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FTA and Export Platform Foreign Direct Investment: Evidence from Japanese firm level data

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Abstract

This paper examines the choice of foreign direct investment (FDI) among four types—traditional horizontal FDI, traditional vertical FDI, export-platform horizontal FDI, and export-platform vertical FDI—focusing in particular on the recent phenomena of the export-platform type FDI. The theoretical discussion shows a prediction of the effect of free trade agreements (FTAs) on the FDI type chosen. The empirical discussion provides descriptive statistics which point to the growing importance of export-platform type FDI. It then shows supportive evidence for the model's prediction, using Japan's firm-level FDI data. More specifically, it is shown that regional trade agreements (RTAs), such as the Association of Southeast Asian Nations (ASEAN) or the North America Free Trade Agreement (NAFTA), drives horizontal export-platform-type FDI, whereas bilateral FTAs (Japan's economic partnership agreement in the context of the data used in this paper) in some cases induce vertical export-platform type FDI. The findings suggest some policy implications for FDI recipient countries. First, the obvious positive effect of an RTA on horizontal export-platform type FDI is an encouraging finding for countries forming them in that it leads to a reduction in production costs and a concomitant rise in production/consumption. Even more importantly, the finding is a testament to a rarely mentioned benefit of smaller countries joining RTAs. Second, the positive effect of a bilateral FTA between Japan and Malaysia on the vertical export-platform type FDI is also reassuring in the same reason of cost reduction and production/consumption increase.

Keywords: Export-platform FDI, Free trade agreement, Firm level data, Japan

JEL classification: F12, F21, F23

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1. INTRODUCTION

As production stage fragmentation (Jones and Kierzkowski (2001), Ando and Kimura (2005)), off-shoring (Blinder (2006)) or the 2nd unbundling (Baldwin (2011)) deepens, modes of foreign direct investment (FDI) have become more complex than they were decades ago. A prominent example of such complex FDI is the export-platform type FDI. This type of investment occurs where a firm sets up a plant in one foreign country to supply not only the local market but also the host country's neighbouring markets. An example is Toyota, which has its Asian regional centre in Indonesia, supplies the local Indonesian market, and exports to neighbouring countries.

Figure 1 shows the ratio of exports to third countries over the total sales of Japanese FDI[1], in the top 20 Japanese FDI host countries, in 1995 and 2006. The countries are ordered according to the rank of Japanese FDI's total sales amounts. In 2006, out of the 20 countries, the ratio exceeds 20% for 19 of these countries. The United States is the only exception, which is not surprising given the huge size of its domestic market. Hence, the export-platform type FDI is a major type of FDI. Looking more closely, Belgium shows the highest ratio at about 75%. EU countries, such as the UK, Germany, and Spain, have ratios of more than 40%. In Asia, Hong Kong and Singapore show high ratios. The lowest ratios are for the US, China, and Australia. In general, small- to medium-sized countries, which have similar incomes, seem to have high ratios, whereas countries with larger markets, such the US and China, and countries that do not have neighbouring countries of a similar income level, such as Australia, are likely to have lower ratios. Another notable finding is that from 1995 to 2006, the ratio increased in 16 of the 20 countries. Given this evidence of the ever-growing importance of the export-platform type FDI, there is a need to study this type of FDI, both theoretically and empirically. From a policy point of view, it is of utmost interest for an FDI recipient country to understand the impact of both bilateral and regional FTAs on the FDI types, now that joining a supply chain is considered highly important for economic growth. To conduct such an analysis, we use Japanese

[1] We define the third country exports as the third country sales amount divided by the total sales amount.

firm-level FDI data. Having only Japan as an FDI home country is admittedly a limitation of this paper's analysis. However, given the limited availability of firm-level FDI data, we have completed an analysis using Japanese data only.

Drawing on the same author's previous theoretical work, this paper first shows that a reduction in intra-regional trade costs induces firms to choose the export-platform FDI (either horizontal or vertical), and that a reduction in both intra- and inter-regional trade costs induces firms to opt for the vertical export-platform FDI. Using Japan's outward FDI data, the empirical part of this paper shows that a decrease in intra-regional costs through regional trade agreements such as the EU, NAFTA, and ASEAN seems to have driven the horizontal export-platform FDI, whereas a decrease in inter-regional trade costs through Japan's Economic Partnership Agreement (EPA), that is, Japan's FTA, had a positive effect on the vertical export-platform FDI in some cases.

Literature

The conventional binary categorization of FDI into horizontal and vertical FDI is attributed to Helpman and Krugman (1985). Horizontal FDI is a substitute for trade in the conventional mode of FDI (Markusen (2002)); however, Bergstrand and Egger (2007) construct a model where horizontal FDI coexists with trade between identical countries. Yeaple (2003) constructs a model where a firm may engage both in horizontal and vertical FDI, for a medium range of trade costs.

Motta and Norman (1996) is presumably the first theoretical work on the export-platform type FDI. By constructing an oligopoly model of one-stage (final-product) production, they succeeded in explaining why a significant amount of FDI takes place between countries within regional trading blocs. Ekholm et al. (2007) also explains this by constructing a partial equilibrium oligopoly model that consists of two production stages (intermediate and final-product) and in which the export-platform FDI is driven by a trade-off between the lower production costs of the South and trade costs. The empirical part of their paper shows that US firms in Europe have higher shares of third-country exports when compared with those of US firms in other regions. Although all of the above models assume identical firms, Grossman et al. (2006)—motivated by the observation that various modes of supply coexist within the same industry (Hanson et al. (2001) and Feinberg and Keane (2003))—develops a model wherein firms face a richer array of modes of supply, by allowing for firm heterogeneity and by incorporating several types of complementarities, first pointed out by Yeaple (2003). Neary (2009) develops a model based on the "proximity–concentration" trade-off. Mrázová and Neary (2010) constructs a general model of how a firm will choose to serve a group of foreign markets through exports or FDI, and how many foreign plants it will want to establish, using the super-modularity concept. Similar to Mrázová and Neary (2010) in its question, Ito (2012) constructs a model in which a multinational enterprise (MNE) determines the spatial extension of operations (number of FDI destinations) and the intensity of production (volume of sales), in which the export-platform type FDI emerges. Ito (2013), on which this paper draws for its theoretical prediction, constructs a model that nests five types of supply modes, that is, export, the conventional horizontal FDI, the conventional vertical FDI, the horizontal export-platform FDI, and the vertical export-platform FDI. Baldwin and Okubo (2012) proposes a new method to organize the FDI types, i.e., by looking at sales and sourcing patterns of FDI affiliates. They show that the majority of FDIs do not fit neatly into the existing categorization.

The contribution of this paper is on two fronts. First, it shows a theoretical prediction on the effects of FTA's on the various types of FDI. Second, utilizing unique information found in Japan's confidential firm-level FDI data, it categorizes FDI into four types: the conventional horizontal FDI, the conventional vertical FDI, the horizontal export-platform FDI, and the vertical export-platform FDI, which has not been previously done in the literature. This paper then applies its theoretical framework on the choice of these modes of supply.

Plan of the paper

Section 2 explains the model. Section 3 explains the data, the estimation equation and the results. The final section concludes.

