Preliminary, do not cite this version

Trade Liberalization in East Asia and FDI Strategies in Heterogeneous Firms: Evidence from Japanese Firm-level Data

Kazunobu HAYAKAWA
Bangkok Research Center, JETRO, Thailand

Toshiyuki MATSUURA
Keio Economic Observatory, Keio University, Japan

Abstract: This paper attempts to clarify the reasons for the rapid growth of foreign direct investment (FDI) in developing countries, particularly East Asian countries, compared with that of FDI in developed countries. To do this, we examine the mechanics of horizontal FDI and vertical FDI (VFDI) to shed light on the role of trade costs. Our empirical analysis using logit estimation or a multinomial logit model of Japanese firms' FDI choices reveals that a reduction in tariff rates attracts even less productive VFDI firms. This result is consistent with a different definition of VFDI. Because developing countries, particularly East Asian countries, have experienced a relatively rapid decrease in tariff rates, our results indicate that the increase in VFDI through tariff rate reduction led to the recent relative surge of FDIs in developing countries.

***Keywords*:** Multinational firm; Firm heterogeneity; Productivity
***JEL Classification*:** D24; F23

1. Introduction

Recently, foreign direct investments (FDIs) from developed countries to developing countries have increased remarkably compared with FDIs between developed countries. Navaretti and Venables (2004) report that *although FDI goes predominantly to advanced countries, the share of developing countries has been rising*. They show that the share of worldwide FDI received by the developing and transition economies jumped from 24.6% in the period 1988-93, to more than 40% in the period 1992-97. Moreover, in Japan, few investors have invested in developed countries and almost all investment goes to developing countries, particularly in East Asia. Furthermore, recent investors are relatively low productive firms (Obashi et al., 2009; Wakasugi and Tanaka, 2009). Why have FDIs in developing countries, particularly from low productive firms, grown so rapidly compared with those in developed countries?

This paper attempts to clarify the reasons for this relatively rapid growth of low productive firms' FDIs in developing countries by shedding light on the role of trade costs. Obviously, trade liberalization has progressed globally, particularly in developing countries. Due to the prohibitively high trade costs in the initial period, developing countries have achieved much greater trade liberalization. A major contribution to the opening of domestic economies can be attributed to unilateral decisions, as in China and India, but regional and multilateral reductions under the pretence of the World Trade Organization are also important in promoting global trade. Since 1990, many regional trade agreement notifications involving new transition economies have surfaced (World Bank, 2006). Such significant trade liberalization is a driving force for the rapid increase of FDIs in developing countries.

However, the relationship between trade costs and FDI is not as simple. The FDI literature proposes many types of FDI classification. One of the most common is horizontal FDI (HFDI). HFDI is a market-seeking investment and, thus, is likely to be directed toward developed countries. To avoid high trade costs when supplying products to the market, HFDI firms locate their affiliates in the market country and directly supply their products from that country. In other words, the generally acknowledged proximity-concentration hypothesis is that firms invest in countries with large markets and substantial trade costs with their home country (Brainard, 1997). Chen and Moore (2010) concludes that French firms are likely to invest in countries located geographically away from France. Therefore, an increase in trade costs is expected to result in an increase of HFDI. However, as previously mentioned, trade liberalization has progressed globally. Trade liberalization cannot explain the recent increase of FDIs in developing countries with this simple HFDI framework.

Furthermore, by incorporating firm heterogeneity in terms of productivity into the HFDI model, Helpman et al. (2004) show the presence of a sorting effect on the basis of firms' productivity: only firms with productivity beyond a cutoff can afford to pay the entry costs to invest abroad; thus, they become multinationals, indicating that an increase in investments can occur if firms' productivity rises or if the productivity cutoff for investing *per se* decreases. As Chen and Moore (2010) demonstrate, productivity cutoff is a function of several host country characteristics. In particular, the rise of trade costs lowers productivity cutoff and, thus, enables even less productive firms to invest abroad. Therefore, this extended version of HFDI cannot demonstrate that trade liberalization plays a crucial role in increasing low productive firms' FDIs in developing countries.

An alternate model that attempts to clarify the reasons for the relative increase of FDIs in developing countries by low productive firms is the vertical FDI (VFDI) model.[1] VFDI aims to relocate part of the production process to cheap labor countries and to engage, insofar as their production processes are concerned, in a vertical division of labor between host and home countries. Therefore, VFDI is directed toward developing countries rather than developed countries. Furthermore, the reduction in production costs through division of labor needs to outweigh the additional cost burden incurred from linking remote production blocks. Obviously, the main costs are trade costs between host and home countries. Thus, VFDI is likely to be conducted in countries with large wage gaps and low trade costs between home and host countries. Therefore, a reduction in trade cost is expected to result in an increase in VFDI. In other words, the mechanics of VFDI seem to be able to consistently explain the recent increase in FDIs in developing countries. Furthermore, similar to the extended version of HFDI, productivity cutoff plays an important role for VFDI. In particular, if trade cost reduction lowers productivity cutoff for VFDI, the recent decrease in trade costs increases the VFDI by less productive firms.

Our research strategy is as follows. We first extend the Helpman et al. (2004) model to allow firms to choose another option, VFDI. In other words, we explicitly integrate the HFDI and VFDI models into a single framework. Subsequently, we derive some propositions regarding the relationship between trade cost reduction and firms' choice of FDI. Specifically, we examine how changes in trade cost affect productivity cutoffs

[1] In addition, specific types of FDI are proposed. In particular, to explore the mechanics of setting up multiple affiliates, FDI theories have been reconstructed in the framework of a three-country, and not the traditional two-country, setting (Yeaple 2003; Grossman, et al. 2006; Baltagi, et al. 2007; Ekholm, et al. 2007).

that separate firms' FDI choice. Next we empirically examine those propositions for Japanese FDIs in five Asian countries—China, Thailand, Malaysia, the Philippines and Indonesia—by employing firm-level data. We estimate the discrete choice model regarding firms' FDI decision or choice of FDI type. In the classification of HFDI and VFDI, we adopt various criteria such as export or import intensity of each affiliate and qualitative question items on the motivation for investing abroad. As a result, our estimation reveals that the reduction in tariff rates in host countries has different effects between HFDI and VFDI. Their reduction induces firms in the middle range of productivity distribution to follow VFDI; its impact is more pronounced for VFDI firms than for HFDI firms. Because developing countries, particularly East Asian countries, have experienced a relatively rapid decrease in tariff rates, our findings imply that the increase in VFDI through tariff rate reduction has resulted in the recent relative surge of FDIs in developing countries.

This paper complements the recent empirical studies that examine the decision of heterogeneous firms to participate in international markets by extending the Helpman et al. (2004) model: Aw and Lee (2008), Yeaple (2009), Chen and Moore (2010), and Hur and Hyun (2011). Aw and Lee (2008) consider Taiwanese HFDI as the investment of middle country firms in terms of wage levels and have four options: domestic production, investment in a lower wage country (China), investment in a higher wage country (The US), and investment in both higher and lower wage countries. Then, they examine the ranking of firms' productivity according to the option chosen and find it as follows: domestic production, FDI in China, FDI in the US, and FDI in both China and the US. Yeaple (2009) and Chen and Moore (2010) examine the relationship of productivity cutoff with several host country characteristics in HFDI in the US and France, respectively. For example, they show that the cutoff for investing is lower in countries with larger markets. Recently, Hur and Hyun (2011) examine the role of firm heterogeneity in choosing FDI type by using Korean firm-level data. They distinguish FDI types, including HFDI, VFDI, and combined FDI, and demonstrate a pecking order of firm productivity across FDI types. This paper focuses on HFDI and VFDI and examines productivity cutoff for investing, shedding light on changes in tariff rates and their effect on VFDI, as in Chen and Moore (2010).

The remainder of this paper is organized as follows. The next section illustrates a model to motivate our empirical analysis. Empirical analyses and their results are reported in Sections 3 and 4, respectively. Section 5 concludes.

2. Theoretical Framework

This section examines the problem of selecting an FDI pattern—HFDI or VFDI. This section aims not to provide a general equilibrium model of multi-production stages and multi-country settings, but instead, under simplified settings (a two-country setting or a partial equilibrium model), it focuses on an examination of how changes in various parameters affect firms' FDI pattern.

2.1. Profit Functions in Each Strategy

Suppose that two countries exist: country 1 (home country) and country 2 (foreign country). In this supposition, we consider horizontally differentiated finished products. Each of a continuum of firms manufactures a different brand with zero measure. Finished products are consumed in both countries. A representative consumer in country i has a constant elasticity of substitution utility function over varieties. As in the literature, utility maximization yields

$$x_{ji}(k) = p_{ji}(k)^{-\sigma} A_i ,$$

where $x_{ji}(k)$ is the demand of country i for variety k produced in country j. $p_{ji}(k)$ is the price in country i for variety k produced in country j. σ is the elasticity of substitution between varieties, assumed to be greater than unity. The brand name k is omitted from this point onwards for brevity. $A_i \equiv P_i^{\sigma-1} Y_i$, where P_i is the price index in country i and Y_i is total income in country i. Although demand level A is endogenous to the industry, it is treated as exogenous by producers because every producer is negligible relative to its industry size. There are ice-berg costs t_{ji} (≥ 1) for the shipment of products between countries j and i: $t_{ji} = t$ for $j \neq i$ and $t_{ji} = 1$ for $j = i$.

The market structure of the finished goods sector is regarded as monopolistic competition. Each firm knows its cost efficiency θ only after its entry into the market. Finished products are produced in two stages of production. The production function in each stage is kept simple to highlight the nature of the interdependence of production stages. Our Leontief-type production structure is as follows. A first-stage product is produced with θ units of skilled labor; a second-stage product is produced with one unit of the first-stage product and θ units of unskilled labor. In other words, our production structure implies that each stage product is used in fixed proportions, as no substitutability exists between both stages of products. Furthermore, improvement in cost efficiency decreases production factors necessary for producing each stage product at the same proportion. These production technology settings greatly simplify our

analysis.[2]

Factor prices for skilled labor and unskilled labor are represented by r and w, respectively. Once again, there are ice-berg trade costs t for the shipment of the first stage product between countries 1 and 2. For simplicity, trade costs are assumed to be identical between the first and second stage products.[3] Although firms with headquarters in country 1 do not need to pay fixed costs if they produce both two-stage products in only country 1, they must incur plant setup costs f if they setup plants in country 2.

We consider the production pattern of firms with headquarters in country 1. For simplicity, it is assumed that headquarters are not relocated. Furthermore, we restrict the considerations to firms with at least one production stage in country 1. This restriction rules out the pattern of complete specialization in headquartered services at home. Our interest in the production pattern is devoted to three specific patterns: domestic production (*D*), VFDI (*V*), and HFDI (*H*). Domestic production indicates that firms locate both stages in the home country and supply finished products from home to both countries. In VFDI, firms locate the first stage of production at home and the second stage abroad. Because the finished products are completed abroad, firms supply their finished products from the foreign plant to both countries. In HFDI, firms locate both production stages in both countries and supply their finished products domestically[4].

Among these three patterns, firms choose the pattern that yields the highest total profit. Let c^M_{ji} be the marginal cost of producing products in country j for country i market in the production pattern M. Then, respective marginal costs are given by

$$c^D_{11} = (r_1\theta + w_1\theta), \qquad c^D_{12} = (r_1\theta + w_1\theta)\, t,$$
$$c^V_{21} = (t\, r_1\theta + w_2\theta)\, t, \qquad c^V_{22} = (t\, r_1\theta + w_2\theta),$$
$$c^H_{11} = (r_1\theta + w_1\theta), \qquad c^H_{22} = (r_2\theta + w_2\theta).$$

The profit-maximizing strategy yields $p_{ji} = \sigma c^M_{ji}/(\sigma - 1)$, indicating that profit functions are represented by

[2] Our two-country setting implies that we do not consider the sales of the second stage product to and the inputs of the first stage product from the "third country," as in Yeaple (2009) and Chen and Moore (2010). Also see footnote 1 and the second empirical issue in Section 3.

