

Export Platform Foreign Direct Investment: Theory and evidence

Tadashi Ito[♦]

Okinawa University, Japan
Initial draft: March 2010
This draft: September 2010

Abstract:

This paper proposes a model that accounts for “export platform” FDI – a form of FDI that is common in the data but rarely discussed in the theoretical literature. Unlike the previous literature, this paper’s theory nests all the typical modes of supply, including exports, horizontal and vertical FDI, horizontal and vertical export platform FDI. The theory yields the testable hypothesis that a decrease in either inter-regional or intra-regional trade cost induces firms to choose export platform FDI. The empirical part of the paper provides descriptive statistics which point to large proportions of third country exports of US FDI, and an econometric analysis, whose results are in line with the model’s predictions. The last section suggests policy implications for nations seeking to attract FDI.

Key words: Export platform FDI

JEL Classification: F12, F15, F23

1. INTRODUCTION

The complexity of modes of foreign direct investment (FDI) has recently been discussed in the literature. The old framework of horizontal and vertical FDI does not represent well the actual modes of FDI. Firms set up plants not only to supply the host country’s market but also the host nation’s neighbouring countries. For example, many tobacco companies have their European headquarters and plants in Switzerland. The world’s largest Vinyl Chloride Monomer¹ producer, Shinetsu Chemical has its plants in Portugal and supplies all European countries from there. In Far East Asia, parts and components are produced and shipped back and forth among many countries in the region² before they are sold as final products.

To see if the export platform type FDI is an important phenomenon, we have computed the ratio of exports to third countries over the total sales of US FDI.³ Figure 1 shows the ratios. We have taken the top 20 countries which have the largest US FDI stock in 2006, the most recent year for which the data are available at the time of writing. Countries are ordered by the US FDI stock amount. The

*Aza-Kokuba 555, Naha, Okinawa, Japan; Tadashi.Ito@graduateinstitute.ch. I am grateful to my thesis adviser, Professor Richard E. Baldwin at the Graduate Institute, Geneva for his invaluable advice. I thank Pierre-Louis Vézina at the Graduate Institute for his proofreading and comments of the first draft. I also thank seminar participants at Institute of Developing Economies, Japan, and ETSG 2010 in Lausanne, Switzerland for their comments.

1 A basic raw material for plastics used mainly for construction

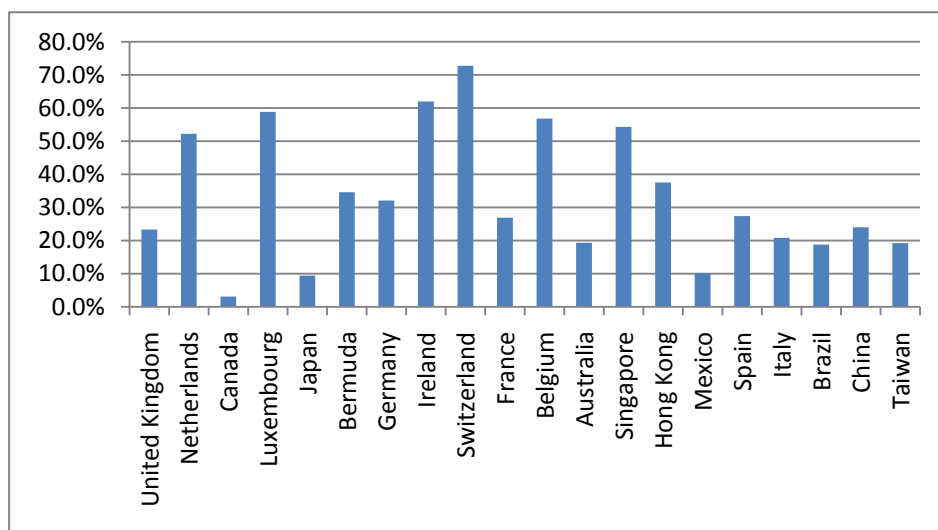
2 For production/distribution networks in East Asia, see Ando and Kimura (2003, 2005)