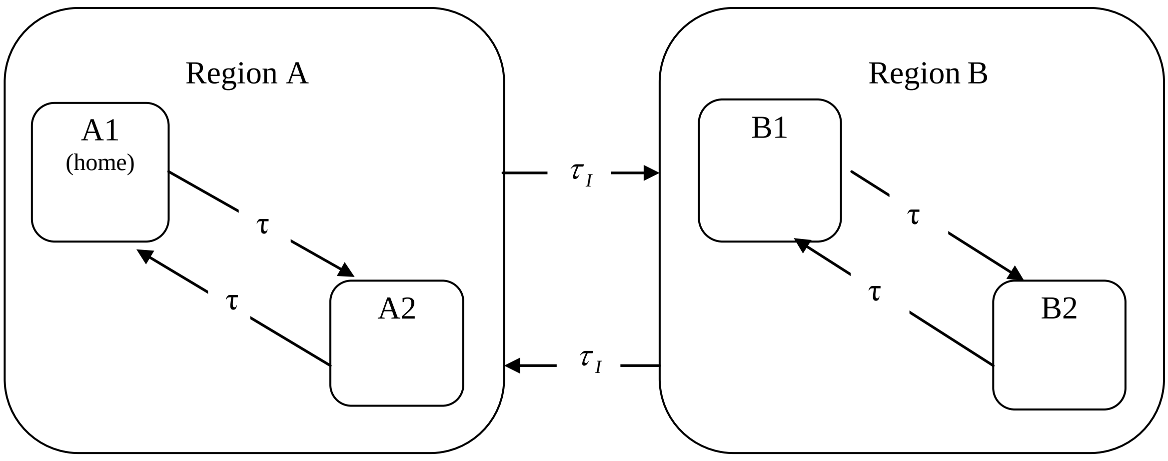
2. MODEL

This section draws on Ito (2013) for the model that structures our empirical exercise below. In essence, it is a two-region, two-country, identical firm, partial equilibrium model, with the key mechanism of the trade-off between stage-fragmentation (unbundling) costs and lower trade costs for intermediates and the usual proximity-concentration trade-off.

Countries and modes of supply

There are two regions: Region A and Region B, each of which consist of two countries. The production process has two stages: components and assembly. Firms can decompose these two stages of components and assembly, but decomposition incurs an additional cost, which we call the "decomposition cost." The usual "Iceberg trade costs" are assumed for the transportation costs of the component and/or the assembly. Namely, to deliver one unit of good from one country to the other within a region, $1+t$ units are to be shipped out. We denote $1+t \equiv \tau$ (Iceberg trade cost). The interregional transportation of one unit between two regions requires $1+t_I \equiv \tau_I$ to be shipped out.

<u>Two regions and two countries in each region</u>



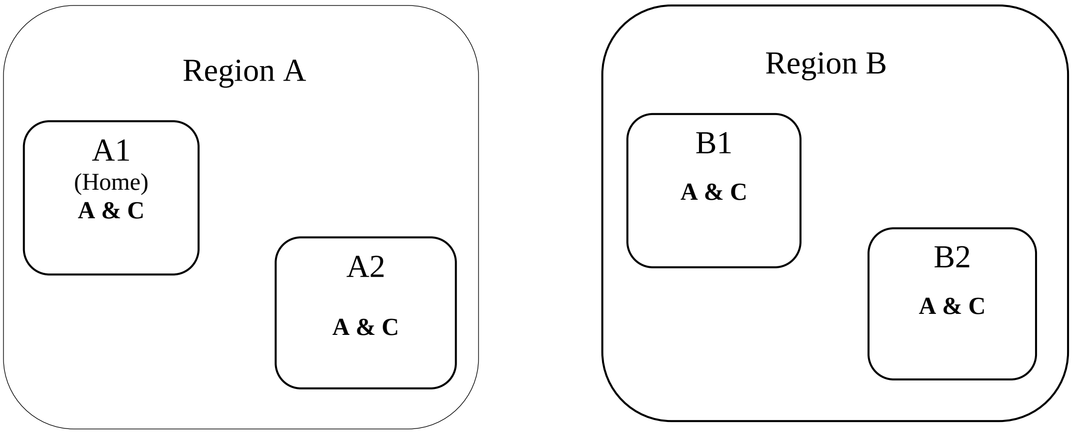
The black arrows represent the iceberg trade cost within regions, τ , and the iceberg trade cost between regions, τ_I .

Firms choose a mode of supply from four types. Ito (2013) includes exports as the mode of supply. This paper does not consider exports as a choice of supply modes, however, because the firm-level data used in this paper do not contain information on parent firms' export activities and because

Japanese law inhibits the disclosure of customs data, preventing one from obtaining data related to firm-level export activities.

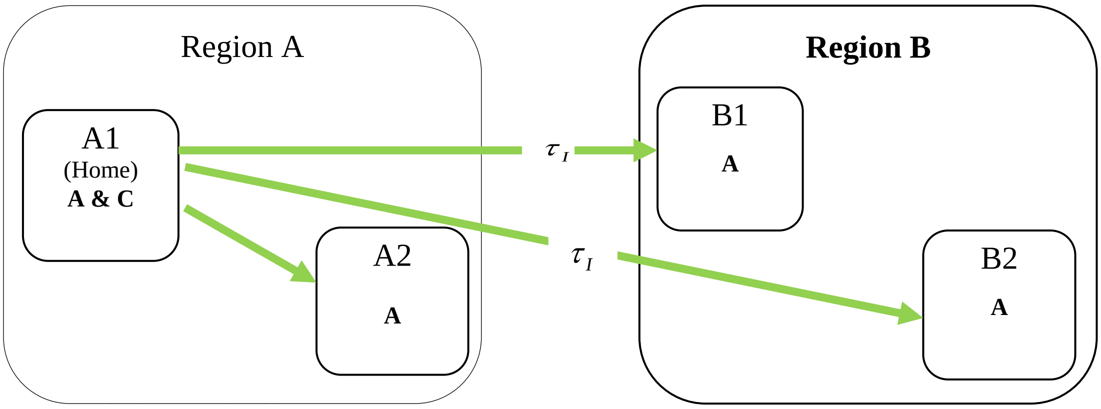
Modes of supply

1. Conventional horizontal type (H-type): Firms have a set of a component plant and an assembly plant in the home country, and another set in the other country within the home region and in the two nations of the other continent.



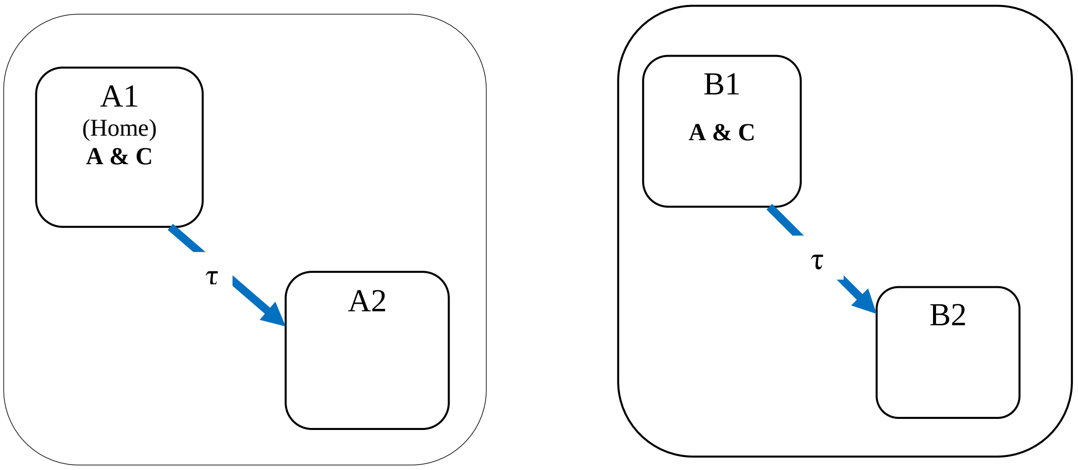
A & C indicate where the assembly plants and the component plants are located. There is no flow of assembled goods (final goods) because production and assembly of components are both done in each country.