[3] Distinguishing trade costs between two stages makes the analysis quite complicated. The examination of such a model is beyond our scope to motivate our empirical analysis (Grossman, et al. 2006).

[4] Obviously, other possible production patterns exist for firms. For example, firms conduct first-stage production only at home, but second-stage production for supplying finished products to home and foreign countries may be done at home and in foreign countries, respectively. This type of production pattern is likely to be dominant in the medium level of trade costs. This paper does not consider this pattern because we focus later on cases of high and low trade costs. Moreover, this pattern is difficult to identify using firm-level data.

$$\pi_1^D = (r_1 + w_1)^{1-\sigma} (A_1 + A_2 t^{1-\sigma}) \Theta$$
$$\pi_1^V = (tr_1 + w_2)^{1-\sigma} (A_1 t^{1-\sigma} + A_2) \Theta - f,$$
$$\pi_1^H = \{(r_1 + w_1)^{1-\sigma} A_1 + (r_2 + w_2)^{1-\sigma} A_2\} \Theta - f,$$

where $\Theta \equiv \sigma^{-\sigma}(\sigma - 1)^{\sigma-1} \theta^{1-\sigma}$. We call Θ the productivity measure. Because $\sigma > 1$, a smaller cost efficiency θ results in a larger measure Θ.

2.2. FDI Choice

This subsection examines the production pattern that firms in country 1 choose according to their productivity levels. Let S_i^M be the slope of the profit function of country i's firm in production type M. Then, the three slopes are represented by

$$S_1^D = (r_1 + w_1)^{1-\sigma} (A_1 + A_2 t^{1-\sigma}),$$
$$S_1^V = (tr_1 + w_2)^{1-\sigma} (A_1 t^{1-\sigma} + A_2),$$
$$S_1^H = (r_1 + w_1)^{1-\sigma} A_1 + (r_2 + w_2)^{1-\sigma} A_2.$$

For simplicity, we assume that $w_1 \geq w_2$ and $r_2 \geq r_1$, indicating that country 1 (the home country) has higher wages for unskilled labor, whereas country 2 (the potential host country) has higher wages for skilled labor.[5]

Assumption 1: $w_1 = a\, w_2$ *and* $r_2 = b\, r_1$, *where* $a \geq 1$ *and* $b \geq 1$.

Furthermore, we assume that the home country has as large as or larger demand than any potential host country.

Assumption 2: $A_1 \geq A_2$.

Our assumption of identical plant setup costs between VFDI and HFDI assures that firms that choose VFDI and those that choose HFDI do not coexist. In other words, in our model setting, firms choose between VFDI and Domestic or between HFDI and Domestic production patterns. The case of the different plant setup costs is considered later. This subsection presents the theoretical results of describing profits as a function of the productivity measure Θ. For more details, see Appendix 1.

[5] The assumption of lower wages for skilled labor in the home country than, for example, in developing countries may seem unrealistic in the empirical analysis. However, one should interpret this assumption under the condition of the same labor quality between developing and developed countries. That is, if firms attempt to hire, in developing countries, an adequate number of skilled laborers with the same education level as those in developed countries, they price to search for such laborers is costly; thus, the entire cost per skilled labor—substantial wages for skilled laborers—becomes expensive.

We confirm the well-known conditions for the dominance of each FDI. First, we consider how the differences in wages affect the choice of production type. Given the trade costs between countries, the lower the wages for unskilled labor abroad, the more likely VFDI (S_1^V) has a steeper profit line slope than domestic production (S_1^D) (Corollary 2). One of the crucial differences between VFDI and Domestic is the location of second-stage production, which uses unskilled labor intensively. Thus, lower wages for unskilled labor abroad result in cheaper second-stage production abroad. In contrast, the lower the wages for skilled labor abroad, the steeper the slope is likely to be in HFDI (S_1^H) compared with domestic production (S_1^D) (Corollary 8). One difference between HFDI and Domestic is production location of products designed for a foreign market. That is, unlike the case of VFDI, HFDI locates both the first and the second stages and employs both types of labor abroad. Hence, lower wages for both types of labor abroad result in cheaper production for the foreign market.

As a result, because both HFDI and VFDI firms must incur fixed setup costs *f* for a plant in country 2, a profit line in each production type is drawn, as in Figures 1 and 2. Figure 1 shows productivity cutoff dividing firms between domestic and VFDI categories in the case of lower wages for unskilled labor abroad. Therefore, this figure shows that in case of low wages for unskilled labor abroad, more productive firms choose VFDI whereas less productive firms concentrate on production activity at home. Similarly, we show productivity cutoff dividing firms between domestic and HFDI categories in the case of lower wages for skilled labor abroad, as in Figure 2, and obtain the following: in the case of low wages for skilled labor abroad, more productive firms choose HFDI whereas less productive firms concentrate on production activity at home.

=== Figures 1&2 ===

Second, we assume the differences in wages for both types of labor as given. Then, as trade costs between the countries decline, the slope in VFDI (S_1^V) becomes steeper than that of domestic production (S_1^D) (Corollary 3) because low trade costs reduce shipment costs of the first-stage product from home to abroad. In contrast, the higher the trade costs, the steeper the slope in HFDI (S_1^H) becomes compared with that of domestic production (S_1^D) (Corollary 9) because high trade costs increase shipment costs of the second-stage product from home to abroad in the case of domestic production. Thus, we draw two types of figures, similar to Figures 1 and 2, according to the magnitude of trade costs. In case of low trade costs, as in Figure 1, more productive firms choose vertical FDI whereas less productive firms focus on domestic production.

In contrast, in case of high trade costs, more productive firms choose HFDI whereas less productive ones focus on domestic production, as in Figure 2.

Next, we consider how previously described cutoffs change according to host country characteristics. As previously shown, VFDI is chosen in case of low trade costs and lower wages for unskilled labor abroad. Then, a further reduction in trade costs (Corollary 4), fixed costs (Corollary 5), their wages (Corollary 7) or market-size expansion (Corollary 6) abroad reduces the cutoff that divides firms into domestic and VFDI categories. In other words, these changes in potential host countries succeed in attracting less productive VFDI firms. Effectively, the underlying mechanics are similar to the aforementioned ones. In contrast, as previously confirmed, HFDI is likely to be chosen in case of lower wages for skilled labor abroad and higher trade costs. Then, except for reductions in trade costs, similar changes in host country characteristics result in attracting less productive HFDI firms (Corollaries 10 and 11). However, reductions in trade costs require HFDI firms to be more productive. As a result, there is a contrastive effect of changes in trade cost on productivity cutoff between HFDI and VFDI. Trade cost reduction attracts even less productive VFDI firms, and an increase in trade costs attracts even less productive HFDI firms.

Finally, we examine how the above results change if we assume different plant setup costs between VFDI and HFDI. Then, domestic firms, VFDI firms, and HFDI firms can coexist. For example, there are combinations of wages for skilled and unskilled labor where $S_1^H > S_1^D$ and $S_1^V > S_1^D$. In such a combination, if $S_1^H > S_1^V$ and plant setup costs are cheaper in VFDI than HFDI, firms with high levels of productivity choose HFDI, those with medium levels choose VFDI, and those with low levels choose Domestic (Figure 3). However, if $S_1^H > S_1^V$ and plant setup costs are cheaper in HFDI than VFDI, VFDI firms do not exist (Figure 4). As previously noted, productive firms choose HFDI whereas less productive firms choose domestic production. Therefore, the production strategy by both a group of the most productive firms and a group of the least productive firms does not change if the difference in plant setup costs between HFDI and VFDI is not significantly large. However, firms' strategy with a middle level productivity is more complicated and depends on their magnitude, in addition to the aforementioned parameters. Because of the lack of evidence indicating the type of FDIs that require a more expensive plant setup, we examine empirically how the previously noted host country characteristics affect firms' decision to choose FDI types.

=== Figures 3&4 ===

3. Empirical Framework and Data

3.1. Overview of Japanese FDI

This section explains our empirical strategies. Before discussing the empirical specification, we present some preliminary findings on Japanese machinery FDI by using the micro database of *Kaigai Jigyou Katsudou Kihon (Doukou) Chousa* (*Survey on Overseas Business Activities*, hereafter SOBA) prepared by the Research and Statistics Department, Ministry of Economy, Trade and Industry (hereafter, METI). SOBA aims to obtain basic information on the activities of foreign affiliates of Japanese firms. The survey covers all Japanese firms that have affiliates abroad. SOBA includes items such as the year of establishment of the affiliate, and a breakdown in sales and purchases, employment, costs, and research and development.

Table 1 reports the number of Japanese overseas affiliates in new investors by year and region. This table is restricted to the first investment in each country for firms, which implies that we include the first investment in one country by firms who have invested in different countries but do not count the second investment. In our sample, the total number of new investment was highest in 1995 and then gradually decreased toward 2003. As for regional distribution, the number of firms investing in North America and Europe were 109 and 198, respectively, new investment toward Asia[6] accounted for 856 among total 1,212 investments from 1995 to 2003. Figure 5 presents the number of newly established overseas affiliates in Asian countries from 1995 to 2003. China was the most popular destination of Japanese FDI in Asia, with 275 investments. For the rest of the countries, ASEAN 4 countries, namely Thailand, Indonesia, the Philippines, and Malaysia were the major destinations. This paper focuses on investment in China plus the ASEAN 4 countries because they account for 67.9% of new overseas affiliates from 1995 to 2003 in East Asia.

=== Table 1 & Figure 5 ===

Table 2 shows the ratio of export-intensive overseas affiliates by region and industry. We define an export-intensive affiliate as an affiliate whose share of exports in total sales is greater than the industry average of all sampled affiliates. Export intensity

[6] In this table, Asia includes not only East Asian countries but also South Asian countries. Whereas North America consists of the US and Canada, Europe includes not only Western European countries but also Eastern European countries.

in MNEs' affiliates is sometimes used as a proxy for the extent of VFDI[7] because, although HFDI is an investment to avoid broadly defined trade costs by setting up plants within a targeted market/country rather than by exporting from the home country, VFDI is intended to exploit low price-production factors of the host country. In other words, most of the goods produced by HFDI affiliates are intended for sale in the host country; however, sales of products from VFDI affiliates are not aimed at the host country. Thus, the larger export share suggests that overseas affiliates are more likely to be involved in vertical production networks. Clearly, affiliates in Asia are more likely to fall into the category of export-intensive affiliates than those in developed countries.

== Table 2 ==

Asian countries have experienced gradual trade liberalization through the 1990s and 2000s. Panels (a) and (b) in Figure 6 present the changes in tariff rates (the simple-average in manufacturing sectors) by region or certain Asian countries. Our tariff rates data source is the World Integrated Trade Solution (WITS), particularly TRAINS raw data. Panel (a) shows that tariff rates in regions other than Asia remained almost unchanged during the sample period, but those in Asia gradually decreased. In other words, Asia has achieved greater trade liberalization in terms of tariff rate reductions than other regions. Panel (b) reports the trend in tariff rates for five Asian countries: China, Thailand, Malaysia, the Philippines, and Indonesia. These countries experienced a significant tariff reduction in the late 1990s and the early 2000s. This paper explores the effect of changes in tariff rates in Asian countries on the FDI decision by Japanese MNEs.

