled workers to positively influence the probability of exporting.

Training $(TRAIN_{i(t-1)})$ represents a training dummy that equals 1 if the workforce within a firm received any formal training and 0 otherwise. Formal training may consist of in-house training, outside training or both. Workers who are trained tend to increase their workplace skills and are thus more efficient.

R&D expenditure has the potential to enhance product quality and also to generate cost savings in the production process, two factors that may increase the likelihood of a firm entering the export market. R&D is categorised into two groups: R&D in product development and R&D in process development. The former, R&D in product $(RDPRODUCT_{i(t-1)})$, is a dummy variable for product improvement; it equals 1 if a firm conducts R&D in the product and 0 otherwise. The latter, R&D in process $(RDPROCESS_{i(t-1)})$, is an indicator for cost saving in the production process where a dummy variable equals 1 if a firm carries out R&D in production processes and 0 otherwise.

Regional location variables $(REGION_r)$ are included to measure fixed regional effects. We divide regional location into 6 regions namely, the Bangkok Metropolitan Area $(BKKM)$, Central $(CENTRAL)$, East $(EAST)$, North $(NORTH)$, Northeast $(NORTHEAST)$ and South $(SOUTH)$. The Northeast, the poorest region of Thailand, is the omitted category.

4.3 Data

Our data consist of a four year unbalanced firm level panel from the Annual Survey of Thailand's manufacturing industries by the Office of Industrial Economics (OIE), Ministry of Industry, Thailand for the period between 2001 and 2004. All monetary variables are converted into US dollars using the market exchange rate from International Financial Statistics (IFS) and are expressed in 2001 constant prices. The survey covers 79 types of manufacturing activity at the 4-digit ISIC level that consist of 23 2-digit ISIC industries and includes small, medium, and large firms.[6] The sample can be considered representative of Thai manufacturing industries with the value added of firms included in the survey accounting for 95% of total manufacturing GDP (OIE, 2001). The questionnaire includes twenty-five major questions that cover different aspects of a firm's characteristics and performance including balance sheet information. We control for possible outliers by excluding a small number of firms for which their mean of total sales exceeds US$ 1 billion. Our final unbalanced panel comprises 15,115 observations for the period 2001 to 2004.[7]

[6] In 2001 a questionnaire was sent out to 6,735 firms. The response rate was around 60%. Approximately 35% of firms were are small, 32% medium and 33% large.

[7] Each year, there are some firms that do not respond or even shut down which causes our data set to have an unbalanced structure. To compensate for the closure or none response of some firms in 2004 the sampling was extended and data collected for additional plants (OIE, 2004). Unfortunately we do not have specific data on firm deaths.

As all regressors in the model are lagged by one year to minimise possible simultaneity problems, the data in the estimated sample includes 9,049 observations. Descriptive statistics and a correlation matrix are provided in Tables A2 and A3 of the appendix. The raw correlations tend to match our prior expected signs except perhaps for the relationship between the export dummy and the ratio of skilled workers.

Table 3 presents the mean values of different characteristics between exporters and non-exporters. We compare the differences of three groups; all firms, foreign firms, and domestic firms. For all firms, exporters have higher output, capital stock, productivity, wage and employment compared to non-exporters. However, the differences are reasonably small for wage per worker. Capital stock, output and employment of exporters is four times larger than that of non-exporters while no difference in the ratio of skilled labor is observed. Foreign exporters are more productive than foreign non-exporters and have considerably higher output, capital and employment levels. Surprisingly, the results show that foreign exporters have a lower ratio of skilled labor to total labor.

In the case of domestic firms, there are differences between domestic exporters and non-exporters in terms of output, capital stock, productivity, wage, ratio of skilled labor, employment. Output of domestic exporters is twice that of domestic non-exporters. These differences are even more pronounced for capital stock and employment.

Table 3: Mean Characteristics of Exporters vs. Non-Exporters in 2003

	All firms		Foreign Firms		Domestic Firms	
	Exporters	Non-Exporters	Exporters	Non-Exporters	Exporters	Non-Exporters
Output (million $US)	22.400	5.475	33.500	8.691	13.500	5.030
Capital Stock (million $US)	11.300	2.369	15.100	6.211	8.297	1.833
Total Factor Productivity	9.712	9.003	9.770	9.605	9.666	8.919
Labor Productivity	9.308	8.847	9.624	9.428	9.054	8.763
Employment	596.184	137.375	683.867	240.392	525.345	123.034
Wage per Worker ($US)	3256.014	2434.465	4000.662	3918.826	2654.413	2227.832
Ratio of Skilled Labor	0.530	0.529	0.517	0.540	0.535	0.528

4.4 Econometric Methodology

In our model, the dependent variable is a binary response dummy variable for export status. The explanation for the binary choice model can be written in the form of latent variables as:

$$EX_{it}^{*} = \alpha + \beta' Z_{i(t-1)} + \varepsilon_{it} \qquad (9)$$

where Z is a $K \times 1$ vector of firm characteristic parameters and ε_{it} is the error term. Rather than observing the latent variable (EX_{it}^{*}) in equation (9), we only observe a binary response (EX_{it}) which then indicates the sign of EX_{it}^{*} where $EX_{it} = 1$ if $EX_{it}^{*} > 0$ and $EX_{it} = 0$ if $EX_{it}^{*} \leq 0$.

Because of the discrete dummy variable for export status, a probit model is used for our estimation methodology. With certain assumptions, the error term (ε_{it}) follows a normal cumulative distribution function.