2. Conventional vertical type (V-type): Firms have a component plant in their home country and have an assembly plant in each of the four countries.



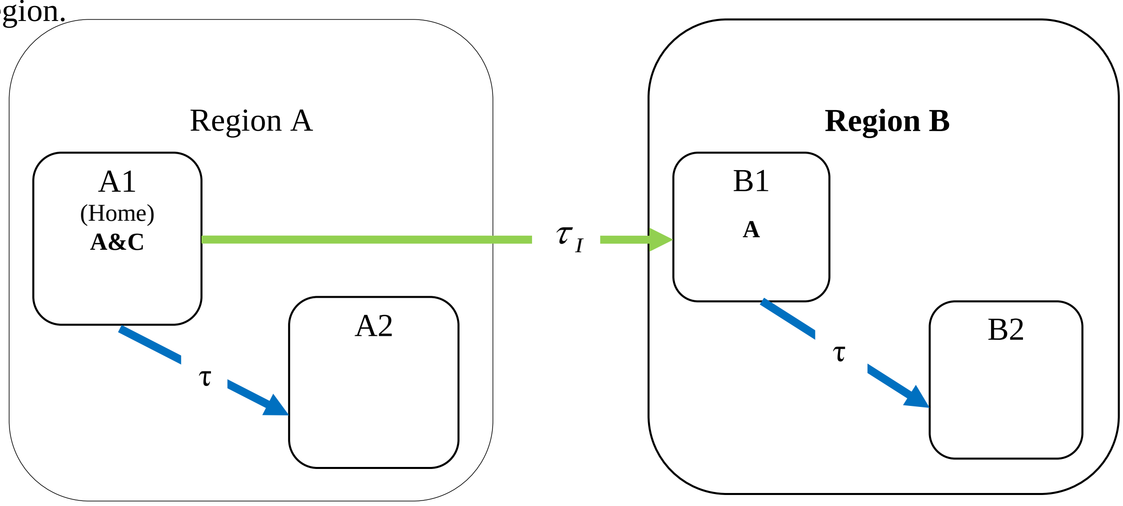
The green coloured arrows represent the flow of components.

3. Hxp (horizontal export platform) type: Firms have a component plant and an assembly plant in their home country to supply both it and the other country in its own region. Firms also have a set of component and assembly plants in one of the symmetric countries on the other continent to supply both countries on the other continent.



The blue coloured arrows represent the flow of assembled goods (final goods).

4. Vxp (vertical export platform): Firms have a set of component and assembly plants at home to supply the home country and the other country in its own region. For the other region, they have an assembly plant in one of the symmetric countries in the region to supply both countries in the foreign region.



Operating Profit, Fixed Costs, and Profits

We describe only the summary of the model structure and relegate some details to the appendix.

The operating profit of firm k in county j is expressed as

$$\pi_j^k = s_j^k E_j \big/ \varepsilon\left[s_j^k\right] \quad (1)$$

where E_j represents the market size of country j, $s_j^k \equiv p_j^k q_j^k \big/ E_j$ represents the firm's market share (p and q represent price and quantity, respectively), and $\varepsilon_j^k = \varepsilon\left[s_j^k\right]$ represents each firm's perceived elasticity of demand, which depends only on the firm's market share. The derivation of equation (1) is in the appendix.

Any type of firm pays H (the firm specific fixed cost, or the headquarters cost). To produce the good, they incur F (the plant specific fixed cost), which is comprised of the component plant fixed cost Fc, and the assembly plant fixed cost Fa. The firms can decompose these two stages of component and assembly by paying D (the decomposition cost). The fixed costs for each mode of supply are as follows:

1. H-type: $\underbrace{H}_{\text{Firm specific fixed cost}} + \underbrace{4\,(Fc + Fa)}_{\text{Sum of plant specific fixed costs in 4 countries}}$

2. V-type: $\underbrace{H}_{\text{Firm specific fixed cost}} + \underbrace{Fc + Fa}_{\text{Plant specific fixed costs in the home country}} + \underbrace{3\,(Fa + D)}_{\text{Assembly plant fixed cost at N2, E1 and E2}}$

3. Hxp-type: $\underbrace{H} + \underbrace{Fc + Fa} + \underbrace{Fc + Fa}$

Firm specific   Plant specific fixed   Plant specific fixed

fixed cost   cost in the home country   cost in a country (eg. E1) of the foreign region

4. Vxp-type: H + Fc + Fa + Fa + D

Firm specific   Plant specific fixed   Plant specific fixed

fixed cost   cost in the home country   cost in a country (eg. E1) of the foreign region

To keep the model as parsimonious as possible, the four countries are assumed to have identical market sizes, and all firms to have identical marginal costs and to face identical fixed costs. Namely, multinationals producing in country j have exactly the same market share as domestic firms. Imported goods have smaller market shares because of trade costs τ and τ_I. Using ϕ, the freeness of trade (Baldwin et al. (2003)), which makes algebraic manipulation much easier than iceberg trade costs τ [2], the market share in country j of a supplier from country i is defined as $s_j\phi_i$. We can think of ϕ as a parameter that implicitly reflects the difference in both trade costs and marginal costs between Region A and Region B, as in Navaretti and Venables (2004), on which the present model is based. Thus, the model also embodies the possibility of a marginal cost difference. Namely, it applies to the North–North FDI choice, the North–South FDI, and the South–South FDI choice. As is shown in the Appendix, however, to explicitly incorporate the marginal cost difference makes the algebra unnecessarily complicated without illuminating the role of the trade cost reduction typically caused by an FTA, which is the focus of this paper. Therefore, we assume away the marginal costs difference because the focus of this paper is the effect of trade cost reduction typically caused by an FTA and not the marginal cost difference. We also do so because incorporating the marginal costs difference does nothing more than magnify the possibility of the vertical type FDI quantitatively, that is, it does not

[2] To be precise, $\phi \equiv \tau^{1-\sigma}$, where σ is the parameter of the constant elasticity of substitution in the CES utility function, i.e., $U = \left(\sum_{i=1}^{N} (C_i)^{1-1/\sigma} \right)^{1/(1-1/\sigma)}$

change the qualitative nature of this paper's analysis. Because of the symmetry assumption for countries and firms, as mentioned above, firms choosing each mode of supply yield profits, as below.[3]

$$\Pi^{H} = SE/\sigma + SE/\sigma + SE/\sigma + SE/\sigma - (H + 4(Fc + Fa)) \tag{2}$$

$$\Pi^{V} = SE/\sigma + S\phi^{c}E/\sigma + S\phi_{I}^{c}E/\sigma + S\phi_{I}^{c}E/\sigma - (H + Fc + Fa + 3(Fa + D)) \tag{3}$$

$$\Pi^{Hxp} = SE/\sigma + S\phi^{a}E/\sigma + SE/\sigma + S\phi^{a}E/\sigma - (H + Fc + Fa + Fc + Fa) \tag{4}$$

$$\Pi^{Vxp} = SE/\sigma + S\phi^{a}E/\sigma + S\phi_{I}^{c}E/\sigma + S\phi_{I}^{c}\phi^{a}E/\sigma - (H + Fc + Fa + Fa + D) \tag{5}$$

where S, E and σ represent the market share, the market size and the firm's perceived elasticity of demand. Due to the symmetry assumption, there is neither a subscript nor a superscript on S and E. The firm's perceived elasticity of demand, ε_{j}^{k} does not need a superscript or subscript. We change the term to σ in order to link it to the constant elasticity of the CES utility function (See footnote 2). The first term of each equation stands for the operating profit the firm earns in its home market (A1 in the above figure). The second term represents the operating profit in the other country within the same region (A2 in the above figure). The third term is the operating profit in one of the two countries in the foreign region (B1 in the above figure). The fourth term is the operating profit earned in the other country in the foreign region (B2 in the above figure). To be brief, the difference in profits between firms comes from the difference in market shares, which is affected by the freeness of trade ϕ and the difference in fixed costs. For example, in equation (5), the firm's share in the home country is S, while it is $S\phi^{a}$ in the neighbouring country. The market share is "eroded" by ϕ^{a} because of the trade cost associated with the transport of the assembly from A1 to A2. In B1, the market share is $S\phi_{I}^{c}$ because the components are to be transported to B1 from A1. Finally in B2, the share becomes $S\phi_{I}^{c}\phi^{a}$ because the full market share S, which firms could enjoy if they produced their goods within