=== Figure 6 (a) & (b) ===

3.2. Data and Empirical Specification

Firm-level data analyzed are from the *Basic Survey of Japanese Business Structure and Activities* (BSJBSA) and the *Survey of Overseas Business Activities* (SOBA). While the SOBA collects information on the activities of Japanese MNEs

[7] For example, Fukao et al. (2003) compares the share of sales destination in total sales for Japanese and US MNE affiliates among regions and finds that for both Japanese and US MNEs, although the share of local sales by MNE affiliates in Europe and Latin America exceed 50% or 60%, that for affiliates in East Asia was less than 50%. Because VFDI is considered as investments that take advantage of the differences in factor prices and export the output to foreign countries, they conclude that FDI in East Asia is more likely to be "vertical" in nature.

affiliates, the BSJBSA covers all Japanese manufacturing firms with more than 50 employees and capitalization of more than 30 million yen. The BSJBSA statistically captures the overall picture of Japanese corporate firms: the diversification and globalization of corporate activities and corporate strategies on R&D and other topics. This firm-level data are used to construct variables for controlling firm characteristics. As noted, this paper focuses on FDI in Asia, namely in China, Thailand, Malaysia, the Philippines, and Indonesia, from 1995 to 2003. In addition, to maintain consistency with our theoretical framework, we restrict firm samples only to those exporting to Asian countries. Table 3 presents the samples by destination country. Although non-MNEs are firms without investment in both 1994 and 2003, new MNEs are those that set up the first affiliate between 1994 and 2003 in each country. Firms with a foreign affiliate in 1994 are referred to as incumbent MNEs.

=== Table 3 ===

In the model, underling productivity differences enable firms sorting: low productivity firms become engaged only in domestic production, whereas high productivity firms invest abroad and become engaged in international division of labor between home country and host country. In this setting, a reduction in trade costs increases revenues for VFDI firms, inducing firms that do not invest in the initial year to set up overseas affiliates. Figure 7 illustrates the effects of trade liberalization. The upper line indicates the productivity cutoff line before trade liberalization, whereas the lower line represents the line after a reduction in trade cost. Because high productivity firms have already invested abroad even before trade liberalization, the effect of trade cost reduction is significant for firms in the middle range of the distribution.

=== Figure 7 ===

To confirm the sorting pattern, we estimate the discrete choice model in the following specification:

$$\Delta FDI_{ijs} = \begin{cases} 1 & if\ \beta\Delta\tau_{js} + \gamma Z_{i,1994} + \alpha_j > 0 \\ 0 & otherwise \end{cases}$$

where ΔFDI_{ijs} is a dummy variable that takes the value of 1 if firm i in industry s starts investing in country j from 1995 to 2003 and $\Delta\tau_{js}$ represents changes in tariff rates for imported input. We construct input tariff rates by industry as a weighted average of tariff rates at the Harmonized System (HS)1988 six-digit level. As for the weight, we

use an intermediate input share calculated with the basic table from the 2000 Japanese Input–Output Table (Ministry of Internal affairs and Communications). The three-digit SOBA industry classification is used. Z_i represents firm characteristics, including total factor productivity, and α_j is a vector of variables for country characteristics.

The underlying model suggests that trade liberalization induces new FDI in concerned countries by firms in the middle range of productivity distribution, but not by the least or most productive firms. To examine this prediction, we follow the specification proposed by Bustos (2011), which uses Argentina plant-level data and investigates the effect of tariff reduction in a destination country in the early 1990s on changes in productivity cutoff for exporting. The equation to be estimated is as follows:

$$\Delta FDI_{ijs} = \begin{Bmatrix} 1 & if \sum_r \beta_r \Delta\tau_{js} Q_r + \gamma Z_{i,1994} + \alpha_j > 0 \\ 0 & otherwise \end{Bmatrix},$$

where r indexes each of the four quartiles of productivity distribution and Q_r is a dummy variable taking unity if firm i belongs to quartile r. The reason we use quartile dummy variables rather than a continuous variable of productivity is that trade liberalization affects only firms in the middle range of productivity distribution, not all firms. The four quartiles of productivity distribution are defined for domestic and new investing firms as well as incumbent MNEs. However, when estimating a logit model, we exclude incumbent MNEs.

To confirm our model's validity, we conduct two types of additional estimations. First, we estimate our models based on the more systematic classification of FDI types. As is shown in Table 2, many Japanese overseas affiliates in Asia are considered VFDI affiliates, but not all of them are engaged in vertical specialization. Thus, as in Table 2, those affiliates whose export intensity is higher than its industry average are regarded as export-intensive affiliates. These affiliates are called VFDI affiliates and others are called HFDI affiliates. Then, indicator variables are constructed that take the value of 1 for HFDI and 2 for VFDI, and estimate the following multinomial logit model:

$$\text{Prob}\left(I_{ij} = k \mid \beta\Delta\tau_{js} + \gamma Z_{i,1994} + \alpha_j\right) = \frac{\exp[\beta\Delta\tau_{js} + \gamma Z_{i,1994} + \alpha_j]}{\sum_{k=0}^{2} \exp[\beta\Delta\tau_{js} + \gamma Z_{i,1994} + \alpha_j]}, \; k = 0, 1, 2.$$

$\boldsymbol{\beta}_j$ is a vector of coefficients to be estimated using the maximum likelihood estimation (MLE) technique. We expect that the effect of a tariff reduction on the productivity cutoff for FDI is more pronounced in the case of VFDI type affiliates.

One may argue that a number of ways exist to differentiate between overseas affiliates opting for HFDI and those opting for VFDI. Thus, those two types of FDI are also classified based on the following two types of information obtainable from the

SOBA. One type is constructed based on a questionnaire item on investment motivation. Some supplier firms (automobile parts companies) invest abroad following their assemblers' investment (Toyota) to maintain the relationship with those assemblers. Because such suppliers' motivation for investing is to reduce transaction costs with their assemblers, regarding those affiliates as HFDI type affiliates may be more appropriate. By utilizing a qualitative questionnaire item on the motivation to invest abroad, we classify affiliates with the motivation to maintain the supplier–assembler relationship as HFDI type affiliates and others as VFDI type affiliates. The other questionnaire is based on information on production patterns and asks Japanese overseas affiliates whether they engage in full-scale local production. Those affiliates engaging in that type of production are regarded as HFDI affiliates. Affiliates that engage in international division of labor are classified as VFDI affiliates. We construct an indicator variable that takes the value of 1 if affiliates are full-scale local production type, 2 otherwise.

Second, we apply the same empirical model to Japanese FDI to European countries, where wage rates for unskilled worker are as high as those in Japan. Furthermore, because European countries are geographically away from Japan, transportation costs to Japan are be higher than to East Asian countries. Thus, firms investing in European countries are less likely to engage in international division of labor between home and host country. In other words, FDIs in European countries are more likely to be HFDI. As destination countries, we select four European countries: UK, France, Germany, and Italy. We expect that the reduction in tariff rates does not significantly encourage FDIs in those countries.

Our explanatory variables based on the theoretical framework in the previous section are firms' total factor productivity (TFP) as the measurement of their productivity, specifically the TFP index proposed in Caves et al. (1982, 1983) and Good et al. (1983). These variables are calculated as follows:

$$TFP_{it} = \left(\ln Y_{it} - \overline{\ln Y_t}\right) - \sum_f \frac{1}{2}\left(s_{ift} + \overline{s_{ft}}\right)\left(\ln X_{ift} + \overline{\ln X_{ft}}\right)$$

$$+ \sum_s \left(\overline{\ln Y_s} - \overline{\ln Y_{s-t}}\right) - \sum_s \sum_f \left(\overline{s_{fs}} - \overline{s_{fs-t}}\right)\left(\overline{\ln X_{fs}} - \overline{\ln X_{fs-t}}\right),$$

where Y_{it}, s_{ift}, and X_{ift} denote the shipments of firm i in year t, the cost share of input f for firm i in year t, and input of factor f for firm i in year t, respectively. The inputs are labor, capital, and intermediates. The industry average variables are denoted using an upper bar. As for other control variables for firm characteristics, we introduce the capital-labor ratio (KL-ratio), R&D intensity, and share of unskilled workers in total

workers[8]. All noted firm-level variables are from the *Basic Survey of Japanese Business Structure and Activities*. We control for the number of Japanese foreign affiliates in 1994 in each country as a proxy for an agglomeration of Japanese MNEs. Country dummy variables are used to control for host-country-specific elements. Additionally, as highlighted in Chen and Moore (2010), productivity cutoff for FDI depends on country attractiveness. For example, in countries with large markets or stable economic conditions, both high productivity firms and less efficient firms are able to invest and set up their affiliates. To control for the differences in productivity cutoff depending on destination market characteristics, we add country-TFP interaction terms. We also control for industry fixed effect using two-digit industry level dummy variables.

Before discussing estimation results, we compare productivity distribution of three groups of firms: non-MNEs, new MNEs, and incumbent MNEs by country. Table 4 shows the share of firms categorized into each quartile for the 1994 productivity distribution. For example, in case of China, the share for incumbent MNEs in the fourth quartile is highest among three groups of firms. For new MNEs, 35.3% of firms fall into the third quartile of productivity distribution, which is higher than those in the upper and lower categories. In contrast, non-MNEs are uniformly distributed, although the share of the lowest quartile firms is slightly higher than the share of the other three-quartile firms. A similar tendency is found in other Asian countries except for new MNEs in Indonesia. The productivity distribution presented in Table 4 seems consistent with our empirical hypothesis in Figure 7. Namely most incumbent MNEs fall into the highest productivity categories, new MNEs in the middle range of productivity distribution, and non-MNEs in the lower productivity categories. Our empirical analysis examines whether this relationship is more substantial in industries with significant reductions in tariff rates.

=== Table 4 ===

4. Empirical Results

The estimation results for the logit model are found in Table 5.[9] The results in column (1) do not contain interaction terms with the quartile dummies, the results from

[8] Unskilled workers are those who work at production site.

[9] As Ai and Norton (2003) suggest, paying additional attention when we interpret the parameter of an interaction term in a nonlinear model is necessary. Actually, some programs help calculate the marginal effect for an interaction term in a logit or probit model. However, programs such as *inteff* in

column (2) to column (3) include interaction terms with a productivity quartile dummy and tariff changes. The coefficient for tariff changes in column (1) is negative but insignificant. In contrast, TFP has a significant positive effect on FDI decision. This result of MNEs' high productivity is consistent with that from a large number of previous studies, such as Kimura and Kiyota (2006). That is, MNEs are productive firms compared with domestic firms. In columns (2) and (3), we include the interaction terms between productivity quartile dummy and changes in tariff rates. For column (3), we add the interaction term between country dummy and TFP to control for changes in the TFP cutoff level depending on country-specific factors. In both cases, the third quartile dummy variables always have significantly negative coefficients in both models with or without country dummy-TFP interaction. As mentioned, because the quartile dummy variables are constructed including incumbent MNEs, we expect the effect of trade liberalization to be higher for firms in the middle range of the productivity distribution. This result is consistent with our hypothesis.

For other control variables, agglomeration of Japanese MNEs has a significantly positive coefficient, suggesting that firms investing abroad prefer countries that have a large agglomeration of Japanese MNEs. The positive and significant coefficient for the capital-labor ratio may imply that firms with capital-embodied technology are more likely to invest abroad. Moreover, the share of unskilled workers always has a significantly negative coefficient. Because the intensity of the non-manufacturing worker is sometimes regarded as the skilled worker ratio, this result indicates that skilled worker-intensive firms tend to invest abroad.