3 We define the third country exports as the total sales minus the domestic sales and the exports to the USA.

United Kingdom is the largest recipient of US FDI, followed by the Netherlands. We notice that small countries, such as the Netherlands, Luxembourg, Ireland, Switzerland, Belgium, Singapore and Hong Kong have high ratios of exports to third countries, ranging from about 40 to 70 percent. Large EU countries, such as the United Kingdom, France, Germany and Spain exhibit 20 to 30 percent. On the other hand, also large but non-EU countries, which do not have neighbour countries of similar income level, such as Australia and Japan show rather small numbers. These findings imply that export platform FDI is prevalent in countries (especially small countries) which have neighbour countries of similar income level and also that the EU might have incited export platform type FDI by reducing intra-regional trade costs within EU countries.

This paper constructs a model with export platform FDI. Unlike previous theoretical works on export platform FDI, this paper attempts to nest all the types of FDI in one model. The model shows that a reduction in trade cost, either inter-continental and/or intra-regional, induces firms to choose Export platform FDI rather than other modes of supply. The empirical part of the paper corroborates this theoretical prediction, using US outward FDI.

Figure 1: Third country export ratios of the top 20 US FDI recipient countries



Source: Author's computation from the data of Bureau of Economic Analysis (BEA)

Literature

Many economists argue that the modes of supply of Multinational Firms are more complex than the pioneering works of Horizontal and Vertical FDI by Helpman & Krugman (1985). Unlike the usual model of FDI (Markusen (2002)), in which horizontal FDI is a substitute for trade, Bergstrand and Egger (2007) develop 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.

On the front of export-platform FDI, Motta and Norman (1996), motivated by the observation that much FDI is between countries in regional trading blocks, constructs an oligopoly model of one stage (final product) production. Ekholm et al. (2007) constructs a partial equilibrium oligopoly model of two stage (intermediate and final products) production. The driving force of the export platforms in their model is an interaction of lower production costs of the South and trade costs. They also show empirically that US firms in Europe have higher shares of third country exports than the US firms in other areas. Baltagi et al. (2007), using spatial econometrics, show a significant third countries effects on FDI locations, namely neighbouring countries' characteristics matter for inward FDI. Blonigen et al. (2007), in an analysis similar to Baltagi et al. (2007), examine third countries' effects on the choice of FDI type but uses the third countries' market potential as a major explanatory variable. Whereas

firms are atomistic in all the above models, 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)), constructs a model, where 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). A model close to ours is built by Neary (2009), which is also based on “proximity-concentration” trade-off. Murázová and Neary (2010) develops a general model of how a firm will choose to serve a group of foreign markets by exports or FDI, and how many foreign plants it will want to establish, using supermodularity concept. Ours is different from his in that it includes not only horizontal export platform but also vertical export platform.

The newness of this paper is on two fronts. On the theoretical side, following Navaretti and Venables (2004)’s framework, it develops a model which nests all the modes of supply. A nice feature of Navaretti and Venables’ framework is the use of more general assumptions than those of Ekholm et al. This paper incorporates the option of decomposing the production process into Navaretti and Venables’ framework. By doing so, the model includes horizontal export platform FDI and vertical export platform FDI. While this paper’s model has a drawback of not yielding co-existence of several modes of supply within the same industry, which is one of Grossman et al. (2006)’s contributions, its virtue lies in its simple structure. On the empirical side, using US FDI data from 1983 to 2001, it shows that a reduction in trade cost induces firms to choose export-platform FDI.

The other contribution is on empirical side. Baltagi et al. (2007) and Blonigen et al. (2007) use total FDI stock as the dependent variable without distinguishing between various types of FDI, such as horizontal, vertical, and export platform FDI. However, third country effects, i.e., the influence of neighbouring countries’ characteristics on FDI inflow, which is the focus of Baltagi et al. (2007) and Blonigen et al. (2007), should have come from the potentiality of third country exports. Thus, in order to better capture the third country effects, this paper uses FDI stocks multiplied by the third country export ratio as the dependent variables and attempts to explain the determinants of export platform FDI.

Plan of paper

Section 2 develops the model that structures our empirical exercise. Section 3 explains the data, estimation equation and results. The final section concludes.