The literature suggests a number of alternative estimation methods to deal with the characteristics of a binary choice model, such as GMM in first differences and the linear probability model (LPM). However, the GMM first difference estimator for dynamic panel data by Arellano and Bond (1991) requires two or more lags of all the right-hand-side variables as instruments. Because of our relatively short panel we cannot use GMM in first differences. For LPM, the relationship between the occurring probability and the independent variables is assumed to be linear. However, LPM seems not to be an appropriate method of estimation for a binary choice framework because of several deficiencies. Firstly, the value of the disturbance comprises of only two specific values. Therefore, LPM fails to fulfil the OLS requirement of a normal distribution of the disturbances. Secondly, LPM appears to have a problem of heteroscedastic variances of disturbances because the variances of disturbances follow the change in the dependent variables. Finally, there is the possibility that the predicted probability of LPM lies outside the range of 0 to 1, so the estimated coefficients are likely to be biased. Although the problem of heteroscedastic standard errors can be corrected by using a robust variance estimator the first and third problems persist.[8]

[8] For further detailed discussions, see Gujarati (1995) pp. 542-546.

Within our available firm-level data, we have unobserved firm heterogeneity. For each specification, unobserved firm heterogeneity should be modelled as fixed effects or random effects depending on which is the more appropriate. The error term (ε_{it}) from the latent variable model in equation (9) comprises of two components where $\varepsilon_{it} = \mu_i + \eta_{it}$. μ_i is the individual unobserved heterogeneity error and η_{it} is the idiosyncratic error or time-varying error. It is assumed that η_{it} follows $\eta_{it} \sim IN(0, \sigma_\eta^2)$ and unobserved firm effects (μ_i) have zero mean and constant variance, $\mu_i \sim IN(0, \sigma_\mu^2)$.

The random effects estimator treats unobserved heterogeneity as a random variable by the assumption that the unobserved firm heterogeneity errors are uncorrelated with the observed explanatory variables. On the other hand, the fixed effects estimator captures firm specific effects where its assumption requires the unobserved firm effects to be correlated with the idiosyncratic error.

The random effects estimator does not appear to suit our model due to the fact that the required assumption for independent variables to be strictly exogenous conditional on μ_i is likely to be violated as we include a lagged dependent variable as a measure of sunk entry cost in the model. Plant characteristics are also correlated with the unobserved firm heterogeneity such as technology within the firm, managerial capability, etc. Regarding the lagged dependent and independent variable, the fixed effects estimator would produce biased and inconsistent results (Bernard and Jensen, 2004).

Consequently, by choosing among the models and available specifications, we employ a pooled probit model to estimate the decision of a firm to engage in export markets. The response probability for the probit model can be written as:

$$P(EX_{it} = 1 \mid Z_{i(t-1)}) = \Phi(\beta' Z_{i(t-1)}) \qquad (10)$$

where P stands for outcome probability. $Z_{i(t-1)}$ is a vector of firm characteristics including sunk entry costs. $\Phi(.)$ is a normal cumulative distribution function of the error term which is assumed to lie between the range of 0 and 1, $0 < \Phi(.) < 1$.

We add industry dummies and time dummies to control for unobserved industry fixed effects and time varying effects. The former $(INDUS_j)$ are categorised according to the three-digit ISIC level (Revision 3); there are 51 industries in total. For the time dummies

(T_t), only two-year dummies are included to the model as we lag all the independent variables by one year.

We also correct for the problem of heteroscedastic errors by using a robust variance estimation that allows for clustering at the industry level. Thus, the estimated model of the export decision becomes:

$$\begin{aligned} P(EX_{it}=1 \mid Z_{i(t-1)}) = \Phi\,[&\beta_0 + \beta_1 EX_{i(t-1)} + \beta_2 FOREIGN_{i(t-1)} + \beta_3 TFP_{i(t-1)} \\ &+\beta_4 SMALL_{i(t-1)} + \beta_5 LARGE_{i(t-1)} + \beta_6 VLARGE_{i(t-1)} \\ &+\beta_7 wage_{i(t-1)} + \beta_8 SKILL_{i(t-1)} + \beta_9 TRAIN_{i(t-1)} \\ &+\beta_{10} RDPRODUCT_{i(t-1)} + \beta_{11} RDPROCESS_{i(t-1)} \\ &+\sum_{r=1}^{5}\beta_r REGION_r + \sum_{j=1}^{50}\beta_j INDUS_j + \sum_{t=1}^{2}\beta_t T_t + \varepsilon_{it}] \end{aligned} \qquad (11)$$

In our estimated results, the coefficients obtained from the probit estimation are the predicted probabilities of belonging to one of the categories. In order to provide an interpretation of the coefficients, we calculate marginal effects to indicate the slope of the expected change in the probability of the outcome when the independent variables are changed one at a time. In general, marginal effects are calculated at the mean of the particular variable while keeping all other variables constant. The marginal effect of the pooled probit model is given by:

$$\frac{\partial[P(EX_{it}=1 \mid Z_{i(t-1)})]}{\partial Z_{ki(t-1)}} = \frac{\partial[E(EX_{it})]}{\partial Z_{ki(t-1)}} = \frac{\partial[\Phi(\beta' Z_{i(t-1)})]}{\partial Z_{ki(t-1)}} = \Phi(\beta' Z_{i(t-1)})\beta_k \qquad (12)$$

where Φ is the probability density function for a standard normal variables. Z_k is a coefficient of a particular continuous variables from the probit regression where $k = 1, 2, 3, \ldots, n$.

5. Results

5.1 Firm Characteristics and a Firm's Decision to Export

Table 4 provides the marginal effect estimations, calculated at the mean of the independent variables (except for dummy variables). Three different TFP calculation techniques are

performed for the purpose of sensitivity analysis. Column (1) includes TFP^{LP} obtained from the estimation procedure of Levinsohn and Petrin (2003). Columns (2) and (3) are our alternative TFP measures denoted $TFP^{BUETTNER}$ and $TFP^{LABPROD}$ from Buettner's (2003) method and the log of labor productivity respectively.