[3] The profits described here can be interpreted as a simplified version of the present discount value of the current and future profits, as in the various literature including Navaretti and Venables (2004).

the market country, is first "eroded" by ϕ_I^c, the transport of the components from A1 to B1 and then by ϕ^a, the transport of the assembly from B1 to B2.[4]

Assuming monopolistic competition, free entry drives profits to zero. Then, the boundary conditions between each mode of supply can be derived from the above profit equations from (2) to (5). Because of the zero-profit condition, a particular mode of supply is the equilibrium choice when it yields zero profits, while the other mode of supply yields negative profits. The boundary conditions of all pairs of modes of supply are summarized in Table 1.[5] The derivation process is presented in the appendix.

Numerical solutions

We assume that iceberg trade costs differ between components and assembly. Whereas 1+t units need to be shipped out to deliver 1 unit of assembled products, 1+αt units need to be shipped out to deliver 1 unit of components, with the assumption of 0<α<1, that is, the iceberg trade cost of components is cheaper than that of the assembled products. We adopt this assumption because, in this symmetric model, firms' choices between the horizontal types and the vertical types come from the trade-off between decomposition (or unbundling) costs and the lower trade cost of components. Thus, unless 0<α<1, decomposition never pays off. So, $\phi^c > \phi^a$, $\phi_I^c > \phi_I^a$. Moreover, this assumption sounds reasonable because freight for components is generally considered to be cheaper than that for assembled goods. It is also widely known that tariffs are generally lower for intermediate goods than for final goods (Olsen's asymmetry). Because of the simultaneous inequality conditions, closed form solutions cannot be obtained. Thus, we resort to numerical solutions. We draw a picture of modes of supply in the region of freeness of trade to obtain a testable hypothesis on the relationship between the freeness of trade and modes of supply. The area of H-type is the one that simultaneously solves the boundary conditions concerned with the H-type ((A6), (A7), (A8) in the appendix). The area for each

[4] Derivation of the "erosion effects", such as $S\phi_I^c$ and $S\phi_I^c\phi^a$, is in the appendix.

[5] Note that the model here analyses the choice of FDI types for new affiliates, i.e., it does not consider a switch of FDI types of existing affiliates. (e.g., a switch from V-type to Hxp-type of an already existing affiliate)

mode of supply is delineated by the simultaneous inequality conditions derived in the Appendix. There are four types of freeness of trade in our model, $\phi^a, \phi^c, \phi_I^a, \phi_I^c$. To yield the figures in two dimensions, we assume $\phi^a = \rho\phi^c, \phi_I^a = \rho\phi_I^c; 0 < \rho < 1$.

Figure 2 is a numerical solution for one set of parameters. This is the case where all four modes of supply are within the choice set. Obviously, depending on the parameter values, the picture changes. For example, when ρ takes a high number (e.g., 0.8), neither v-type nor Vxp-type is within the choice set because the merit of transporting the components instead of the assembly is small. As long as the parameter values are within the range that yields all the four modes of supply, the figure's qualitative feature does not change, depending on the parameter values, although the size of area for each mode of supply does change.

At a high ϕ^a and a low ϕ_I^a, such as A in Figure 2, the inter-regional trade cost is high (low ϕ_I^a (inter-regional freeness of trade)) and the intra-regional trade cost is low (high ϕ^a (intra-regional freeness of trade)). Thus, it is optimal for firms to avoid transportation between regions but to make use of the low trade costs within a region. Thus, the horizontal export-platform FDI is the optimal choice. Meanwhile, consider a point such as B in Figure 2, with a high ϕ^a and a high ϕ_I^a. A high ϕ_I^a is associated with a high ϕ_I^c by the parameter ρ, which takes a value between 0 and 1. Thus, with a sufficiently low value of ρ (in the case of Figure 2, it is 0.5), it pays for firms to decompose the production process and transport components across regions. Thus, the optimal choice is the vertical export-platform FDI.

3. Empirical Framework

This section first introduces our main sources of the Japanese firm-level FDI data. Then we show some descriptive statistics, specify the estimation equations and show the results.

3.1. Kaigai Jigyo Katsudou Kihon Chosa (The Survey on Overseas Business Activities)

This paper uses microdata pertaining to Kaigai Jigyo Katsudou Kihon Chosa (the Survey of Overseas Business Activities) , henceforth the METI survey, conducted by Ministry of Economy, Trade and Industry. The METI survey has been conducted annually, since 1995, by a questionnaire sent to parent companies in Japan with more than 50 employees and with paid-in-capital of more than 30 million yen for its parent firm’s activities and those of its overseas affiliates. It covers all foreign affiliates of Japanese firms for which the parent firms’ equity share is greater than or equal to 10%, for both manufacturing and non-manufacturing sectors. In addition to some basic information on the parent firm and each affiliate, such as paid-in-capital, total sales values, number of employees, establishment year, etc., the data decompose the total sales values into local sales values, sales to Japan, and sales to third countries. They also include information on the task division, which helps us categorize the FDI into vertical or horizontal types. This study uses the data for the years 1995 to 2010, the most recent year for which data is available.

3.2. Descriptive Analysis

This sub-section first explains how we categorize the affiliates into the four FDI types, and then shows some descriptive statistics for the export-platform type FDI.

Sorting into the four types of FDI

There are two dimensions for categorising FDI into the four types. One is between the horizontal type and the vertical type. The other is the conventional (local-sales oriented) type and the export-platform type. For the first dimension, we can use the information on the task division. Respondent companies are asked to choose among three options: the task division within Japan, the task division within the third countries, and full stage production. The affiliates with task divisions either within Japan or the third countries are defined as the vertical type, whereas the affiliates with full-stage production are defined as the horizontal type. For the second dimension, information on the value of sales to the third countries is used. If there are exports to the third countries, the affiliate is defined as the export-platform type. If not, it is defined as the conventional type. The classification scheme is summarised in Figure 3.

Descriptive statistics of the four types of FDI

Table 2 shows the ratios of the sales amounts to the local market, to the Japanese market, and to the third countries' market. While the share of local market sales is in a decreasing trend and sales to the Japanese market are stable or very slightly declining, the third countries' sales ratio is on an increasing trend. The number of FDI establishments, according to the above categorisation, is shown in Table 3. Take the case of the year 2008,[6] about 3700 firms are of the horizontal type (Hxp-type or H-type), while about 1600 are of the vertical type (Vxp-type or V-type). This substantial presence of the vertical type FDI supports the argument of Baldwin and Okubo (2013), which " would reverse the conclusion suggested in the empirical survey of Blonigen (2005), which stated the following: "It seems clear that vertical motivations are not prevalent in general FDI patterns." In terms of the categorisation between the conventional and the export-platform type FDI, about 2800 are the export-platform type FDI, while 3600 are the conventional type FDI. The export-platform type FDI represents a substantial portion of the total FDI.[7]

3.3. Specification

Since we aim to estimate the effect of the FTA and the other control variables, that is, productivity, year dummies, country dummies, and industry dummies, which are all "case specific" as termed in the econometrics literature (these conditioning variables do not change across alternative FDI choices), we employ the multinomial logit estimation.[8] The estimation equation is

[6] Since the questions for the task division are asked only for 1996 to 2001 and 2008, the most recent year is 2008.