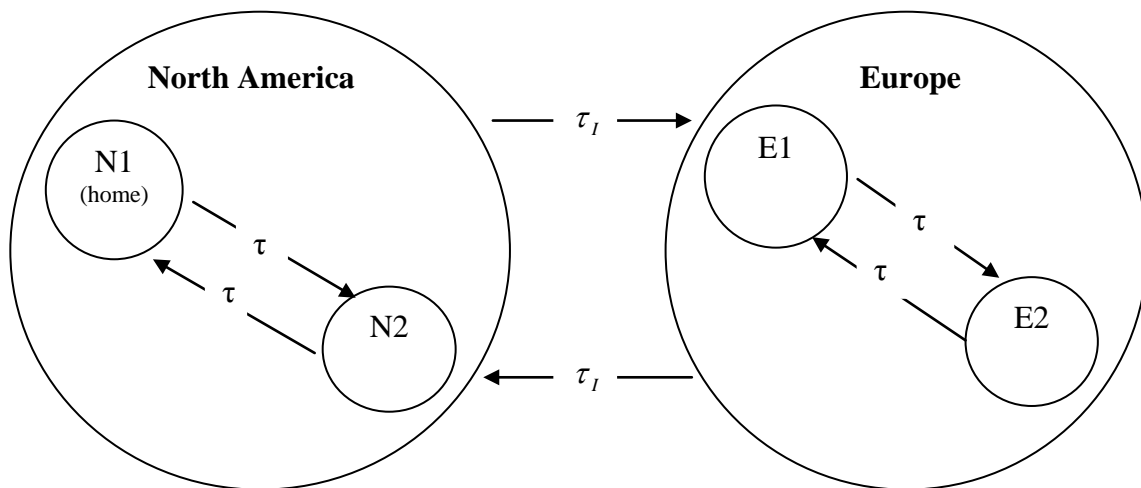
2. MODEL

We extend the model developed by Navaretti and Venables (2004) to 2-regions 2-countries and include the possibility of export platform FDI.

Countries and modes of supply

There are two regions, for example, North America and Europe. Each region consists of 2 countries. The production process comprises of two stages: components and assembly. Firms can decompose these two stages of component and assembly by paying a ‘decomposition cost’. So-called “Iceberg trade costs” are incurred when component and/or assembly are transported. To deliver one unit of good from one country to the other within a region requires that $1+t$ units be shipped out. We denote $1+t \equiv \tau$ (Iceberg trade cost). Intercontinental transportation of one unit between two regions requires $1+t_l \equiv \tau_l$ to be shipped out.