The results show that the past experience of a firm or sunk entry costs have a positive effect on the export decision. The coefficient on past export experience is identical and consistent across all three columns and indicates that export experience in the previous period increases the probability of the current period exporting by 0.91.

For foreign ownership, it is clear seen that foreign ownership is positively correlated with the probability of exporting. Hence, foreign firms are more likely to become exporters; the probability to export is increased by an average value of 0.07.

The results for all three TFP variables are similar and are a positive and significant determinant of the decision to export. The coefficients in Column (1) to Column (3) can be interpreted as an increase in TFP by one unit raises the probability of exporting by 3.2, 3.0 and 3.6 percentage points, respectively.

As expected, firm size is another important determinant of the export decision. The three size groupings provide different results. The negative and significant coefficient on small firms indicates that small firms are less likely to become exporters. As firm sizes increase, we observe increasingly positive and significant results. The coefficients of large and very large firms indicate that the larger the size, the more likely the firm is to enter the export market. The quality of the workforce is also a factor that could determines the probability of exporting. We assume that labor quality is proxied by the average wage. However, Table 4 shows that the wage has an insignificant effect.

Other firm characteristics such as average wage, the ratio of skilled labor[9], training, R&D in the product, and production process have a positive effect on the probability of exporting. However, such variables appear to be insignificant in all three columns.

For the location variables, the coefficients of the Bangkok Metropolitan Area, Central, East, North and South are positive relative to the North-Eastern region.[10] The Southern region is

[9] We have some concerns about the quality of our skilled labor variable from the raw data as some firms may not specify the quantity of labor skill differences correctly. When we exclude this variable there are no differences in the results for the other regressors. The sign, the significant or insignificant of all other variables in the model are the same. The results for excluding the ratio of skilled labor are available for authors upon request.

significant at the 1% level.[11] Being located in the South increases the probability of exporting on average by 0.17. One explanation for the significant of South coefficient may be that a firm located in the South has lower transportation costs. Surface transport within the continent (e.g. exports to Malaysia) may be used instead of more costly aerial or ocean shipping.

As a further sensitivity check we investigate the effect of sunk-entry costs and firm characteristics on the probability of exporting using different definitions of foreign ownership. Rather than define a firm as foreign when only 10% is foreign owned, we use 25% and 50% as alternative cut-off points.

Our results show that the higher the percentage share used to classify foreign ownership, the greater the effect on the probability of exporting. All other variables are almost identical to those in Table 4. We also perform a range of other sensitivity checks on other variables. For example, classifying size according to total fixed assets instead of total employment. The results are generally consistent and are available from the authors upon request.

[10] According to the 2002 Gini Coefficient and Gross Regional per Capita of 2006 from Office of the National Economic and Social Development Board, the Northeast is the poorest region of Thailand.

[11] We also try an alternative categorisation of location following the Board of Investment (BOI) ranking of privileges by location. Due to the decentralisation of industrial investment, since 1993 the BOI has divided the country into three different investment promotion zones. Approved foreign applicants will receive different privileges (tax-based and non-tax privileges) according to their establishment location. In our regression, for a firm export's decision, low income provinces (Zone 3-Group 2) is the omitted category. The results show that Zone 1, Zone 2 and Zone 3-Group 1 (high income provinces) all have positive and significant effect on the probability of exporting. However, as we have some difficulty in identifying whether foreign owned firms in our sample actually receive these privileges we do prefer our original specification.

Table 4: Pooled Probit Model for a Firm's Decision to Export

Variable	(1)	(2)	(3)
$EX_{i(t-1)}$	0.914***	0.914***	0.914***
	(42.63)	(42.65)	(42.59)
$FOREIGN_{i(t-1)}$	0.072***	0.072***	0.071***
	(2.68)	(2.61)	(2.62)
$TFP^{LP}_{i(t-1)}$	0.032***		
	(2.72)		
$TFP^{BUETTNER}_{i(t-1)}$		0.030*	
		(1.89)	
$TFP^{LABPROD}_{i(t-1)}$			0.036***
			(2.78)
$SMALL_{i(t-1)}$	-0.102***	-0.099***	-0.110***
	(4.30)	(3.93)	(4.95)
$LARGE_{i(t-1)}$	0.106***	0.105***	0.114***
	(3.49)	(3.39)	(3.96)
$VLARGE_{i(t-1)}$	0.154***	0.152***	0.170***
	(4.10)	(3.68)	(5.08)
$wage_{i(t-1)}$	0.049	0.047	0.040
	(1.60)	(1.54)	(1.43)
$SKILL_{i(t-1)}$	0.022	0.023	0.022
	(0.62)	(0.67)	(0.63)
$TRAIN_{i(t-1)}$	0.015	0.014	0.014
	(0.41)	(0.38)	(0.40)
$RDPRODUCT_{i(t-1)}$	0.050	0.048	0.051
	(0.84)	(0.80)	(0.86)
$RDPROCESS_{i(t-1)}$	0.044	0.044	0.043
	(0.52)	(0.52)	(0.50)
BKKM	0.093	0.094	0.096
	(1.34)	(1.34)	(1.39)
CENTRAL	0.071	0.068	0.070
	(0.77)	(0.74)	(0.76)
EAST	0.070	0.069	0.070
	(0.89)	(0.87)	(0.88)
NORTH	0.089	0.092	0.094
	(1.23)	(1.25)	(1.28)
SOUTH	0.166***	0.165***	0.165***
	(2.71)	(2.72)	(2.66)
Observations	9049	9049	9049

Note: Robust z statistics in parentheses. Standard errors are adjusted for clustering at the two-digit industry level. Time dummies and three-digit industry dummies are included. All the dependent variables are lagged one year. * significant at 10%; ** significant at 5%; *** significant at 1%.