[7] There is a large jump in the numbers from 2000 to 2001. This is most likely caused by a change in the form of the answer from 2000 to 2001. Because of the inconsistent answers for the questionnaires up to 2000, the METI have changed the answer sheet to minimize this. In the computation of the numbers in Table 3, we have deleted all the inconsistent answers. That is why the numbers for 1996–2000 are much smaller than those in 2001 and 2008. We have tried to deduce true answers by analysing the patterns of inconsistent answers, but we have concluded that all attempts are not free from arbitrariness and we should go with the original answers and delete all the inconsistent replies.

[8] For more details, see Wooldridge (2002) or Cameron and Trivedi (2009).

$$P\left(y=l \middle| X\right)=\exp\left(X\beta_l\right)\Big/\left(1+\sum_{h=1}^{L}\exp\left(X\beta_h\right)\right), l=1,\ldots,4$$

where l is the parent firms' choice among the four FDI types, X is the vector of the explanatory variables, and β_l represents the vector of the parameters for the choice l. X includes the regional trade agreement dummies, NAFTA, EU, ASEAN, MERCOSUR, which correspond with an increase in intra-regional freeness of trade, ϕ_I^a, and the bilateral free trade agreement of Japan; the Japan-Singapore EPA (the Economic Partnership Agreement), the Japan-Malaysia EPA, the Japan-Thailand EPA, the Japan-Philippines EPA, and the Japan-Mexico EPA[9], which correspond to an increase in inter-regional freeness of trade, ϕ^a. X also contains value-added per worker, which is included to control the productivity of each affiliate, the year dummies, the country dummies, and the industry dummies.

3.4. Results

Table 5 shows the estimation results with the horizontal FDI as the base (reference), while the results in Table 6 have the horizontal export-platform FDI as the base (reference). As the statistically significant coefficient estimates for the regional trade agreement (ASEAN, NAFTA, EU15, MERCOSUR) in Table 5 show, a reduction in intra-regional trade cost (a left-to-right movement of ϕ^a in Figure 3) increases the probability of firms choosing the Hxp-type compared with those choosing the H-type. As is shown in Table 6, for inter-regional trade cost reduction (a down-to-up movement of ϕ_I^a in Figure 3), which is represented by Japan's EPA dummies (Japan-Singapore, Japan-Malaysia, Japan-Thailand, Japan-Philippines, Japan-Mexico), Japan-Malaysia EPA shows statistically significant coefficient estimates, while the coefficient estimates for the other EPAs are not statistically significant. This insignificant result might have come from somewhat complicated procedures to obtain the certificates of the rules of origin, or it might have come simply from the data availability for only up to 2008 for the information on the task division while most of Japan's EPA

[9] Japan-Indonesia EPA is not included because the period of study (1996-2001, and 2008) does not cover the years after the enactment of the agreement.

came into effect only in 2007.[10] The staging schedule of tariff reduction instead of immediate tariff elimination may have further exacerbated such constraint of the information.

4. CONCLUDING REMARKS

This paper examines the choice of foreign direct investment (FDI) among four types: the traditional horizontal FDI, the traditional vertical FDI, the export-platform horizontal FDI, and the export-platform vertical FDI, with particular focus on the recent phenomena of the export-platform type FDI. The theoretical discussion shows a prediction of the effects of free trade agreements on the choice of FDI type. The empirical discussion provides descriptive statistics that point to a growing importance of the export-platform type FDI. It then uses Japan's firm-level FDI data to show evidence that supports the model's predictions. More specifically, it is shown that regional trade agreements, such as ASEAN or NAFTA, drive horizontal export-platform type FDI, while bilateral FTA, such as Japan's Economic Partnership Agreement in the context of the data this paper uses, induces the vertical export-platform type FDI in some cases. The findings suggest some policy implications for FDI recipient countries. First, the obvious positive effect of a regional trade agreement (RTA) on the horizontal export-platform type FDI is an encouraging finding for countries forming RTAs in that it leads to reduction in production costs and concomitant rise in production/consumption. Even more importantly, the finding is a testament to a rarely mentioned benefit of smaller countries joining RTAs. Second, the positive effect of bilateral FTA between Japan and Malaysia on the vertical export-platform type FDI is also reassuring in the same reason of cost reduction and production/consumption increase. As mentioned above, the statistically insignificant impact of Japan's bilateral FTA with the other countries might have come from somewhat complicated procedures to obtain the certificates of the rules of origin, or have arisen from the limited data availability. A study with the data of a longer time period is a work to be done in the future.

10 Japan-Mexico EPA came into effect in April 2007, Japan-Thailand EPA in September 2007, Japan-Philippines December 2008.

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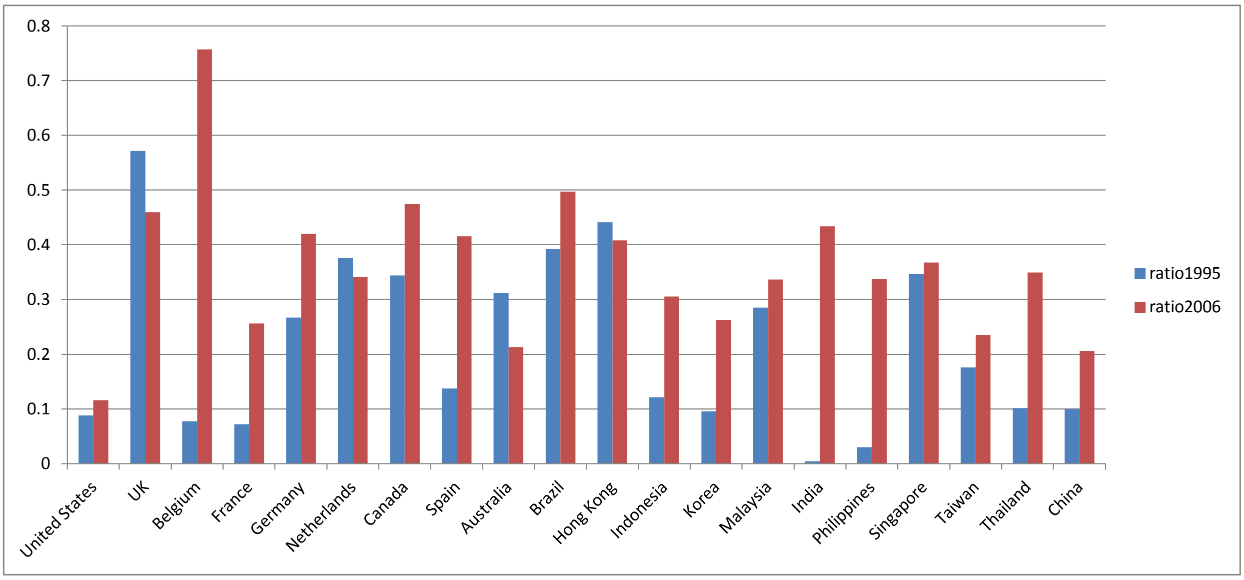
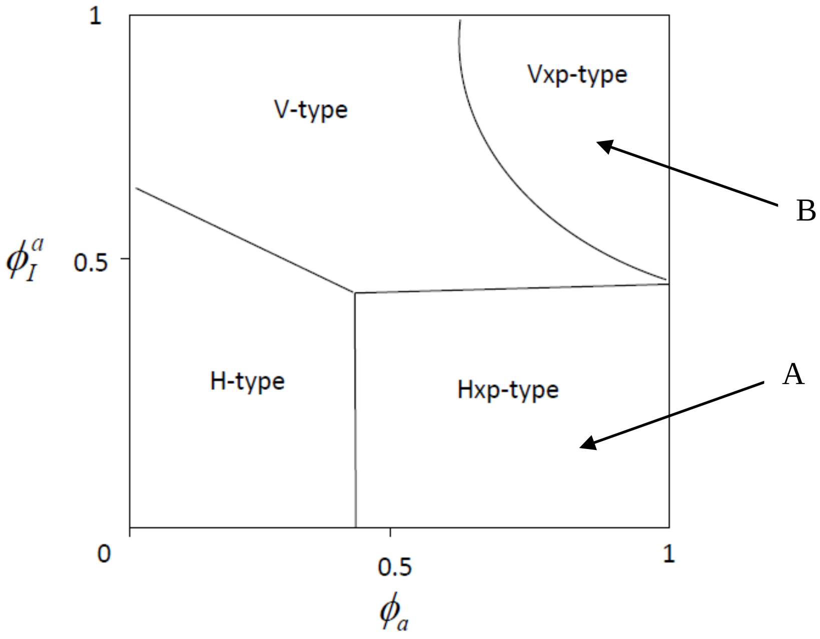
Tables and Figures