Two regions and two countries in each region

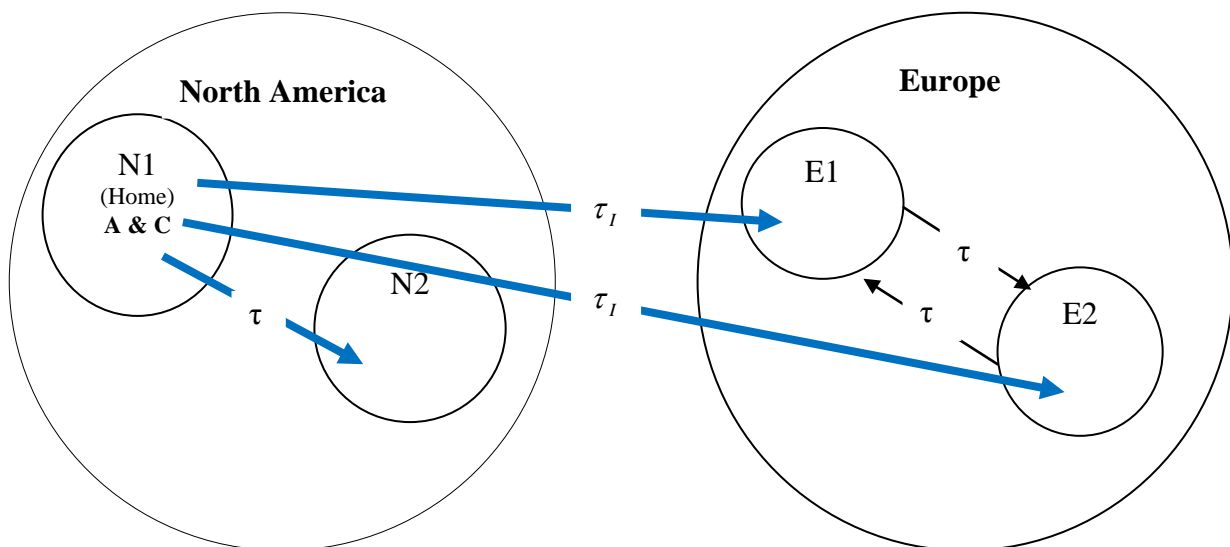


Black arrows represent iceberg trade cost within regions, τ , and iceberg trade cost between regions, τ_I .

Firms choose a mode of supply from the following five types.

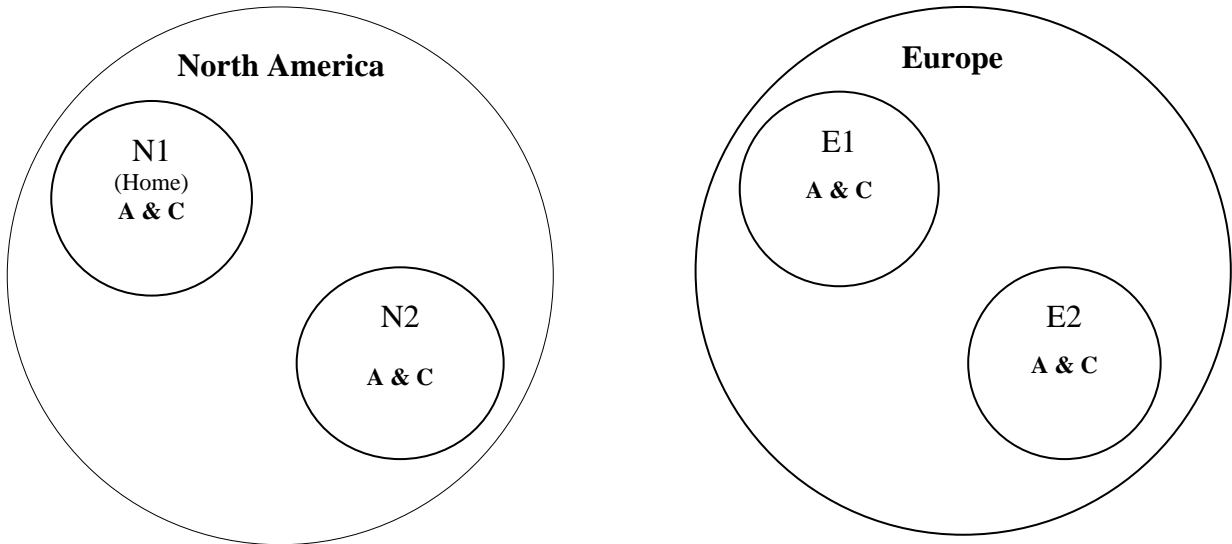
Modes of supply

1. n (national) type: Firms have only one component plant (C) and one assembly plant (A) in their Home country and export to the neighbouring country and to the nations in the other continent.