5.2 Country of Origin of Parent Company and a Firm's Decision to Export

In this subsection we examine the effect of the country of origin of firm ownership on a firm's decision to export by disaggregating our foreign dummy into different countries of origin. The details of the different country of origin groupings that we include in the model are provided in Table A4 of the appendix.[12] Table 5 shows the results of the estimated marginal effects in which foreign ownership is characterised by at least 10% and 50% of shares owned by foreigners.

In Columns (1) to (3), firm specific characteristics and regional location variables are very similar to the results previously discussed. These are not included in the paper for reasons of space. For the effect of country of origin on a firm's decision to export, the estimated marginal effect results in Table 5 show that the coefficients for Japan, Korea, Malaysia, Southeast Asia and UK are significant at the 10% level and the US are significant at the 5% level.[13]

Foreign firms from Japan, Malaysia, UK and US are more likely to export compared to domestic-owned firms where the probability of exporting is increased by average values of 0.10, 0.22, 0.11 and 0.12, respectively. In contrast, Korean and Southeast Asian-owned firms are less likely to export. Interestingly, there is no significant coefficient on China, the second largest investor in Thailand. The results imply that countries invest in Thailand for different reasons. It appears that that firms from Japan, Malaysia, UK, US and perhaps China invest in Thailand in order to use Thailand as an export-platform whereas firms with their parent companies from countries in Korea and the Southeast Asia intend to supply only the domestic market.

[12] See Appendix A for the definitions of each individual country and region dummy.
[13] Southeast Asia consists of Indonesia, Myanmar and the Philippines.

Table 5: Pooled Probit Model for Country of Origin and a Firm's Decision to Export

Variable	10% cut-off			50% cut-off		
	(1)	(2)	(3)	(4)	(5)	(6)
$EX_{i(t-1)}$	0.914***	0.914***	0.914***	0.914***	0.913***	0.914***
	(42.28)	(42.32)	(42.23)	(41.20)	(41.35)	(41.20)
$TFP^{LP}_{i(t-1)}$	0.032***			0.035***		
	(2.91)			(3.12)		
$TFP^{BUETTNER}_{i(t-1)}$		0.030*			0.034**	
		(1.93)			(2.34)	
$TFP^{LABPROD}_{i(t-1)}$			0.036***			0.039***
			(2.93)			(3.10)
$SMALL_{i(t-1)}$	-0.100***	-0.098***	-0.108***	-0.102***	-0.100***	-0.111***
	(4.25)	(3.89)	(4.88)	(4.31)	(3.93)	(4.97)
$LARGE_{i(t-1)}$	0.107***	0.105***	0.114***	0.104***	0.102***	0.112***
	(3.56)	(3.47)	(4.01)	(3.32)	(3.23)	(3.79)
$VLARGE_{i(t-1)}$	0.153***	0.151***	0.169***	0.151***	0.147***	0.168***
	(4.14)	(3.73)	(5.07)	(4.04)	(3.60)	(5.01)
$wage_{i(t-1)}$	0.046	0.045	0.038	0.047	0.043	0.037
	(1.50)	(1.48)	(1.31)	(1.53)	(1.49)	(1.33)
$SKILL_{i(t-1)}$	0.021	0.023	0.021	0.027	0.028	0.027
	(0.58)	(0.63)	(0.59)	(0.73)	(0.78)	(0.73)
$TRAIN_{i(t-1)}$	0.014	0.014	0.014	0.015	0.014	0.015
	(0.39)	(0.37)	(0.38)	(0.44)	(0.39)	(0.42)
$RDPRODUCT_{i(t-1)}$	0.049	0.046	0.049	0.053	0.050	0.053
	(0.81)	(0.77)	(0.82)	(0.89)	(0.85)	(0.91)
$RDPROCESS_{i(t-1)}$	0.042	0.042	0.041	0.047	0.046	0.045
	(0.49)	(0.49)	(0.48)	(0.56)	(0.55)	(0.54)
$CHINA_{i(t-1)}$	0.053	0.051	0.051	0.177**	0.175**	0.175**
	(1.12)	(1.09)	(1.09)	(2.08)	(2.07)	(2.07)
$EU_{i(t-1)}$	0.036	0.032	0.030	0.132	0.131	0.129
	(0.45)	(0.40)	(0.37)	(0.99)	(0.99)	(0.97)
$JAPAN_{i(t-1)}$	0.099*	0.098*	0.097*	0.138***	0.138***	0.137***
	(1.75)	(1.75)	(1.75)	(3.12)	(3.14)	(3.14)
$KOREA_{i(t-1)}$	-0.126*	-0.127*	-0.124*	-0.062	-0.068	-0.062
	(1.69)	(1.79)	(1.69)	(0.81)	(0.92)	(0.86)
$MALAYSIA_{i(t-1)}$	0.224	0.224*	0.222	-0.066	-0.059	-0.068
	(1.63)	(1.67)	(1.64)	(1.16)	(1.13)	(1.21)

$NONEU_{i(t-1)}$	0.079	0.082	0.082	-0.026	-0.021	-0.019
	(0.57)	(0.60)	(0.60)	(0.31)	(0.26)	(0.23)
$OTHER_{i(t-1)}$	0.054	0.053	0.053	-0.069	-0.072	-0.073
	(0.51)	(0.49)	(0.49)	(0.90)	(0.95)	(0.94)
$OECD_{i(t-1)}$	0.163	0.160	0.164			
	(1.54)	(1.54)	(1.57)			
$SOUTHASIA_{i(t-1)}$	-0.037	-0.030	-0.030	-0.043	-0.041	-0.042
	(0.79)	(0.66)	(0.66)	(0.65)	(0.61)	(0.62)
$SEASIA_{i(t-1)}$	-0.195*	-0.195*	-0.195*			
	(1.94)	(1.94)	(1.93)			
$SINGAPORE_{i(t-1)}$	0.038	0.044	0.035	0.206***	0.236***	0.209***
	(0.61)	(0.64)	(0.57)	(3.37)	(2.93)	(3.22)
$UK_{i(t-1)}$	0.109*	0.108*	0.106*	0.109	0.109	0.111
	(1.82)	(1.78)	(1.77)	(1.42)	(1.42)	(1.45)
$US_{i(t-1)}$	0.124**	0.122**	0.123**	0.150***	0.150***	0.149***
	(2.35)	(2.31)	(2.29)	(2.67)	(2.71)	(2.68)
Regional Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9049	9049	9049	9036	9036	9036