Figure 1: Third country export ratios of the Japanese FDI affiliates in top 20 Japanese FDI recipient countries



Source: Author's computation from the METI survey

Figure 2: Modes of supply in the region of inter-regional freeness of trade (ϕ_I^a) and intra-regional freeness of trade (ϕ^a)



Parameter values: H=1, Fa=0.1, Fc=0.2, D=0.1, ρ=0.5

Figure 3: The scheme of the classification for the four types of FDI

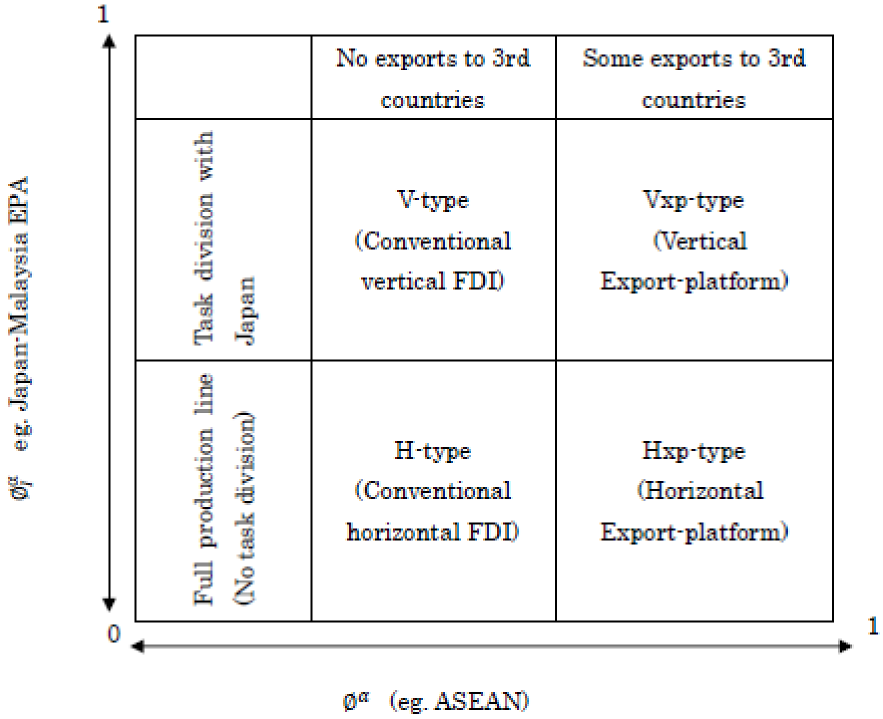
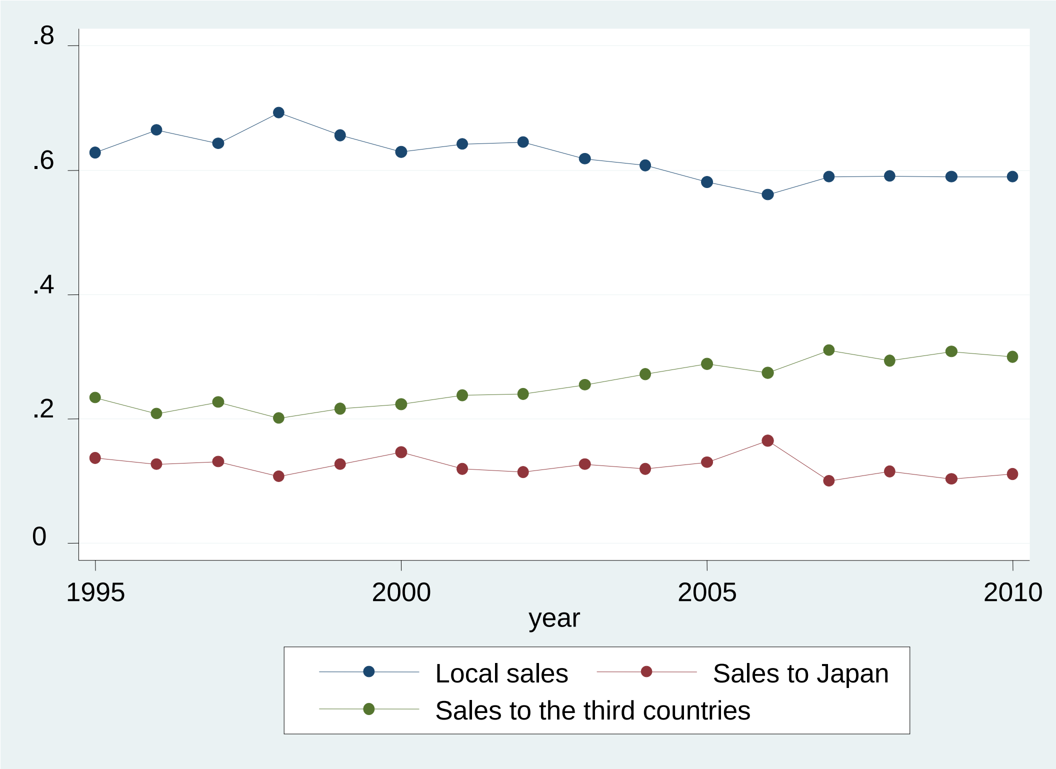


Table 1: Six boundary conditions

	H-type	Hxp-type	V-type	Vxp-type
H-type	NA	$\varphi^{a} < \frac{H}{H+4(Fc+Fa)}$	$\phi^{c} + 2\phi_{I}^{c} < \frac{3(H+4(Fa+D))}{H+4(Fc+Fa)}$	$1+\phi^{a}+\phi_{I}^{c}+\phi_{I}^{c}\phi^{a} < \frac{4\left(H+Fc+Fa+Fa+D\right)}{H+4(Fc+Fa)}$
Hxp-type		NA	$\frac{H+2Fc+2Fa}{2H+2Fc+8Fa+6D} < \frac{1+\phi^{a}}{1+\phi^{c}+2\phi_{I}^{c}}$	$\frac{1+\phi^{a}+\phi_{I}^{c}+\phi_{I}^{c}\phi^{a}}{1+\varphi^{a}} < \frac{2(H+Fc+Fa+Fa+D)}{H+2Fc+2Fa}$
V-type			NA	$\frac{1+\phi^{a}+\phi_{I}^{c}+\phi_{I}^{c}\phi^{a}}{1+\phi^{c}+2\phi_{I}^{c}} < \frac{H+Fc+Fa+Fa+D}{H+Fc+Fa+3(Fa+D)}$
Vxp-type				NA