=== Table 5 ===

Table 6 presents the estimation results for a multinomial logit model for three different FDI choices: no investment, HFDI, and VFDI. In column (1), VFDI affiliates are defined as those affiliates with higher export intensity than their industry average. Interaction terms between the productivity of the third and fourth quartile dummy and tariff changes for VFDI are negative and highly significant. Such terms for HFDI are negative in the third quartile but not significant. Different definitions of VFDI and

---

Stata allow an evaluation of only one interaction term in a logit or probit model and do not incorporate multiple interaction terms or a multinomial logit model. We calculate marginal effects at different change levels in tariff rates and confirm that the effect of tariff changes is most significant for firms in the middle range of the productivity distribution. In Appendix A5 and A6, the marginal effects corresponding to column (3) in Table 5 and column (1) in Table 6 are presented.

HFDI are used in columns (2) and (3). In column (2), firms investing abroad so as to maintain a supplier–assembler relationship are regarded as HFDI firms while other investing firms are regarded as VFDI firms. The interaction terms between changes in tariff and the third and fourth quartile dummy are significantly negative for VFDI but not for HFDI. This result is consistent with our theoretical prediction. Column (3) defines those affiliates that engage in division of labor as VFDI. The interaction terms between changes in tariff and third quartile dummy are significantly negative for both HFDI and VFDI. However, this term's magnitude is larger for VFDI affiliates. Moreover, for VFDI, the interaction term with the fourth quartile dummy is significantly negative. Therefore, the effects of tariff reduction on VFDI are always significant for the third quartile of productivity distribution. These results are consistent with our hypothesis[10].

=== Table 6 ===

Next, we apply the same empirical model for Japanese FDI to European countries and the estimation results are reported in Table 7. Samples in Table 7 are selected in the same manner as for Table 5[11]. We first select firms that did not invest in the UK, France, Germany, and Italy in 1994 and check whether they invested in these countries from 1995 to 2003. Although the interaction term between the third or fourth quartile dummy and changes in tariff in the results of Table 6 are usually significantly negative, those in Table 7 are not in most cases, except for column (2). As previously mentioned, this result may reflect the fact that the nature of FDI in Europe might be more similar to horizontal FDI and not vertical FDI.

=== Table 7 ===

5. Concluding Remarks

This paper attempted to clarify the reasons for the relatively rapid growth of FDIs in

[10] As a robustness check, we replace the TFP index with the TFP estimates calculated using the Levinsohn and Petrin (LP) methodology (Levinsohn and Petrin, 2003). Although the interaction term for tariff changes and the fourth quartile dummy becomes negative and significant instead of the third quartile dummy in some cases, major findings do not change. Estimation results of TFP estimates using the LP method are provided on request.

[11] The number of samples and basic statistics for TFP corresponding to Table 7 are presented in Table A1 and Table A2.

Asia by examining the mechanics of HFDI and VFDI and by shedding light on the role of trade costs. We first extended the Helpman et al. (2004) model to allow firms to choose another option, VFDI, and derive several propositions regarding the relationship between trade cost reduction and firms' FDI choices. Next, we empirically examined these propositions in relation to Japanese FDIs in China, Thailand, Malaysia, and Indonesia by estimating the discrete choice model of firms' choices among three options: domestic production, HFDI, and VFDI. As a result, our estimation revealed that the reduction in tariff rates in host countries is affected differently depending on productivity level and type of FDI. This reduction attracts the middle range of productive firms but does not attract the most productive or the least productive firms. Because developing countries, particularly East Asian countries, experienced a relatively rapid decrease in tariff rates, we conclude that the increase in VFDI through a reduction in the tariff rates led to the recent relative surge of FDIs in developing countries.

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Appendix 1. Slope of Profit Function

This appendix examines differences in the slopes of profit functions among production types.

A1.1. Domestic vs. VFDI

The condition that the slope in VFDI is greater than the slope in domestic production is as follows:

$$S_1^V > S_1^D \Leftrightarrow r_1 < \frac{(Ba-1)w_2}{t-B}, \quad B \equiv \left(\frac{A_1 + A_2 t^{1-\sigma}}{A_1 t^{1-\sigma} + A_2} \right)^{\frac{1}{1-\sigma}}.$$

Assumption 2 gives us the following corollary.

Corollary 1: $0 < B \leq 1$.

Proof. Obviously, $B > 0$. $(A_1 + A_2 t^{1-\sigma}) - (A_1 t^{1-\sigma} + A_2) = (A_1 - A_2)(1 - t^{1-\sigma})$. Because $1 \geq t^{1-\sigma}$, $A_1 + A_2 t^{1-\sigma} > A_1 t^{1-\sigma} + A_2$ using Assumption 2. Then, since $\sigma > 1$, $B \leq 1$.

We define function $g(a,t)$:

$$g(a,t) = \frac{(Ba-1)w_2}{t-B}.$$

Then, we can easily show that (considering that $t \geq 1$)

$$\frac{\partial g(a,t)}{\partial a} = \frac{Bw_2}{t-B} > 0, \quad g(1,t) = \frac{(B-1)w_2}{t-B} < 0.$$

Also, denoting a^* so that $S_1^V = S_1^D$,

$$r_1 = \frac{(Ba^*-1)w_2}{t-B} \Leftrightarrow a^* = \frac{(t-B)r_1 + w_2}{Bw_2} > \frac{1}{B}.$$

By employing these relationships and results, we draw Figure A1 and obtain the following result.

Corollary 2: *If $a \geq a^*$, then $S_1^V \geq S_1^D$. Otherwise, $S_1^V < S_1^D$.*

In other words, the lower the wages for unskilled labor in a foreign country, the more likely the slope in VFDI is greater than that in Domestic.

=== Figure A1 ===

In contrast, the condition can also be rewritten as follows:

$$S_1^V > S_1^D \Leftrightarrow 1+\left(\frac{r_1}{w_2}\right)t < \left(a+\frac{r_1}{w_2}\right)B.$$

Given Assumption 2, we have the following:

$$\frac{\partial B}{\partial t} = -t^{-\sigma}\left(A_1 + A_2 t^{1-\sigma}\right)^{\frac{\sigma}{1-\sigma}}\left(A_1 t^{1-\sigma} + A_2\right)^{\frac{2-\sigma}{1-\sigma}}\left(A_1 + A_2\right)\left(A_1 - A_2\right) < 0.$$

Using the sign of this derivative, we can draw the previous condition as in Figure A2 and find t such that RHS = LHS, denoted by t^*. As a result, we obtain the following result.

Corollary 3: *If* $t \le t^*$, *then* $S_1^V \ge S_1^D$. *Otherwise,* $S_1^V < S_1^D$.

The lower the trade costs, the more likely the slope in VFDI is greater than that in Domestic.

=== Figure A2 ===

Last, let Θ_k^{VD} be the productivity in which Domestic and VFDI have equal profits for firms in country k. Thus, Θ_1^{VD} can be expressed as follows:

$$\Theta_1^{VD} = f / (S_1^V - S_1^D) = f / [(tr_1 + w_2)^{1-\sigma}(A_1 t^{1-\sigma} + A_2) - (r_1 + w_1)^{1-\sigma}(A_1 + A_2 t^{1-\sigma})].$$

Its derivatives with respect to various parameters are examined. The derivative with respect to trade cost is as follows:

$$\frac{\partial \Theta_1^{VD}}{\partial t} = \frac{f(1-\sigma)}{\left(S_1^V - S_1^D\right)^2}\left\{t^{-\sigma}\left[(tr_1 + w_2)^{1-\sigma}A_1 - (r_1 + w_1)^{1-\sigma}A_2\right] + r_1(tr_1 + w_2)^{1-\sigma}\left(A_1 t^{1-\sigma} + A_2\right)\right\}$$

With Assumption 2,

$$(tr_1 + w_2)^{1-\sigma}A_1 - (r_1 + w_1)^{1-\sigma}A_2 \ge \left[(tr_1 + w_2)^{1-\sigma} - (r_1 + w_1)^{1-\sigma}\right]A_2.$$

As a result, the sufficient condition for the positive derivative can be written as follows:

Corollary 4: $(t-1)r_1 < (a-1)w_2 \Rightarrow \dfrac{\partial \Theta_1^{VD}}{\partial t} > 0.$

In other words, if wages for unskilled labor in a foreign country are sufficiently low, productivity cutoff becomes low with respect to decreasing trade costs.

Its derivative with respect to fixed entry cost is given by

$$\frac{\partial \Theta_1^{VD}}{\partial f} = \frac{1}{S_1^V - S_1^D}.$$

Given corollaries 2 and 3, we obtain the following:

Corollary 5: *If* $a \geq a^*$ *or* $t \leq t^*$, *then* $\partial \Theta_1^{VD}/\partial f > 0$.

With respect to the size of the foreign market,

$$\frac{\partial \Theta_1^{VD}}{\partial A_2} = \frac{f}{\left(S_1^V - S_1^D\right)^2}\left[\left(tr_1 + w_2\right)^{1-\sigma} - \left(tr_1 + taw_2\right)^{1-\sigma}\right]$$

The following corollary is obtained.

Corollary 6: *If* $ta \leq 1$, *then* $\partial \Theta_1^{VD}/\partial A_2 \leq 0$. *Otherwise,* $\partial \Theta_1^{VD}/\partial A_2 > 0$.

That is, if wages for unskilled labor in a foreign country or trade costs are sufficiently low, productivity cutoff becomes low with respect to decreasing plant setup costs or expanding market size in a foreign country.

The derivatives with respect to other parameters are summarized as follows:

Corollary 7: $\dfrac{\partial \Theta_1^{VD}}{\partial a} = \dfrac{f(1-\sigma)w_2\left(r_1 + aw_2\right)^{-\sigma}\left(A_1 + A_2 t^{1-\sigma}\right)}{\left(S_1^V - S_1^D\right)^2} < 0, \quad \dfrac{\partial \Theta_1^{VD}}{\partial b} = 0.$

Wages for skilled labor do not affect productivity cutoff, whereas lower wages for unskilled labor in a foreign country reduces productivity cutoff.

A1.2. Domestic vs. HFDI

The condition that the slope in HFDI is greater than the slope in domestic production can be simplified as follows:

$$(tr_1 - r_2) + (tw_1 - w_2) > 0.$$

This condition can be expressed as follows:

Corollary 8: $b < \left(\frac{w_2 t}{r_1}\right) a + \left(t - \frac{w_2}{r_1}\right) \Leftrightarrow S_1^H > S_1^D$.

Corollary 9: $t > \frac{r_2 + w_2}{r_1 + w_1} \Leftrightarrow S_1^H > S_1^D$

Figure A3 shows Corollary 8, given the trade costs, the lower the wages for skilled or unskilled labor in a foreign country, the more likely the slope in HFDI is greater than the slope in Domestic. Corollary 9 indicates that, given wages for skilled and unskilled labor, higher trade costs lead to a similar relationship of slopes in HFDI and Domestic.

=== Figure A3 ===

Let Θ_k^{HD} be the productivity whereby Domestic and HFDI yield equal profits for firms in country k. Namely, Θ_1^{HD} can be expressed as follows:

$\Theta_1^{HD} = f / (S_1^H - S_1^D) = f / [\{(r_1 + w_1)^{1-\sigma} A_1 + (r_2 + w_2)^{1-\sigma} A_2\} - (r_1 + w_1)^{1-\sigma} (A_1 + A_2 t^{1-\sigma})]$.

Its derivatives with respect to fixed entry costs and size of foreign markets are given by the following:

$$\frac{\partial \Theta_1^{HD}}{\partial f} = \frac{1}{S_1^H - S_1^D}, \quad \frac{\partial \Theta_1^{HD}}{\partial A_2} = \frac{f}{\left(S_1^V - S_1^D\right)^2}\left[t^{1-\sigma}\left(r_1 + w_1\right)^{1-\sigma} - \left(r_2 + w_2\right)^{1-\sigma}\right].$$

Because the latter becomes negative if $t > (r_2 + w_2) / (r_1 + w_1)$, using Corollaries 8 and 9, these two derivatives can be summarized as follows.