Note: Robust z statistics in parentheses. Standard errors are adjusted for clustering at the two-digit industry level. Time dummies and three-digit industry dummies are included. All the dependent variables are lagged one year. * significant at 10%; ** significant at 5%; *** significant at 1%.

To check the sensitivity of these results we re-estimate the model using the alternative cut-off points for foreign ownership. The results presented in Columns (4) to (6) in Table 5 are for the 50% cut-off point of foreign owned share.[14] The main difference in the results is that the behavior of Chinese, Malaysian, Singaporean and UK firms is now different to those from Japan and the US. As the percentage share owned by China and Singapore increases the probability of Chinese and Singaporean owned firms exporting also increases. However, for Malaysian and UK firms, it appears that an increase in the percentage of foreign owned share does not have any significant effect on the probability of exporting. Even though foreign firms from Malaysia, non-EU and other countries do not significantly determine the probability of exporting, we observe that the coefficients turn out to be negative when 50% of foreign owned share is used as a cut-off point. We also perform a sensitivity check using different definitions of our size variable but the results are generally unchanged.

[14] Using 25% of foreign owned share as a cut-off point, results are broadly similar to those in Columns (1) to (3) of Table 5 except for Korean-owned firms which now have no significant impact on the probability of exporting. Results are available from authors upon request.

6. Conclusions

This paper examines the export decision of firms using a manufacturing firm-level dataset of Thai firms over the period 2001 to 2004. Consistent with both the theoretical and past empirical explanations, sunk entry cost is the most important determinant of the probability of exporting. Firms enter the export market if the expected profit of the current period is greater than the sunk entry costs. Once firms export they are likely to gain experience from being exporters.

To estimate the effect of productivity we employ three alternative estimation techniques to measure TFP; a standard labor productivity measure; a semi-parametric approach that takes account of unobserved firm-specific productivity shocks and a system estimation which allows for endogenous R&D. The estimated results are robust with positive and significant coefficients implying that firms with high productivity have a higher probability of exporting. For our other independent variables, the results show a positive and significant relationship between foreign ownership and export status. Firms with high wages are likely to enter export markets and firm size is also important, small firms are less likely to export but the larger a firm then becomes the more likely it is to export.

One of the key contributions of this paper is to disaggregate the level of foreign ownership into different countries and regions of origin in order to examine the effect on the decision of a firm to export. The results show that certain countries or regions such as China, Japan, Singapore, US and UK are more strongly reliant on Thailand as an export platform. We also observe that the behavior of Chinese and Singaporean owned firms are different to others with the propensity to export correlated with the size of the foreign owned share.

Overall, the determinants of a firm's export decision from a Thai perspective are broadly consistent with those findings from other developed and developing country studies. We can conclude that good firms become exporters whereas firms self-select into the export market based on differences in their export experience, productivity, location and other firm specific characteristics. More importantly, we show that country of origin matters in determining the export decision of a firm. Finally, the effects of sunk entry costs and foreign ownership appear to be more pronounced for Thai firms than those of other studies. We believe that this reflects the importance of exporting to the previous, current and future development strategy of the new Asian Tigers. This is an analysis that until now had not been undertaken.

The implication of our results for governments of developing countries is the need to think carefully about how and to whom they target their inward FDI policies as a means of growth. The heterogeneous behavior of multinationals from different nations means that policies targeting specific regions or countries may be preferable to general tax concessions or the implementation of special economic zones that are open to all.

References

Alvarez, R. and R. A. López (2005), "Exporting and Performance: Evidence from Chilean Plants", *Canadian Journal of Economics*, Vol. 38, No. 4, pp. 1384-1400.

Arellano, M. and S. Bond (1991), "Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations", *Review of Economic Studies*, Vol. 58, No. 2, pp. 277-297.

Arnold, J. M. and K. Hussinger (2005), "Export Behavior and Firm Productivity in German Manufacturing: A Firm-Level Analysis", *Review of World Economics*, Vol. 141, No. 2, pp. 219-243.

Aw, B. Y., M. J. Roberts and T. Winston (2007), "Export Market Participation, Investment in R&D and Worker Training, and the Evolution of Firm Productivity", *The World Economy*, Vol. 30, No. 1, pp. 83-104.

Aw, B. Y., S. Chung and M. J. Roberts (2000), "Productivity and Turnover in the Export Market: Micro-level Evidence from the Republic of Korea and Taiwan (China)", *The World Bank Economic Review*, Vol. 14, No. 1, pp. 65-90.

Baldwin, R. E. (1988), "Hysteresis in Import Prices: The Beachhead Effect", *The American Economics Review*, Vol. 78, No. 4, pp. 773-785.

Blalock, G. and P. J. Gertler (2004), "Learning from Exporting Revisited in a Less Developed Setting", *Journal of Development Economics*, Vol. 75, No. 2, pp. 397-416.

Blalock, G. and S. Roy (2007), "A Firm-level Examination of the Exports Puzzle: Why East Asian Exports Didn't Increase After the 1997-1998 Financial Crisis", *The World Economy*, Vol. 30, No. 1, pp. 39-59.

Bank of Thailand (2006), "Thailand's Economic and Monetary Conditions in 2005", Annual Report.