Table 2: Japanese FDI sales ratios to local, Japan, and the third countries



Source: Author's computation from the METI survey

Table 3: Number of FDI establishments by FDI type

	1996	1997	1998	1999	2000	2001	2008
Hxp–type	287	279	297	288	293	708	2104
Vxp–type	93	101	107	114	99	262	647
H–type	381	386	419	383	369	942	2652
V–type	166	168	140	171	125	374	1002
Total	927	934	963	956	886	2286	6405

Source: Author's computation from the METI survey

Table 4: Number and Ratio of Export-platform type FDI establishments

Year	Export platform	Total	Ratio
1996	380	927	0.410
1997	380	934	0.407
1998	404	963	0.420
1999	402	956	0.421
2000	392	886	0.442
2001	970	2286	0.424
2008	2751	6405	0.430

Table 5: Multinomial logit estimation results (Base (Reference): Horizontal FDI)

Base:	Horizontal		
	Horizontal XP	Vertical	Vertical XP
ASEAN	0.375 **	0.455 *	1.261 ***
NAFTA	0.883 ***	0.062	1.153 ***
EU15	0.825 ***	0.905 **	0.884 **
MERCOSUR	0.317 *	−0.131	−0.122
Japan−Singapore	−0.091	0.116	−0.247
Japan−Malaysia	−0.026	−0.746 **	0.515 *
Japan−Thailand	−0.072	−0.081	−0.039
Japan−Philippines	−0.084	−0.244	0.146
Japan−Mexico	0.086	0.427	−0.139
Log of Value−added per worke	0.179 ***	0.098 ***	0.303 ***
Number of observations		12124	
Prob>chi2		0.0000	
Pseudo R−squared		0.0756	

* p < 0.1, ** p < 0.05, *** p < 0.01□
Coefficient estimates for year dummies, country dummies, industry dummies are not reported for the sake of brevity.

Table 6: Multinomial logit estimation results (Base (Reference): Horizontal Export-platform FDI)

Base:	Horizontal XP		
	Vertical XP	Horizontal	Vertical
ASEAN	0.885 ***	−0.375 **	0.0794
NAFTA	0.269	−0.883 ***	−0.821 *
EU15	0.058	−0.825 ***	0.0802
MERCOSUR	−0.439	−0.318 *	−0.449 *
Japan−Singapore	−0.156	0.0908	0.207
Japan−Malaysia	0.543 *	0.0269	−0.719 **
Japan−Thailand	0.033	0.0727	−0.007
Japan−Philippines	0.23	0.0843	−0.16
Japan−Mexico	−0.226	−0.0869	0.341
Log of Value−added per worke	0.123 ***	−0.18 ***	−0.081 ***
Number of observations		12124	
Prob>chi2		0.0000	
Pseudo R−squared		0.0756	

* p < 0.1, ** p < 0.05, *** p < 0.01□
Coefficient estimates for year dummies, country dummies, industry dummies are not reported for the sake of brevity.

Appendix A:

Operating Profit

Firm k in county j maximizes

$$\pi_j^k = \left(p_j^k - c_j^k \right) q_j^k \tag{A1}$$

where p, c, and q represent price, marginal cost, and quantity, respectively. The first order condition yields the Lerner condition.

$$p_j^k \left(1 - 1 / \varepsilon_j^k \right) = c_j^k \tag{A2}$$

where ε_j^k is the firm's perceived elasticity of demand.

Plugging (A2) into (A1) gives

$$\pi_j^k = p_j^k q_j^k / \varepsilon_j^k \tag{A3}$$

Denoting the firm's market share as $s_j^k \equiv p_j^k q_j^k / E_j$, where E_j is market size of country j, (A3) becomes

$$\pi_j^k = s_j^k E_j / \varepsilon_j^k \tag{A4}$$

Assuming that each firm's perceived elasticity of demand depends only on the market share of the firm, $\varepsilon_j^k = \varepsilon\left[s_j^k \right]$, (A4) becomes

$$\pi_j^k = s_j^k E_j / \varepsilon\left[s_j^k \right] \tag{A5}$$

Derivation of the "erosion" effect

Without τ, we have

$\pi = pq / \varepsilon$

Because of the Dixit–Stiglitz CES utility function, with τ, the equilibrium sales quantity is

$q = \tau^{1-\sigma} p^{-\sigma} \dfrac{E}{P^{1-\sigma}}$

Plugging this into the above operating profit yields,

$$\pi = p \cdot \tau^{1-\sigma} p^{-\sigma} \frac{E}{P^{1-\sigma}} \Big/ \varepsilon$$

With the assumption of identical firms, this becomes

$$\pi = \tau^{1-\sigma} p^{1-\sigma} \frac{E}{P^{1-\sigma}} \Big/ \sigma$$

Since $\frac{p^{1-\sigma}}{P^{1-\sigma}} = \frac{p^{1-\sigma}}{\sum p^{1-\sigma}} = \frac{p^{1-\sigma}}{np^{1-\sigma}} = \frac{1}{n}$ because of identical firms, and also because

$$s \equiv \frac{px}{E}$$

Since $E = npx$ because of identical firms,

$$s = \frac{px}{npx} = \frac{1}{n}$$

Thus,

$$\pi = \tau^{1-\sigma} sE / \sigma$$

Since $\phi \equiv \tau^{1-\sigma}$, $\pi = \phi sE / \sigma$

Assuming the cost function,

$$c = wz$$

where w is wage and z is intermediate inputs.

If we transport final goods, the marginal cost becomes $c = \tau_a (wz)$. And the above derivation applies.

If we transport intermediate goods, the cost becomes $c = \tau_a \left(w(\tau_c z) \right)$.

Due to the multiplicative term, the operating profit becomes $\pi = \phi_a \phi_c sE / \sigma$

Derivation of the boundary conditions

Between H-type and Hxp-type

Because of the zero profit condition, the equilibrium condition of firms choosing n-type instead of m-type is that n-type yields zero profits whereas m-type yields negative profits. Thus, the boundary condition can be found as follows[11]:

[11] The only endogenous variable in the equations is market share S. Hence, we solve the equality condition for S; then by plugging this S into the inequality condition, we can find the boundary condition, which is the relationship among the parameters, ϕ, H, Fc, and Fa.