Corollary 10: $S_1^H > S_1^D \Leftrightarrow \frac{\partial \Theta_1^{HD}}{\partial f} > 0 \Leftrightarrow \frac{\partial \Theta_1^{HD}}{\partial A_2} < 0.$

In other words, if wages for skilled/unskilled labor in a foreign country or trade costs are sufficiently low, productivity cutoff decreases with respect to decreasing plant setup costs or expanding size of the market in a foreign country.

The derivatives with respect to the other parameters are summarized as follows:

Corollary 11: $$\frac{\partial \Theta_1^{HD}}{\partial t} = \frac{-f(\sigma - 1)(r_1 + w_1)^{1-\sigma} A_2 t^{-\sigma}}{\left(S_1^V - S_1^D\right)^2} < 0,$$

$$\frac{\partial \Theta_1^{HD}}{\partial a} = \frac{f(1-\sigma)w_2 A_2 t^{1-\sigma}(r_1 + aw_2)^{-\sigma}}{\left(S_1^H - S_1^D\right)^2} < 0, \quad \frac{\partial \Theta_1^{HD}}{\partial b} = \frac{f(\sigma-1)r_1 A_2 (br_1 + w_2)^{-\sigma}}{\left(S_1^H - S_1^D\right)^2} > 0.$$

An increase in trade costs or lower wages for skilled/unskilled labor in a foreign country reduces productivity cutoff.

A1.3. VFDI vs. HFDI

Our assumption of identical plant setup costs between VFDI and HFDI ascertains that firms choosing VFDI and those choosing HFDI do not coexist. In other words, in this model setting, firms select their production patterns from a choice of either VFDI or Domestic or between HFDI and Domestic. However, if we assume different plant setup costs between these two FDIs, we show that by integrating Figures A1 and A3, situations wherein firms choose VFDI, HFDI, and Domestic production patterns can coexist. Figure A4 shows that there are combinations of *a* and *b*, wherein $S_1^H > S_1^D$ and $S_1^V > S_1^D$. For example, if $S_1^H > S_1^V$ in these combinations, by assuming that plant setup costs are cheaper in VFDI than HFDI, firms with high levels of productivity choose HFDI, those with medium levels choose VFDI, and those with low levels choose Domestic.

=== Figure A4 ===

Table 1: New Investors by Region

	North America	Europe	Asia	Others	Total
1995	19	38	248	13	318
1996	29	26	164	12	231
1997	17	26	119	9	171
1998	12	18	53	10	93
1999	10	17	45	4	76
2000	10	17	57	4	88
2001	6	21	85	3	115
2002	5	16	60	2	83
2003	1	10	25	1	37
Total	109	189	856	58	1212

Source: Authors' calculation based on the linked database of Basic Survey of Japanese Business Activities and Survey of Overseas Business Activities.

Table 2: Share of Export-intensive Affiliates: 2000

	North America	Europe	Asia	World
Textile	15%	10%	59%	43%
Chemical	29%	34%	46%	48%
General Machinery	23%	29%	54%	29%
Electric Machinery	18%	17%	51%	27%
Information and Communication devices	27%	23%	58%	20%
Transport Equipment	23%	22%	39%	46%
Precision Instrument	30%	33%	65%	17%
Other manufacturing	27%	25%	48%	50%

Source: Authors' calculation based on the Survey of Overseas Business Activities.

Table 3: Number of New Overseas Affiliates in New Investors by Country from 1995 to 2003

	Non-MNEs	New MNEs	Incumbent MNEs
China	2382	275	271
Indonesia	2647	92	128
Malaysia	2645	37	185
The Philippines	2727	60	71
Thailand	2530	117	229

Notes: Non-MNEs are firms with no foreign investment between 1994 and 2003. New MNEs are firms with no investment in 1994 but set an affiliate in a concerned country between 1995 and 2003. Incumbent MNEs are firms with an affiliate in a concerned country in 1994.

Source: Authors' calculation based on the linked database of Basic Survey of Japanese Business Activities and Survey of Overseas Business Activities.

Table 4: Comparison of TFP Index by FDI Status

China		1st quartile	2nd quartile	3rd quartile	4th quartile	Total
	Non-MNEs	26.8%	26.3%	23.3%	23.6%	100.0%
	New MNES	18.5%	17.1%	35.3%	29.1%	100.0%
	Incumbent MNEs	12.2%	21.0%	31.4%	35.4%	100.0%
Indonesia						
	Non-MNEs	26.5%	25.7%	24.0%	23.8%	100.0%
	New MNES	6.5%	16.3%	35.9%	41.3%	100.0%
	Incumbent MNEs	10.2%	14.8%	35.9%	39.1%	100.0%
Malaysia						
	Non-MNEs	26.1%	26.0%	24.1%	23.7%	100.0%
	New MNES	13.5%	16.2%	40.5%	29.7%	100.0%
	Incumbent MNEs	12.4%	14.1%	34.1%	39.5%	100.0%
The Philippines						
	Non-MNEs	26.0%	25.6%	24.5%	23.9%	100.0%
	New MNES	13.3%	15.0%	36.7%	35.0%	100.0%
	Incumbent MNEs	5.6%	12.7%	28.2%	53.5%	100.0%
Thailand						
	Non-MNEs	26.8%	26.0%	23.6%	23.6%	100.0%
	New MNES	10.3%	20.5%	38.5%	30.8%	100.0%
	Incumbent MNEs	13.1%	16.6%	32.3%	38.0%	100.0%

Source: Authors' calculation based on the linked database of Basic Survey of Japanese Business Activities and Survey of Overseas Business Activities.

Table 5: Estimation Results for Logit Model. FDI in Five Asian Countries (Marginal Effect)

	(1)	(2)	(3)
$\Delta\tau$	-0.0004		
	(0.0003)		
TFP	0.0606**	0.0136	0.0205
	(0.0264)	(0.0136)	(0.0312)
Q1*$\Delta\tau$		0.0006	0.0008***
		(0.0004)	(0.0003)
Q2*$\Delta\tau$		0.0001	0.0002
		(0.0003)	(0.0003)
Q3*$\Delta\tau$		-0.0008***	-0.0008***
		(0.0003)	(0.0003)
Q4*$\Delta\tau$		-0.0005	-0.0006**
		(0.0003)	(0.0003)
KL ratio	0.0151***	0.0155***	0.0152***
	(0.0025)	(0.0024)	(0.0024)
R&D intensity	0.0207	0.0196	0.0184
	(0.0617)	(0.0591)	(0.0581)
Share of unskilled worker	-0.0156***	-0.0151***	-0.0148***
	(0.0046)	(0.0046)	(0.0046)
Agglomeration	0.0004**	0.0004**	0.0004**
	(0.0002)	(0.0002)	(0.0002)
Country dummy	Yes	Yes	Yes
Country dummy x TFP	No	No	Yes
Industry dummy	Yes	Yes	Yes
Observations	13,512	13,512	13,512
logll	-2093	-2076	-2071
pseudo-R-squared	0.127	0.134	0.136

Notes: Standard errors are clustered at the two-digit industry level. Figures in parenthesis are standard errors. ***, **, and * represent statistical significance at 10%, 5%, and 1% levels, respectively.

Table 6: Estimation Results for Multinomial Logit Model. Choice of FDI Type to Five Asian Countries (Marginal Effect)

	(1)		(2)		(3)	
	Local sales intensive FDI (HFDI)	Export intensitve FDI (VFDI)	Supplier FDI (HFDI)	Other FDI (VFDI)	FDI with full-scale local production (HFDI)	FDI with division of labor (VFDI)
Q1*Δτ	0.0006**	0.0001	0.0003**	0.0002	0.0005**	0.0003
	(0.0002)	(0.0003)	(0.0001)	(0.0003)	(0.0002)	(0.0002)
Q2*Δτ	0.0001	-0.0001	0.0001	-0.0001	0.0001	0.0000
	(0.0003)	(0.0003)	(0.0002)	(0.0003)	(0.0002)	(0.0002)
Q3*Δτ	-0.0003	-0.0005**	-0.0001	-0.0006**	-0.0003*	-0.0004**
	(0.0002)	(0.0002)	(0.0001)	(0.0003)	(0.0002)	(0.0002)
Q4*Δτ	-0.0002	-0.0004	-0.0001	-0.0005**	-0.0003	-0.0002**
	(0.0003)	(0.0003)	(0.0001)	(0.0003)	(0.0002)	(0.0001)
TFP	0.0246	0.0040	0.0110	0.0078	0.0087	0.0120
	(0.0296)	(0.0087)	(0.0138)	(0.0113)	(0.0160)	(0.0230)
KL ratio	0.0077***	0.0068***	0.0029***	0.0101***	0.0066***	0.0079***
	(0.0019)	(0.0007)	(0.0007)	(0.0016)	(0.0012)	(0.0014)
R&D intensity	0.0248	-0.0102	0.0062	0.0072	0.0133	0.0036
	(0.0334)	(0.0230)	(0.0208)	(0.0233)	(0.0184)	(0.0436)
Share of unskilled worker	-0.0057	-0.0081**	-0.0001	-0.0140***	-0.0135***	-0.0010
	(0.0038)	(0.0032)	(0.0014)	(0.0027)	(0.0020)	(0.0034)
Agglomeration	0.0002*	0.0002**	0.0001*	0.0002**	0.0001	0.0002***
	(0.0001)	(0.0001)	(0.0000)	(0.0001)	(0.0001)	(0.0000)
Country dummy	Yes		Yes		Yes	
Country dummy x TFP	Yes		Yes		Yes	
Industry dummy	Yes		Yes		Yes	
Observations	13,512		13,512		13,512	
logll	-2432		-2404		-2455	
pseudo-R-squared	0.127		0.136		0.123	

Notes: Standard errors are clustered at the two-digit industry level. Figures in parenthesis are standard errors. ***, **, and * represent statistical significance at 10%, 5%, and 1% levels, respectively.

Table 7: Estimation Results for Multinomial Logit Model. Choice of Type of FDI to four European Countries (Marginal Effect)

	(1)		(2)		(3)	
	Local sales intensive FDI (HFDI)	Export intensitve FDI (VFDI)	Supplier FDI (HFDI)	Other FDI (VFDI)	FDI with full-scale local production (HFDI)	FDI with division of labor (VFDI)
Q1*Δτ	-0.0001	-0.0003	0.0001*	-0.0015	-0.0017**	0.0004
	(0.0009)	(0.0006)	(0.0001)	(0.0014)	(0.0008)	(0.0003)
Q2*Δτ	-0.0008	0.0005	0.0000	-0.0002	-0.0016*	0.0008**
	(0.0005)	(0.0008)	(0.0000)	(0.0018)	(0.0008)	(0.0003)
Q3*Δτ	-0.0017***	-0.0001	0.0000	-0.0019*	-0.0019***	-0.0001
	(0.0005)	(0.0004)	(0.0000)	(0.0010)	(0.0006)	(0.0003)
Q4*Δτ	-0.0009*	-0.0001	0.0001***	-0.0014	-0.0016**	0.0003
	(0.0005)	(0.0006)	(0.0000)	(0.0013)	(0.0006)	(0.0003)
TFP	-0.0027	0.0086**	-0.0002	0.0198	0.0157***	-0.0021
	(0.0049)	(0.0034)	(0.0003)	(0.0124)	(0.0048)	(0.0028)
KL ratio	0.0015**	0.0018*	0.0000	0.0049***	0.0017	0.0013***
	(0.0007)	(0.0009)	(0.0000)	(0.0015)	(0.0011)	(0.0002)
R&D intensity	0.0456**	0.0144	0.0004	0.0605**	0.0099	0.0276***
	(0.0207)	(0.0104)	(0.0009)	(0.0244)	(0.0175)	(0.0096)
Share of unskilled worker	0.0051**	-0.0019	0.0003*	-0.0019	-0.0022	0.0032*
	(0.0025)	(0.0012)	(0.0002)	(0.0043)	(0.0028)	(0.0018)
Agglomeration	0.0001	0.0001*	0.0000	0.0001	0.0002***	0.0000
	(0.0001)	(0.0000)	(0.0000)	(0.0001)	(0.0001)	(0.0000)
Country dummy	Yes		Yes		Yes	
Country dummy x TFP	Yes		Yes		Yes	
Industry dummy	Yes		Yes		Yes	
Observations	5,507		5,507		5,507	
logll	-489.7		-470.2		-474.5	
pseudo-R-squared	0.151		0.170		0.166	

Notes: Standard errors are clustered at the two-digit industry level. Figures in parenthesis are standard errors. ***, **, and * represent statistical significance at the 10%, 5%, and 1% level, respectively.