Bernard, A. B. and J. B. Jensen (1999), "Exceptional Exporter Performance: Cause, Effect or Both?", *Journal of International Economics*, Vol. 47, No. 1, pp. 1-25.

Bernard, A. B. and J. B. Jensen (2004), "Why Some Firms Export", *The Review of Economics and Statistics*, Vol. 86, No. 2, pp. 561-569.

Bernard, A. B. and J. Wagner (2001), "Export Entry and Exit by German Firms", *Review of World Economics*, Vol. 137, No. 1, pp. 105-123.

Buettner, T. (2003), "R&D and the Dynamics of Productivity" London School of Economics, mimeo.

Clerides, S. K., S. Lach and J. R. Tybout (1998), "Is Learning by Exporting Important? Micro-Dynamic Evidence from Colombia, Mexico, and Morocco", *Quarterly Journal of Economics*, Vol. 113, No. 3, pp. 903-947.

Edward, S. (1993), "Openness, Trade Liberalisation and Growth in Developing Countries", *Journal of Economic Literature*, Vol. 31, No. 3, pp. 1358-1393.

Edward, S. (1998), "Openness, Productivity and Growth: What Do We Really Know?", *The Economic Journal*, Vol. 108, No. 447, pp. 383-398.

Fariñas, J. and A. Martín-Marcos (2007), "Exporting and Economic Performance: Firm-level Evidence of Spanish Manufacturing", *The World Economy*, Vol. 30, No. 4, pp. 618-646.

Girma, S., D. Greenaway and R. Kneller (2004), "Does Exporting Increase Productivity? A Microeconometric Analysis of Matched Firms", *Review of International Economics*, Vol. 12, No. 5, pp. 855-866.

Greenaway, D., A. Guariglia, and R. Kneller (2007), "Financial Factors and Exporting Decisions", *Journal of International Economics*, Vol. 73, No. 2, pp. 377-395.

Greenaway, D., J. Gullstrand and R. Kneller (2005), "Exporting Many Not Always Boost Firm Productivity", *Review of World Economics*, Vol. 141, No. 4, pp. 561-582.

Greenaway, D. and R. Kneller (2004), "Exporting and Productivity in the United Kingdom", *Oxford Review of Economic Policy*, Vol. 20 No. 3, pp. 358-371.

Greenaway, D. and R. Kneller (2007), "Firm Heterogeneity, Exporting and Foreign Direct Investment", *The Economic Journal*, Vol. 117, No. 517, pp. F134-F161.

Gujarati, D. N. (1995), *Basic Econometrics, Third Edition*, Singapore: McGraw-Hill.

Helpman, E., M. J. Melitz and S. R. Yeaple (2004), "Export Versus FDI with Heterogeneous Firms", *The American Economic Review*, Vol. 94, No. 1, pp. 300-316.

Kimura, F. and K. Kiyota (2006), "Exports, FDI and Productivity: Dynamic Evidence from Japanese Firms", *Review of World Economics*, Vol. 142, No. 4, pp. 695-719.

Kneller, R. and M. Pisu (2004), "Export-Oriented FDI in the UK", *Oxford Review of Economic Policy*, Vol. 20, No. 3, pp. 424-439.

Levinsohn, J. and A. Petrin (2003), "Estimation Production Functions Using Inputs to Control for Unobservables", *Review of Economic Studies*, Vol. 70, No. 2, pp. 317-341.

López, R. A. (2004), "Self-Selection into the Export Markets: A Conscious Decision?", Department of Economics, Indiana University, mimeo.

López, R. A. (2005), "Trade and Growth: Reconciling the Macroeconomic and Microeconomic Evidence", *Journal of Economic Survey*, Vol. 19, No. 4, pp. 623-648.

Melitz, M. J. (2003), "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity", *Econometrica*, Vol. 71, No. 6, pp. 1695-1725.

Office of Industrial Economics (2001), "Annual Report on Industry Economics Outlook: The 2001 Manufacturing Industry Survey", Ministry of Industry, Bangkok, Thailand (in Thai).

Office of Industrial Economics (2004), "Annual Report on Industry Economics Outlook: The 2004 Manufacturing Industry Survey", Ministry of Industry, Bangkok, Thailand (in Thai).

Olley, G. S. and A. Pakes (1996), "The Dynamics of Productivity in the Telecommunications Equipment Industry", *Econometrica*, Vol. 64, No. 6, pp. 1263-1297.

Petrin, A., B. P. Poi and J. Levinsohn (2004), "Production Function Estimation in Stata using Inputs to Control for Unobservables", *The Stata Journal*, Vol.4, No. 2, pp. 113-123.

Roberts, M. J. and J. R. Tybout (1997), "The Decision to Export in Colombia: An Empirical Model of Entry with Sunk Costs", *The American Economic Review*, Vol. 87, No. 4, pp. 545-564.

Sjöholm, F. (2003), "Which Indonesian Firms Export? The Importance of Foreign Networks", *Papers in Regional Science*, Vol. 82, No. 3, pp. 333-350.

Van Biesebroeck, J. (2005), "Exporting Raises Productivity in Sub-Saharan African Manufacturing Firms", *Journal of International Economics*, Vol. 67, No. 2, pp.373-391.

Wagner, J. (2007), "Exports and Productivity: A Survey of the Evidence from Firm-level Data", *The World Economy*, Vol. 30, No. 1, pp. 60-82.

Wooldridge, J. M. (2002), *Econometric Analysis of Cross Section and Panel Data, Second Edition*, MIT Press, Cambridge.