Solving $\Pi^{m} = SR/\sigma + SR/\sigma + SR/\sigma + SR/\sigma - (H + 4(Fc + Fa)) = 0$ for S, we get

$$S = \frac{\sigma(H + 4(Fc + Fa))}{4R}$$

Plugging this into the inequality condition of Π^{Hxp},

$$\Pi^{Hxp} = \frac{\sigma(H + 4(Fc + Fa))}{4R}\frac{R}{\sigma}2(1+\varphi^{a}) - (H + Fc + Fa + Fc + Fa) < 0$$

$$\Leftrightarrow \phi^{a} < \frac{H}{H + 4(Fc + Fa)} \qquad \text{(A6)}$$

Analogously, the boundary conditions of other pairs of modes of supply are as follows:

Between H-type and V-type

$$\phi^{c} + 2\phi_{I}^{c} < \frac{3(H + 4(Fa + D))}{H + 4(Fc + Fa)} \qquad \text{(A7)}$$

Between H-type and Vxp-type

$$1 + \phi^{a} + \phi_{I}^{c} + \phi_{I}^{c}\phi^{a} < \frac{4\left(H + Fc + Fa + Fa + D\right)}{H + 4(Fc + Fa)} \qquad \text{(A8)}$$

Between V-type and Hxp-type

$$\frac{1 + \phi^{a}}{1 + \phi^{c} + 2\phi_{I}^{c}} < \frac{H + 2Fc + 2Fa}{2H + 2Fc + 8Fa + 6D} \qquad \text{(A9)}$$

Between Hxp-type and Vxp-type

$$\frac{1 + \phi^{a} + \phi_{I}^{c} + \phi_{I}^{c}\phi^{a}}{1 + \phi^{a}} < \frac{2(H + Fc + Fa + Fa + D)}{H + 2Fc + 2Fa} \qquad \text{(A10)}$$

Between V-type and Vxp-type

$$\frac{1 + \phi^{a} + \phi_{I}^{c} + \phi_{I}^{c}\phi^{a}}{1 + \phi^{c} + 2\phi_{I}^{c}} < \frac{H + Fc + Fa + Fa + D}{H + Fc + Fa + 3(Fa + D)} \qquad \text{(A11)}$$

Incorporation of the marginal costs difference

As in Navaretti and Venables (2004), which this paper's model is based on, we define $s_i\varphi_j$ as the market share in country i of an importer from country j, i.e. of a firm with costs $c_j\tau$ as compared with the costs of local production, c_i. The higher τ and c_j are relative to c_i, the smaller is φ_j. Namely, $\varphi\left[\tau, c_j/c_i\right]; \dfrac{d\varphi}{d\tau} < 0, \dfrac{d\varphi}{d\left(c_j/c_i\right)} < 0$. If we hope to analyse the effects of trade cost reduction and the marginal costs difference separately, we need to explicitly incorporate the marginal costs difference, i.e., we should assume some functional form for $\varphi\left[\tau, c_j/c_i\right]$.

For example, $\varphi = \tau^{1-\sigma} \cdot c_i/c_j$

Note that we (and Navaretti and Vanables (2004)) have assumed that the firm's perceived elasticity is a function of the market share, i.e., $\varepsilon\left[s\right]$, $\dfrac{d\varepsilon\left[s\right]}{ds} > 0$

To simplify the analysis, we assume the following simple functional form.

$$\varepsilon\left[s\right] = 1/s$$

Thus, the market share is $\varepsilon\left[s\right] = \big(\underbrace{\tau^{1-\sigma} \cdot c_i/c_j}_{\varphi} \cdot s\big)^{-1}$

With large group assumption, $\varepsilon\left[s\right]$ becomes σ.

Further assuming c_j and c_i apply both for component and assembly plants,

we change the subscripts from i, j to N(North), S(South) and assume $c_N > c_S$, and

$\gamma \cdot c_N = c_S = c; 0 < \gamma < 1$.

Then, the boundary condition between H-type and V-type is computed as

$$\Pi^H = S\cdot {}^{c}\!/\!_{\gamma}\cdot E/\sigma + S\cdot {}^{c}\!/\!_{\gamma}\cdot E/\sigma + S\cdot c\cdot E/\sigma + S\cdot c\cdot E/\sigma - ({}^{c}\!/\!_{\gamma}\cdot H + 2\cdot {}^{c}\!/\!_{\gamma}\cdot (F_c + F_a) + c(F_c + F_a))$$

$$\Pi^V = S\cdot {}^{c}\!/\!_{\gamma}\cdot E/\sigma + S\tau_c^{1-\sigma}\, {}^{c}\!/\!_{\gamma} E/\sigma + S\tau_{Ic}^{1-\sigma} cE/\sigma + S\tau_{Ic}^{1-\sigma} cE/\sigma - ({}^{c}\!/\!_{\gamma} H + {}^{c}\!/\!_{\gamma} F_c + 2\,{}^{c}\!/\!_{\gamma} F_a + 2cF_a + 3D)$$

A firm chooses H-type instead of V-type when $\Pi^H > \Pi^V$ and $\Pi^H = 0$.

Solving $\Pi^H = 0$ for S,

$$S\cdot {}^{c}\!/\!_{\gamma}\cdot E/\sigma + S\cdot {}^{c}\!/\!_{\gamma}\cdot E/\sigma + S\cdot c\cdot E/\sigma + S\cdot c\cdot E/\sigma - ({}^{c}\!/\!_{\gamma}\cdot H + 2\cdot {}^{c}\!/\!_{\gamma}\cdot (F_c + F_a) + c(F_c + F_a)) = 0$$

$$S\left({}^{c}\!/\!_{\gamma}\cdot E/\sigma + \tau_c^{1-\sigma}\, {}^{c}\!/\!_{\gamma} E/\sigma + \tau_{Ic}^{1-\sigma} cE/\sigma + \tau_{Ic}^{1-\sigma} cE/\sigma\right) < {}^{c}\!/\!_{\gamma} H + {}^{c}\!/\!_{\gamma} F_c + 2\,{}^{c}\!/\!_{\gamma} F_a + 2cF_a + 3D$$

$$\Leftrightarrow S = \frac{H + 2(F_c + F_a) + \gamma(F_c + F_a)}{2E(1+\gamma)}$$

$$\Pi^V = S\cdot {}^{c}\!/\!_{\gamma}\cdot E/\sigma + S\tau_c^{1-\sigma}\, {}^{c}\!/\!_{\gamma} E/\sigma + S\tau_{Ic}^{1-\sigma} cE/\sigma + S\tau_{Ic}^{1-\sigma} cE/\sigma - ({}^{c}\!/\!_{\gamma} H + {}^{c}\!/\!_{\gamma} F_c + 2\,{}^{c}\!/\!_{\gamma} F_a + 2cF_a + 3D) < 0$$

$$S\left({}^{c}\!/\!_{\gamma}\cdot E/\sigma + \tau_c^{1-\sigma}\, {}^{c}\!/\!_{\gamma} E/\sigma + \tau_{Ic}^{1-\sigma} cE/\sigma + \tau_{Ic}^{1-\sigma} cE/\sigma\right) < {}^{c}\!/\!_{\gamma} H + {}^{c}\!/\!_{\gamma} F_c + 2\,{}^{c}\!/\!_{\gamma} F_a + 2cF_a + 3D$$

$$\Leftrightarrow S\, {}^{E}\!/\!_{\sigma}\left({}^{c}\!/\!_{\gamma} + \tau_c^{1-\sigma}\, {}^{c}\!/\!_{\gamma} + \tau_{Ic}^{1-\sigma} c + \tau_{Ic}^{1-\sigma} c\right) < {}^{c}\!/\!_{\gamma} H + {}^{c}\!/\!_{\gamma} F_c + 2\,{}^{c}\!/\!_{\gamma} F_a + 2cF_a + 3D$$

Plugging the above $S = \frac{H + 2(F_c + F_a) + \gamma(F_c + F_a)}{2E(1+\gamma)}$,

$$\Leftrightarrow \frac{H + 2(F_c + F_a) + \gamma(F_c + F_a)}{2E(1+\gamma)}\, {}^{E}\!/\!_{\sigma}\left({}^{c}\!/\!_{\gamma} + \tau_c^{1-\sigma}\, {}^{c}\!/\!_{\gamma} + \tau_{Ic}^{1-\sigma} c + \tau_{Ic}^{1-\sigma} c\right) < {}^{c}\!/\!_{\gamma} H + {}^{c}\!/\!_{\gamma} F_c + 2\,{}^{c}\!/\!_{\gamma} F_a + 2cF_a + 3D$$

The equation is unnecessarily complicated especially because σ enters as the power.