Table A1: Number of New Overseas Affiliates in New Investors from 1995 to 2003 in Four European Countries

	Non-MNEs	New-MNEs	Incumbent MNEs
UK	1,292	36	118
France	1,379	14	53
Germany	1,324	10	113
Iltaly	1,410	8	27

Note: For definitions of non-MNEs, new MNEs, and incumbent MNEs, see Table 3.

Source: Authors' calculation based on the linked database of Basic Survey of Japanese Business Activities and Survey of Overseas Business Activities.

Table A2: Comparison of TFP index by FDI status in Four European countries

		Productivity Distribution				
		1st qurtile	2nd qurtile	3rd qurtile	4th qurtile	Total
UK						
	Non-MNEs	25.9%	25.9%	24.1%	24.0%	100%
	New MNES	19.4%	11.1%	30.6%	38.9%	100%
	Incumbent MNEs	16.9%	20.3%	31.4%	31.4%	100%
France						
	Non-MNEs	25.4%	25.6%	24.2%	24.8%	100%
	New MNES	21.4%	7.1%	42.9%	28.6%	100%
	Incumbent MNEs	18.9%	15.1%	37.7%	28.3%	100%
Germany						
	Non-MNEs	25.8%	26.1%	24.8%	23.3%	100%
	New MNES	10.0%	10.0%	10.0%	70.0%	100%
	Incumbent MNEs	17.7%	14.2%	27.4%	40.7%	100%
Italy						
	Non-MNEs	25.3%	25.2%	24.7%	24.8%	100.0%
	New MNES	25.0%	25.0%	37.5%	12.5%	100.0%
	Incumbent MNEs	18.5%	18.5%	29.6%	33.3%	100.0%

Source: Authors' calculation based on the linked database of Basic Survey of Japanese Business Activities and Survey of Overseas Business Activities.

Figure 1: Medium Trade Cost and Low Wages for Unskilled Labors

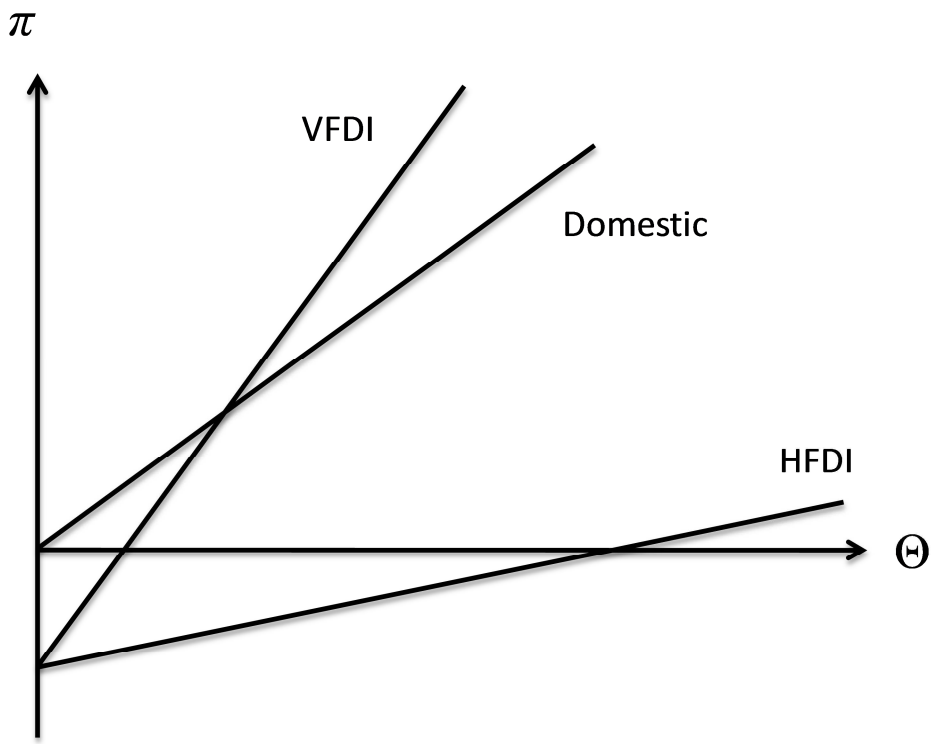


Figure 2: Medium Trade Cost and Low Wages for Skilled Labors

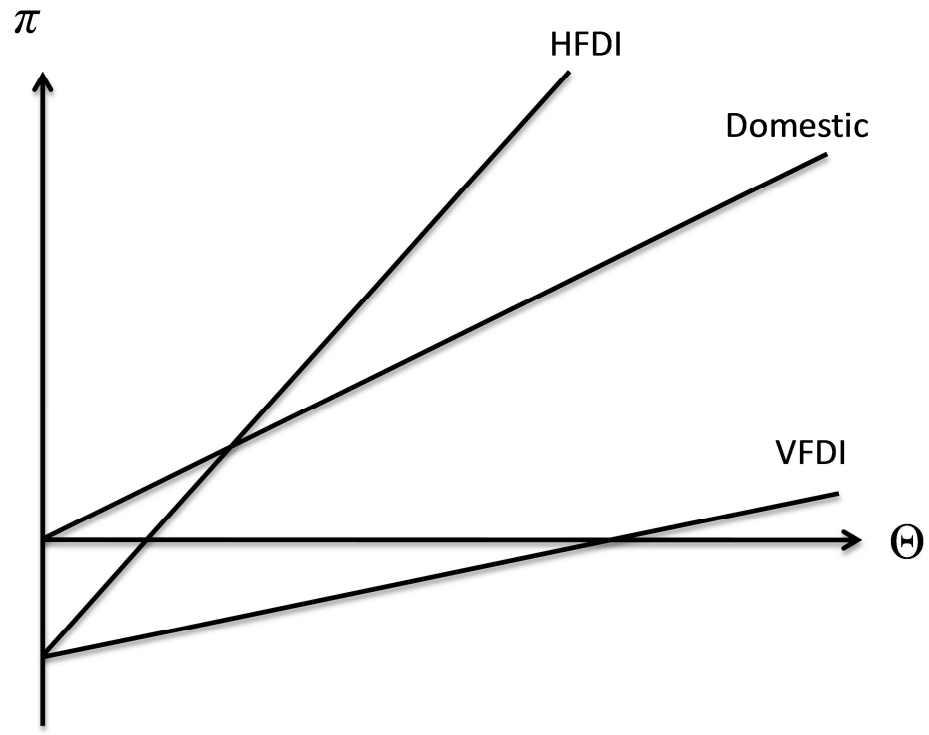


Figure 3: Different Plant Setup Costs: Three Types of Firms

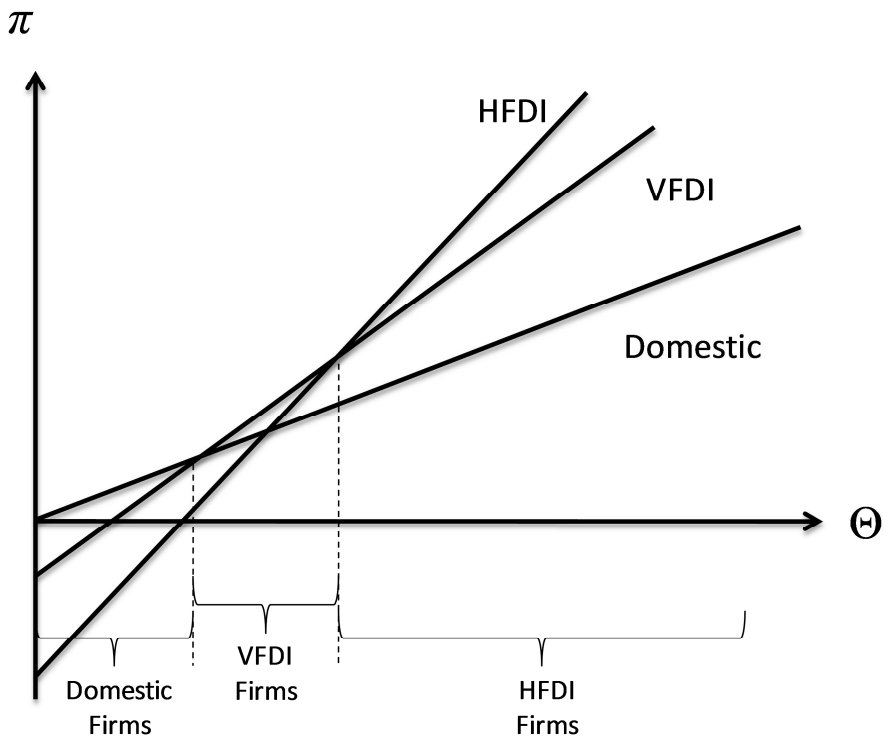


Figure 4: Different Plant Setup Costs: Two Types of Firms

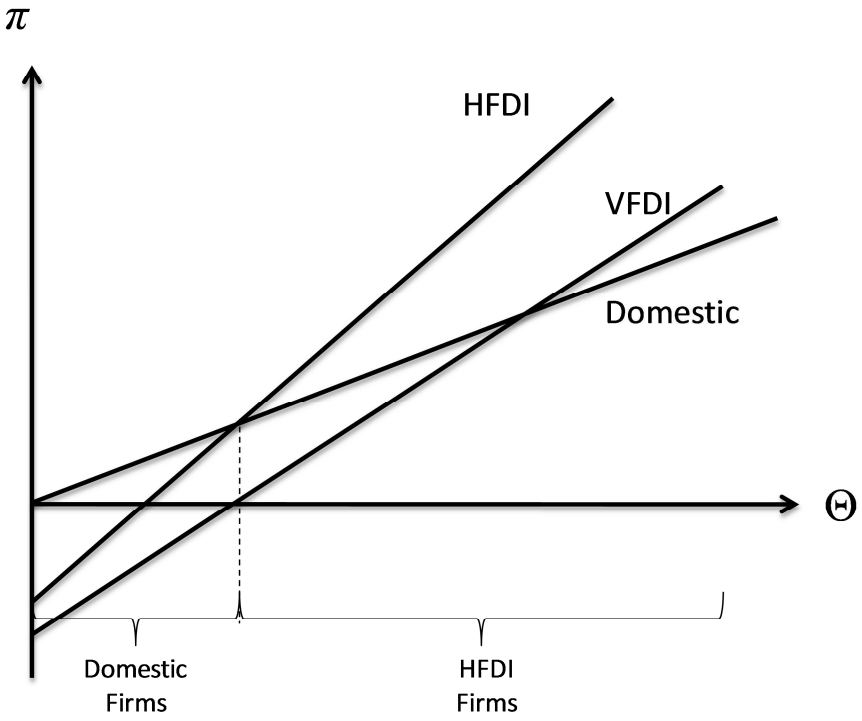
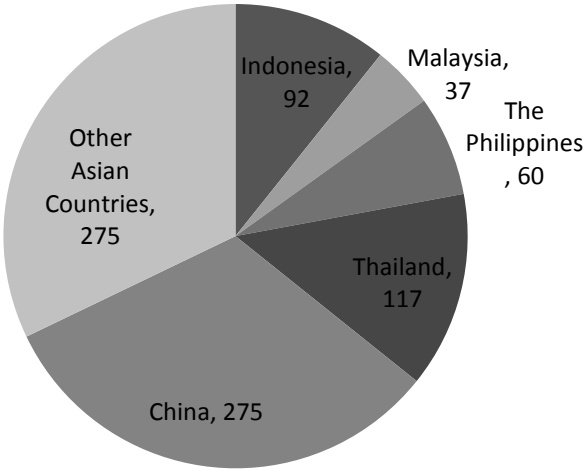