Appendix

Table A1: Variable Definitions

Variable	Definition
EX_{it}	A dummy variable for export status where EX_{it} equals 1 if firm i exports and 0 otherwise.
$EX_{i(t-1)}$	Sunk entry cost or export experience. A dummy variable for export status where EX_{it} equals 1 if firm i exports and 0 otherwise.
$FOREIGN_{i(t-1)}$	A dummy variable that indicates the structure of foreign ownership where a dummy equals 1 if shares of at least 10% are foreign owned.
$FOREIGN25_{i(t-1)}$	A dummy variable that indicates the structure of foreign ownership where a dummy equals 1 if shares of at least 25% are foreign owned.
$FOREIGN50_{i(t-1)}$	A dummy variable that indicates the structure of foreign ownership where a dummy equals 1 if shares of at least 50% are foreign owned.
$TFP^{LP}_{i(t-1)}$	Total factor productivity that is obtained from the estimation of the semi-parametric approach of Levinsohn and Petrin (2003).
$TFP^{BUETTNER}_{i(t-1)}$	Total factor productivity that is obtained from a system estimation of Buettner (2003).
$TFP^{LABPROD}_{i(t-1)}$	Labor productivity that is calculated from the log of value added divided by total labor.
$SMALL_{i(t-1)}$	For a small firm variable, a dummy variable equals 1 if the total labor of the firm i at time $t-1$ is in the first quartile of the distribution of the total labor of all firms operating in the same two-digit ISIC level (Revision 3) as firm i at time $t-1$.
$LARGE_{i(t-1)}$	For a large firm variable, a dummy variable equals 1 if the total labor of the firm i at time $t-1$ is in the third quartile of the distribution of the total labor of all firms operating in the same two-digit ISIC level (Revision 3) as firm i at time $t-1$.
$VLARGE_{i(t-1)}$	A very large firm variable, a dummy variable equals 1 if the total labor of the firm i at time $t-1$ is in the forth quartile of the distribution of the total labor of all firms operating in the same two-digit ISIC level (Revision 3) as firm i at time $t-1$.
$SMALL^{A}_{i(t-1)}$	A firm is categorised as small firm if total fixed assets of firm i at

	time $t-1$ is in the first quartile of the distribution of the total fixed assets of all firms operating in the same two-digit ISIC level (Revision 3) as firm i at time $t-1$.
$LARGE^{A}_{i(t-1)}$	A firm is categorised as large firm if the total fixed assets of firm i at time $t-1$ is in the third quartile of the distribution of the total fixed assets of all firms operating in the same two-digit ISIC level (Revision 3) as firm i at time $t-1$.
$VLARGE^{A}_{i(t-1)}$	A firm is categorised as very large firm if the total fixed assets of firm i at time $t-1$ is in the forth quartile of the distribution of the total fixed assets of all firms operating in the same two-digit ISIC level (Revision 3) as firm i at time $t-1$.
$wage_{i(t-1)}$	The log of wage per employee where wage per employee is calculated from the ratio of total labor payments over total labor less owner's wage.
$SKILL_{i(t-1)}$	The ratio of professional and skilled labor to total labor.
$TRAIN_{i(t-1)}$	A training dummy equals 1 if the workforce within a firm has received formal training either in-house training or outside training or both at least once, and 0 otherwise.
$RDPRODUCT_{i(t-1)}$	A dummy variable equals 1 if a firm carries out R&D in product development and 0 otherwise.
$RDPROCESS_{i(t-1)}$	A dummy variable equals 1 if a firm performs R&D in the development of production processes and 0 otherwise.
$BKKM$	A dummy variable identifies whether firm locates in Bangkok Metropolitan Area or not.
$CENTRAL$	A dummy variable equals 1 if a firm locates in Central region excluding Bangkok and Metropolitan Area and 0 otherwise.
$EAST$	A dummy variable equals 1 if a firm locates in Eastern region and 0 otherwise.
$NORTH$	A dummy variable equals 1 if a firm locates in the North of Thailand and 0 otherwise.
$SOUTH$	A dummy variable equals 1 if a firm locates in the South of Thailand and 0 otherwise.
$CHINA_{i(t-1)}$	A dummy variable equals 1 if a firm owned by Chinese including Taiwan and Hong Kong and 0 otherwise.

$EU_{i(t-1)}$	A dummy variable equals 1 if a firm owned by one of the country in EU-14 which does not include UK and 0 otherwise.
$JAPAN_{i(t-1)}$	A dummy variable equals 1 if a firm owned by Japanese and 0 otherwise.
$KOREA_{i(t-1)}$	A dummy variable equals 1 if a firm owned by South Korean and 0 otherwise.
$MALAYSIA_{i(t-1)}$	A dummy variable equals 1 if a firm owned by Malaysian and 0 otherwise.
$NONEU_{i(t-1)}$	A dummy variable equals 1 if a firm owned by a country in Europe excluding countries in the EU-15 and 0 otherwise.
$AUSCAN_{i(t-1)}$	A dummy variable equals 1 if a firm owned by either Australian or Canadian and 0 otherwise.
$SOUTHASIA_{i(t-1)}$	A dummy variable equals 1 if a firm owned by a country in the South Asia (India and Pakistan) and 0 otherwise.
$SEASIA_{i(t-1)}$	A dummy variable equals 1 if a firm owned by a country in the Southeast Asia (Indonesia, Myanmar and the Philippines) and 0 otherwise.
$SINGAPORE_{i(t-1)}$	A dummy variable equals 1 if a firm owned by Singaporean and 0 otherwise.
$UK_{i(t-1)}$	A dummy variable equals 1 if a firm owned by UK and 0 otherwise.
$US_{i(t-1)}$	A dummy variable equals 1 if a firm owned by US and 0 otherwise.
$OTHER_{i(t-1)}$	A dummy variable equals 1 if a firm owned by countries in Africa, Middle East, Caribbean, Central America, Oceania and South Pacific Ocean and 0 otherwise.