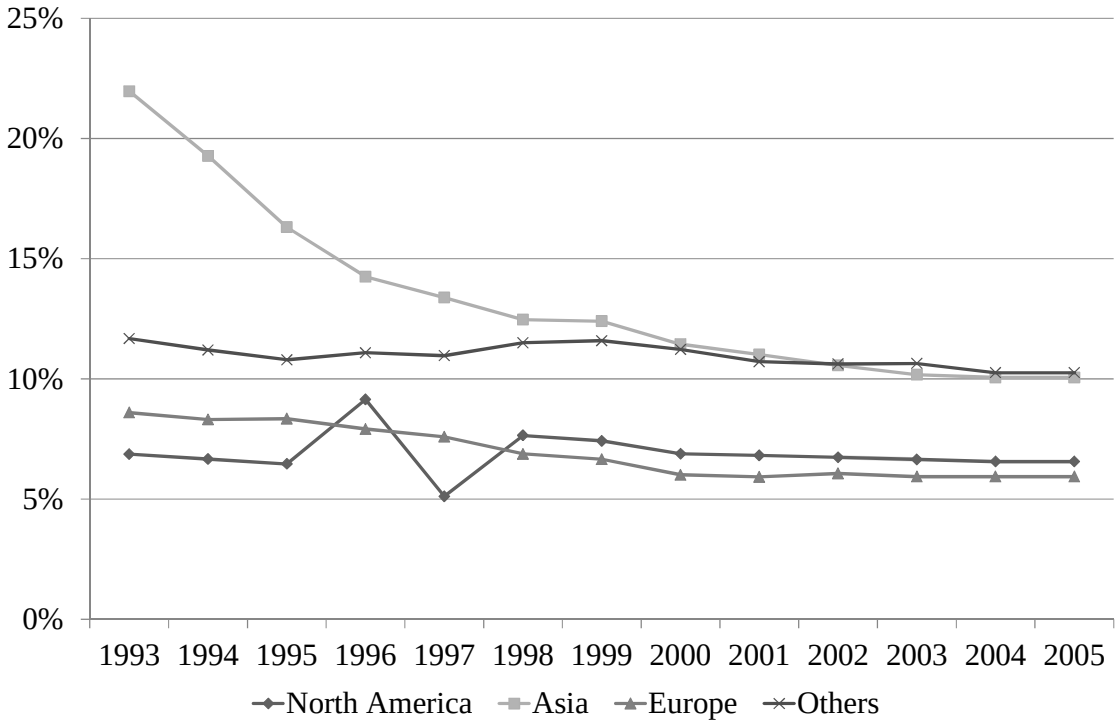
Figure 5: Share of the Number of Japanese Overseas Affiliates by New Investors in Asia



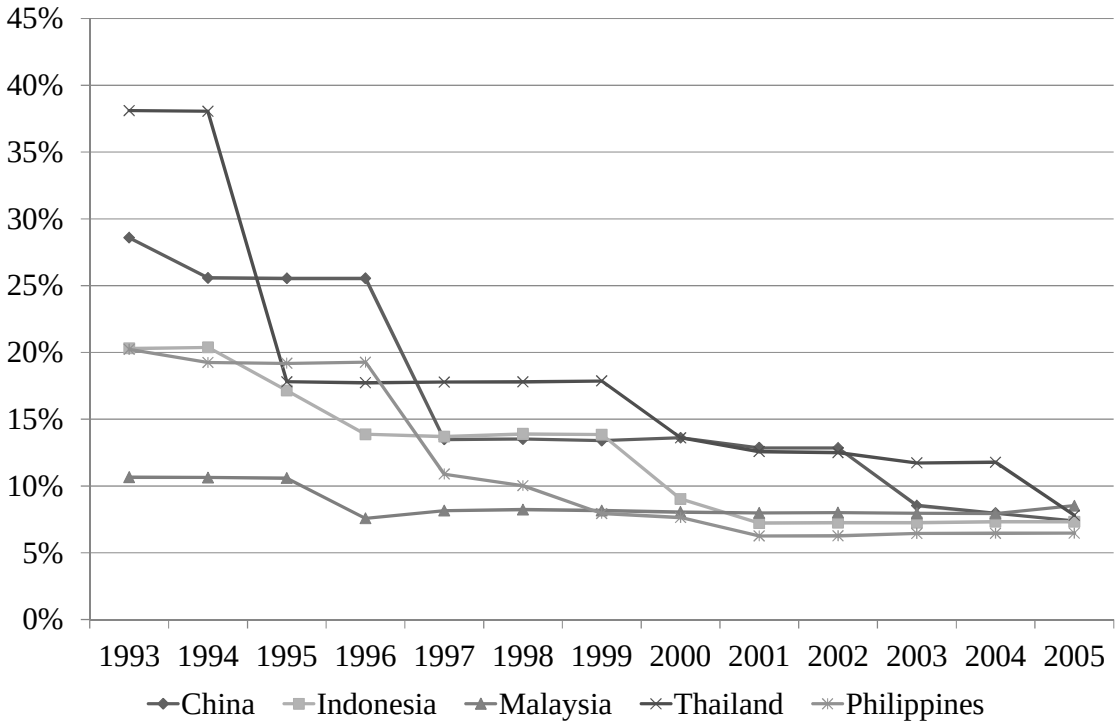
Source: Survey of Overseas Business Activities.

Figure 6: Changes in Tariff Rates by Region and Country

Panel (a)



Panel (b)



Source: The World Integrated Trade Solutions.

Figure 7: Effects of Tariff Reduction on Productivity Cutoff

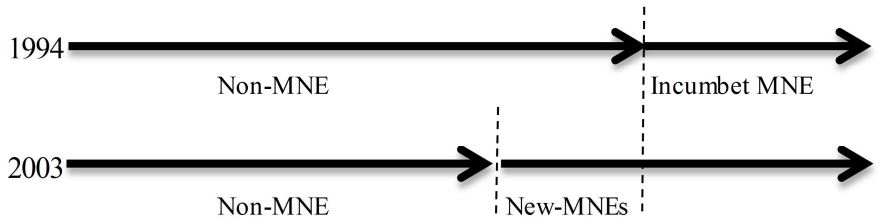


Figure A1: Relationship between S_1^V and S_1^D: Role of a

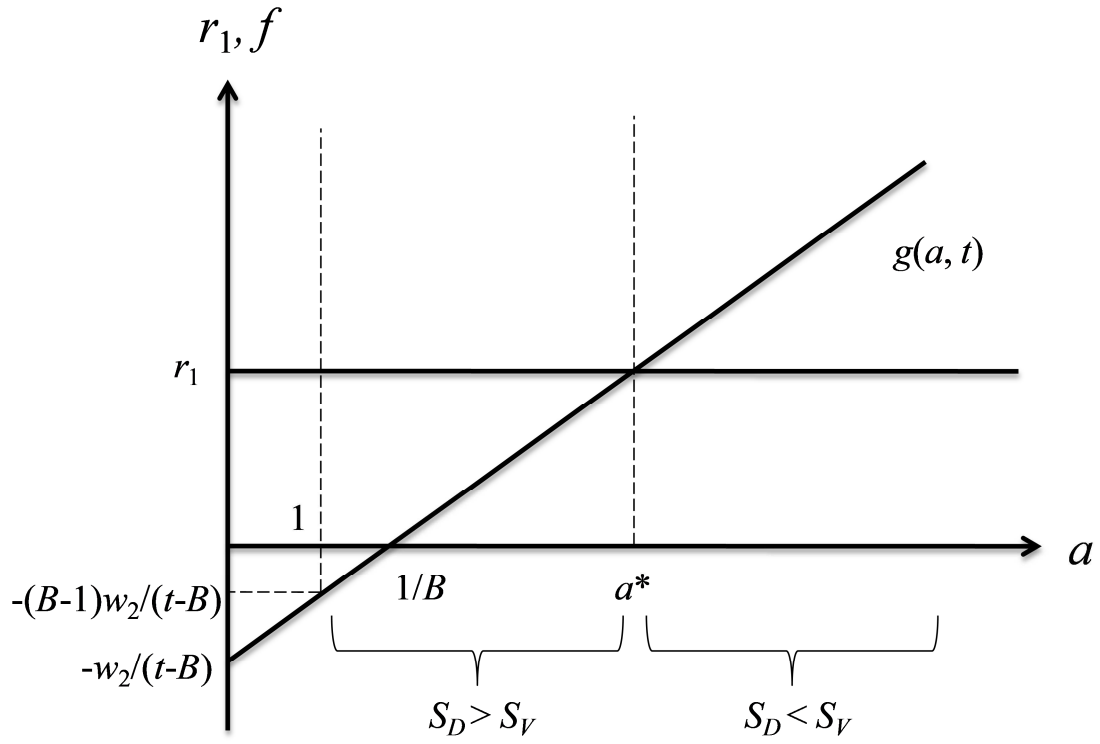


Figure A2: Relationship between S_1^V and S_1^D: Role of t

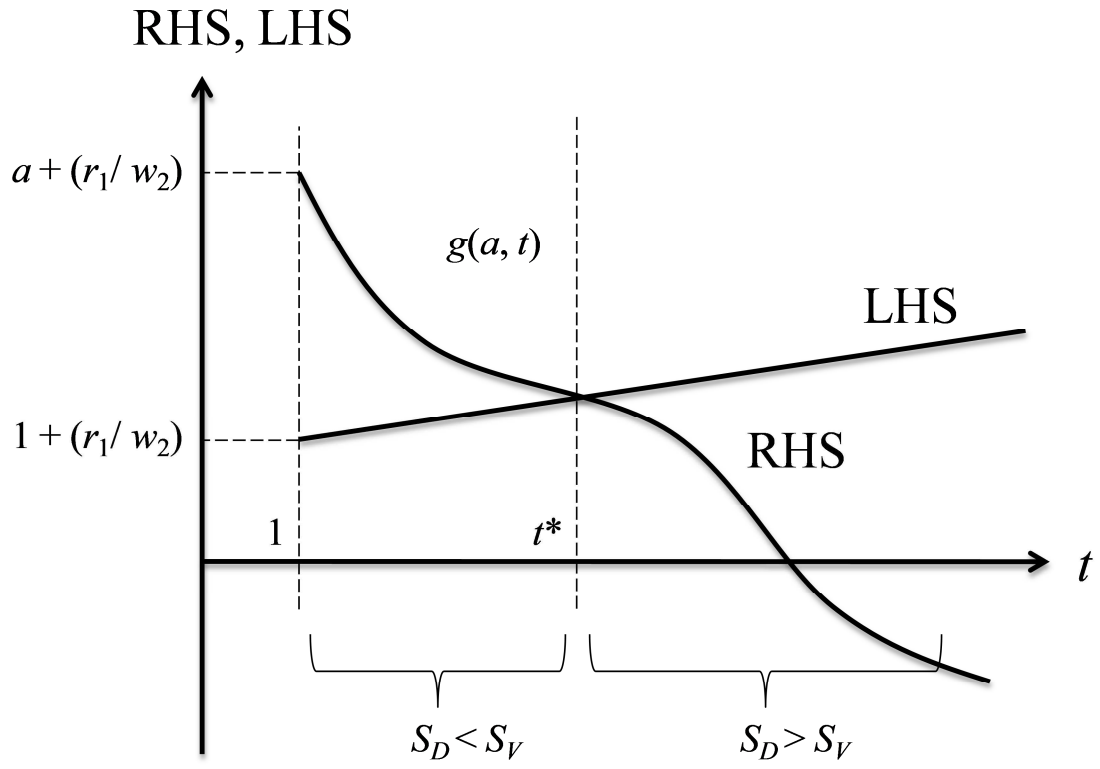


Figure A3: Relationship between S_1^H and S_1^D: Role of *a* and *b*

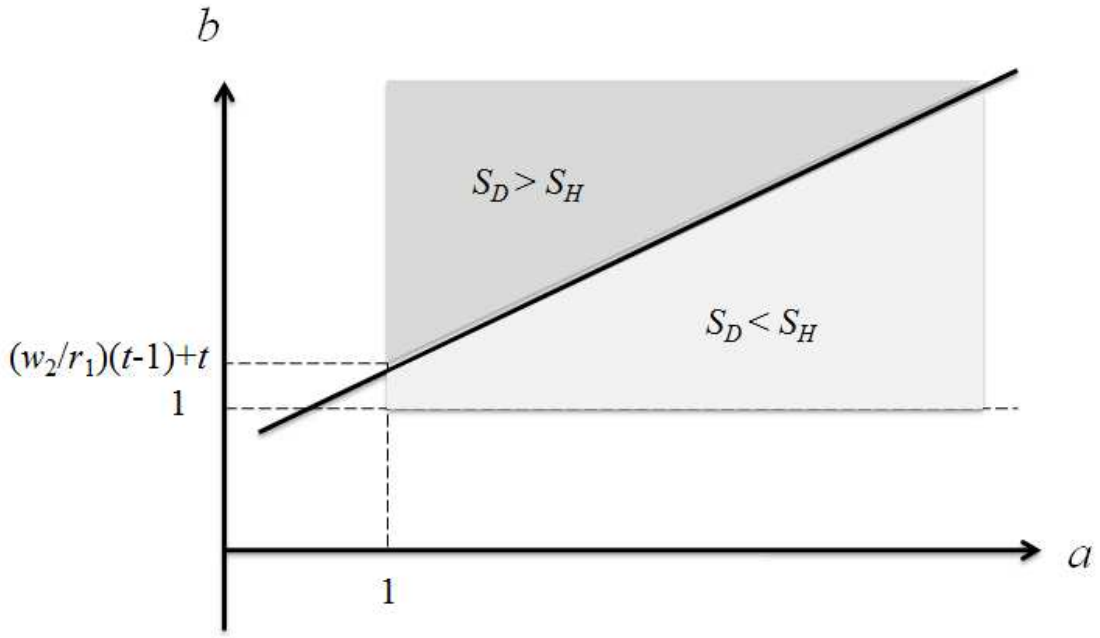


Figure A4: Relationship between S_1^V, S_1^H, and S_1^D: Role of *a* and *b*

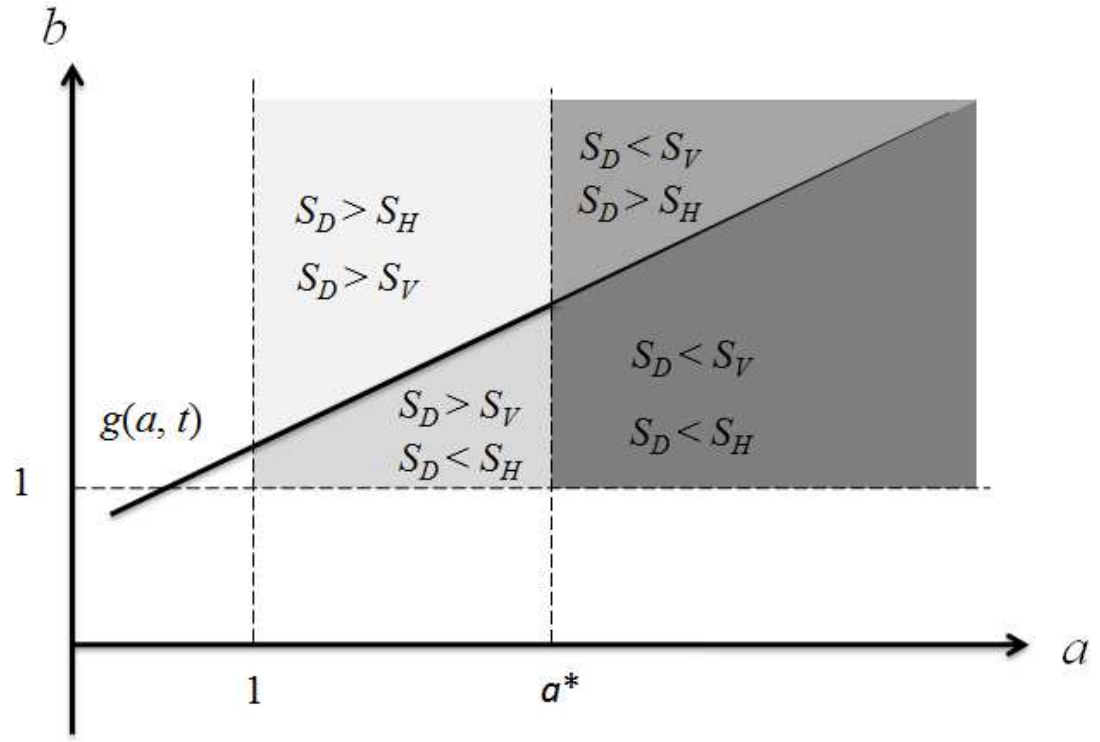


Figure A5: Marginal Effects for the Interaction Terms at Different Level of Changes in Tariff Rates for the Logit Model (Corresponding to Model (3) in Table 5)

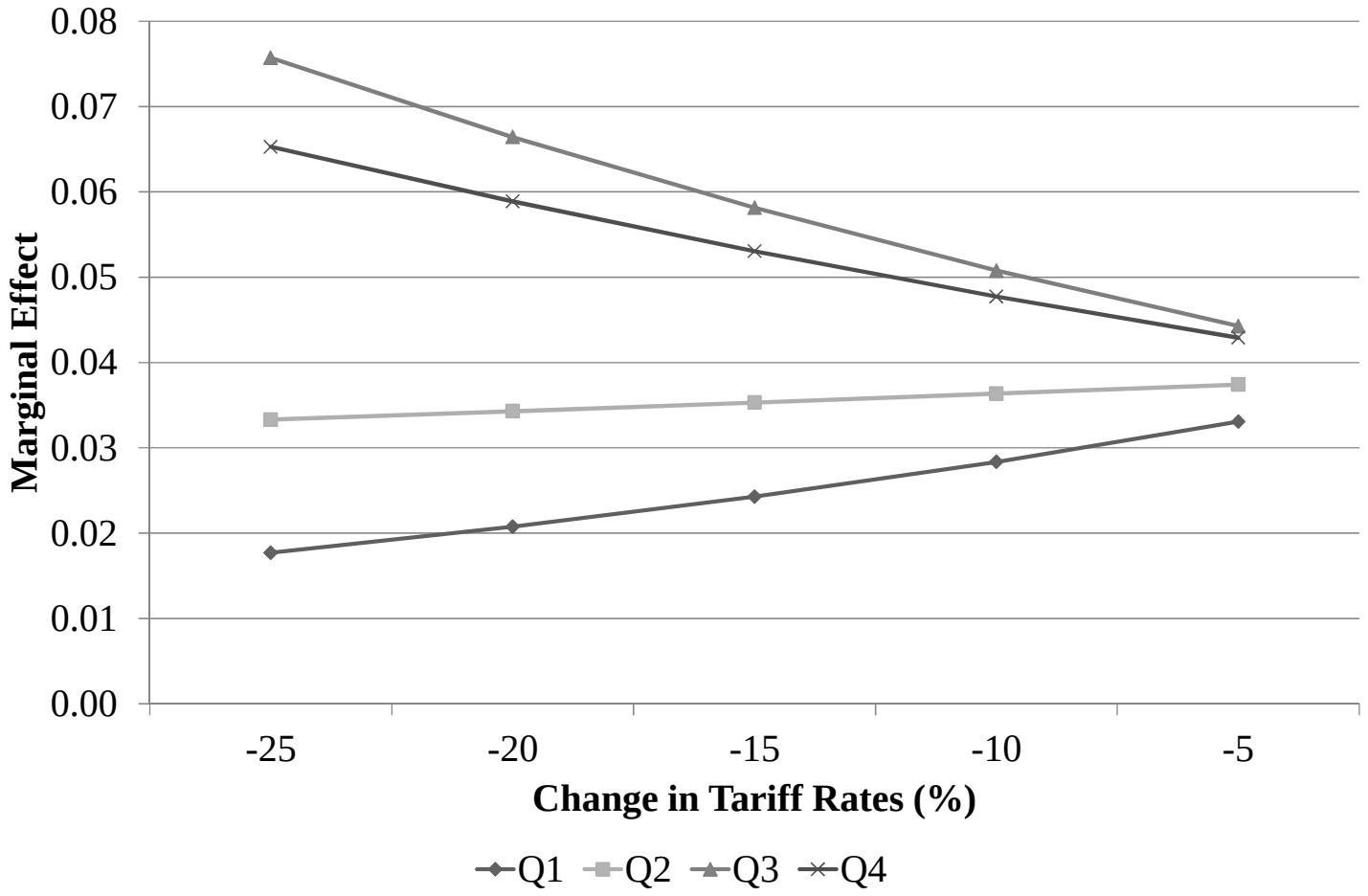
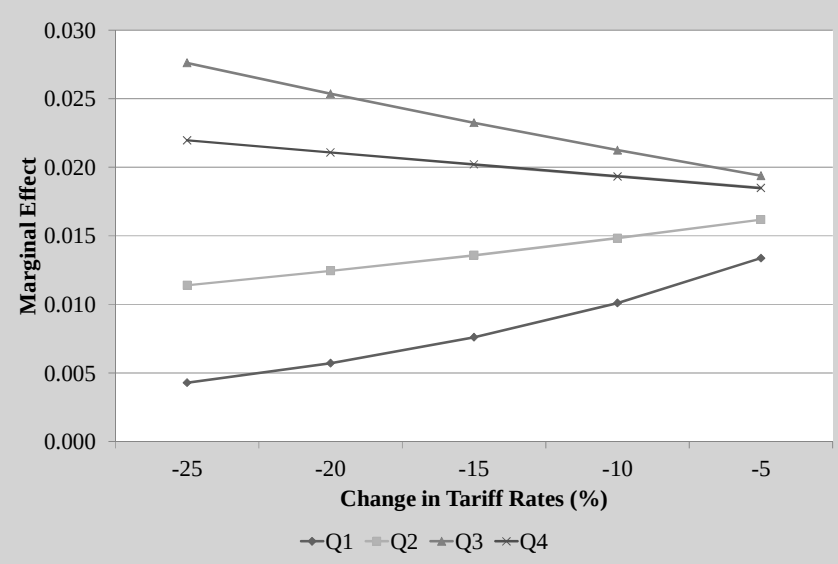


Figure A6: Marginal Effects for the Interaction Terms at Different Change Levels in Tariff Rates in the Multinomial Logit Model (Corresponding to Model (1) in Table 6)

Panel (a) HFDI



Panel (b) VFDI