Table A2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
EX_{it}	9049	0.50	0.50	0	1
$EX_{i(t-1)}$	9049	0.50	0.50	0	1
$FOREIGN_{i(t-1)}$	9049	0.28	0.45	0	1
$FOREIGN25_{i(t-1)}$	9049	0.24	0.43	0	1
$FOREIGN50_{i(t-1)}$	9049	0.14	0.35	0	1
$SMALL_{i(t-1)}$	9049	0.26	0.44	0	1
$LARGE_{i(t-1)}$	9049	0.24	0.43	0	1
$VLARGE_{i(t-1)}$	9049	0.25	0.43	0	1
$SMALL^{A}_{i(t-1)}$	9049	0.26	0.44	0	1
$LARGE^{A}_{i(t-1)}$	9049	0.24	0.43	0	1
$VLARGE^{A}_{i(t-1)}$	9049	0.25	0.43	0	1
$wage_{i(t-1)}$	9049	7.71	0.54	3.08	10.29
$SKILL_{i(t-1)}$	9049	0.53	0.33	0	1
$TRAIN_{i(t-1)}$	9049	0.87	0.33	0	1
$RDPRODUCT_{i(t-1)}$	9049	0.06	0.23	0	1
$RDPROCESS_{i(t-1)}$	9049	0.04	0.20	0	1
$TFP^{LP}_{i(t-1)}$	9049	9.22	1.83	0.47	16.69
$TFP^{BUETTNER}_{i(t-1)}$	9049	10.19	1.28	1.21	15.31
$TFP^{LABPROD}_{i(t-1)}$	9049	8.98	1.04	1.45	14.00

Note: The descriptive statistics are for the 3 years sample period of 2001-2003 except the dependent variable of EX_{it}, the sample period covers 2002-2004.

Table A3: Correlation Matrix

	EX	$EX_{i(t-1)}$	*FOREGIN*	*FOREGIN25*	*FOREGIN50*	*SMALL*	*LARGE*	*VLARGE*	$SMALL^A$	$LARGE^A$	$VLARGE^A$	*wage*	*SKILL*	*TRAIN*	*RDPRODUCT*	*RDPROCESS*	TFP^{LP}	$TFP^{BUETTNER}$	$TFP^{LABPROD}$
EX	1.00																		
$EX_{i(t-1)}$	0.94	1.00																	
FOREGIN	0.37	0.37	1.00																
FOREGIN25	0.36	0.37	0.92	1.00															
FOREGIN50	0.32	0.33	0.66	0.72	1.00														
SMALL	-0.37	-0.37	-0.18	-0.17	-0.17	1.00													
LARGE	0.14	0.13	0.02	0.02	0.02	-0.34	1.00												
VLARGE	0.36	0.36	0.22	0.21	0.20	-0.34	-0.33	1.00											
$SMALL^A$	-0.37	-0.37	-0.24	-0.22	-0.20	0.58	-0.26	-0.33	1.00										
$LARGE^A$	0.14	0.13	0.07	0.06	0.05	-0.24	0.28	-0.03	-0.34	1.00									
$VLARGE^A$	0.34	0.34	0.27	0.26	0.26	-0.34	-0.04	0.63	-0.34	-0.33	1.00								
wage	0.28	0.27	0.40	0.40	0.34	-0.23	0.08	0.18	-0.32	0.11	0.31	1.00							
SKILL	-0.02	-0.02	-0.02	-0.01	-0.01	0.11	-0.05	-0.06	0.06	-0.03	-0.02	0.08	1.00						
TRAIN	0.21	0.22	0.13	0.13	0.11	-0.28	0.11	0.19	-0.25	0.09	0.20	0.21	-0.03	1.00					
RDPRODUCT	0.13	0.13	0.05	0.05	0.04	-0.10	0.01	0.15	-0.10	0.04	0.11	0.08	-0.04	0.08	1.00				
RDPROCESS	0.10	0.10	0.04	0.04	0.02	-0.08	0.02	0.11	-0.09	0.02	0.10	0.08	-0.02	0.07	0.58	1.00			
TFP^{LP}	0.21	0.20	0.15	0.13	0.08	-0.26	0.07	0.25	-0.26	0.06	0.30	0.42	-0.04	0.17	0.08	0.07	1.00		
$TFP^{BUETTNER}$	0.40	0.40	0.38	0.36	0.31	-0.46	0.13	0.44	-0.50	0.12	0.55	0.65	-0.03	0.29	0.15	0.13	0.63	1.00	

$TFP^{LABPROD}$	0.27	0.26	0.35	0.33	0.28	-0.25	0.08	0.22	-0.38	0.10	0.41	0.70	0.01	0.22	0.11	0.10	0.61	0.93	1.00

Note: The correlation matrix of the 3 years sample period.

Table A4: Country of Origin of a Parent Company by Year

Country	2001		2002		2003	
	Frequency	Percent	Frequency	Percent	Frequency	Percent
Foreign:						
China	210	6.27	195	6.33	167	6.38
EU-14	75	2.24	73	2.37	62	2.37
Japan	359	10.72	344	11.16	322	12.30
Korea	17	0.51	18	0.58	19	0.73
Malaysia	15	0.45	13	0.42	9	0.34
Non EU-15	22	0.66	23	0.75	16	0.61
Australia and Canada	10	0.30	9	0.29	6	0.23
South Asia	12	0.36	12	0.39	9	0.34
Southeast Asia	4	0.12	4	0.13	6	0.23
Singapore	57	1.70	46	1.49	44	1.68
UK	34	1.01	34	1.10	24	0.92
US	67	2.00	65	2.11	55	2.10
Other Countries	9	0.27	13	0.42	10	0.38
Domestic:						
Thailand	2,459	73.40	2,233	72.45	1,868	71.38
Total	3,350	100.00	3,082	100.00	2,617	100.00