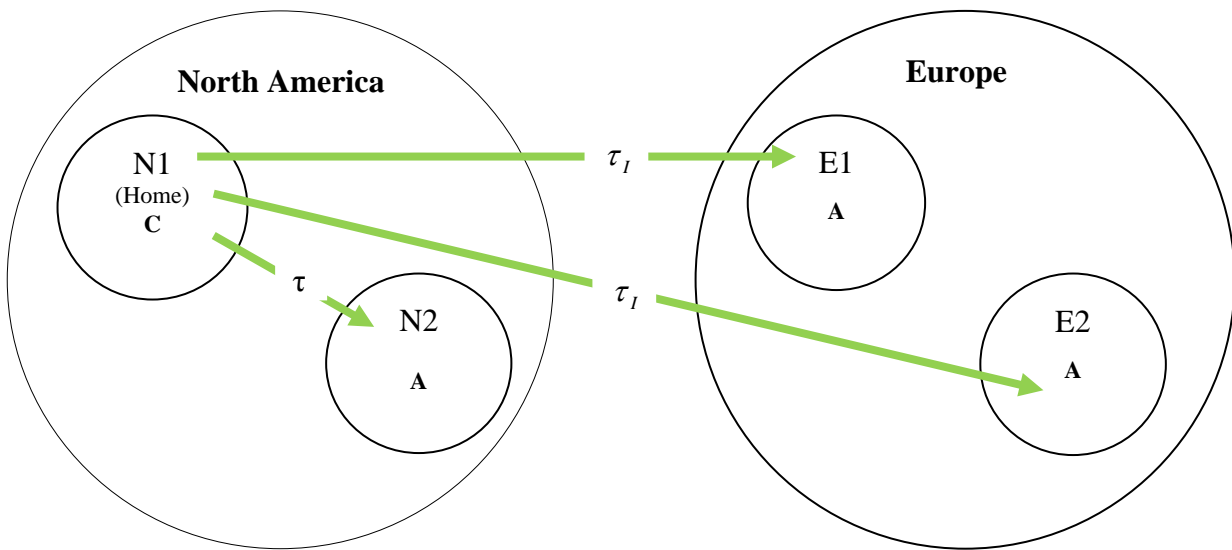
A & C indicate where assembly plants and component plants are located. Blue coloured arrows represent the flow of assembled goods (final goods).

2. m (horizontal multinational) type: Firms have a set of a component plant and an assembly plant in Home country and another set in the other country in Home region and in the two nations of the other continent.



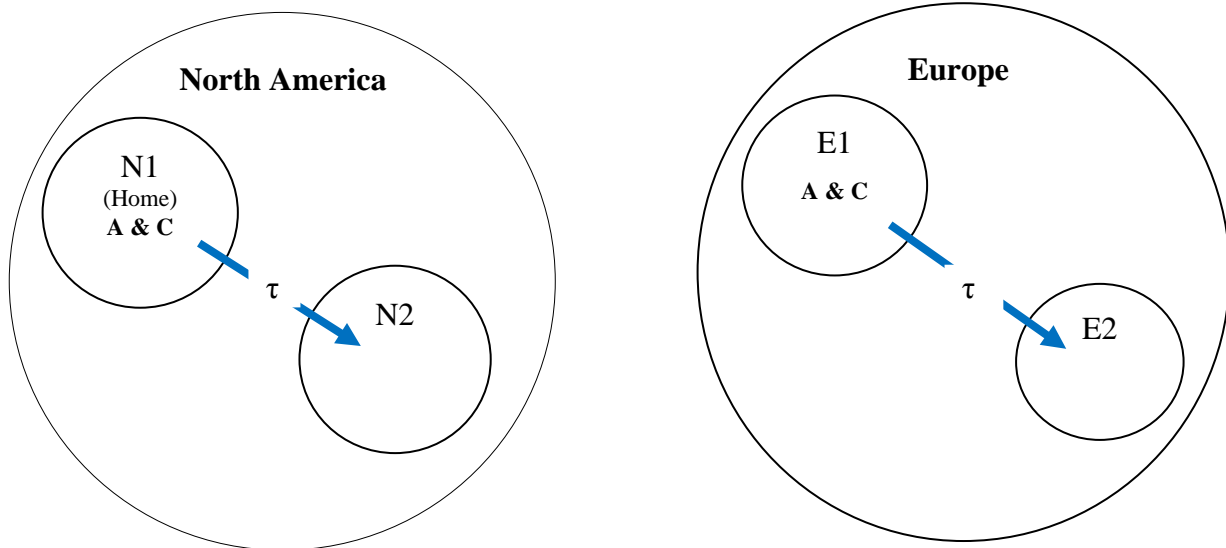
There is no flow of assembled goods (final goods) because production of component and assembly are both done in each country.

- v (vertical multinational) type: Firms have a component plant in its Home country and have an assembly plant in each of 4 countries.

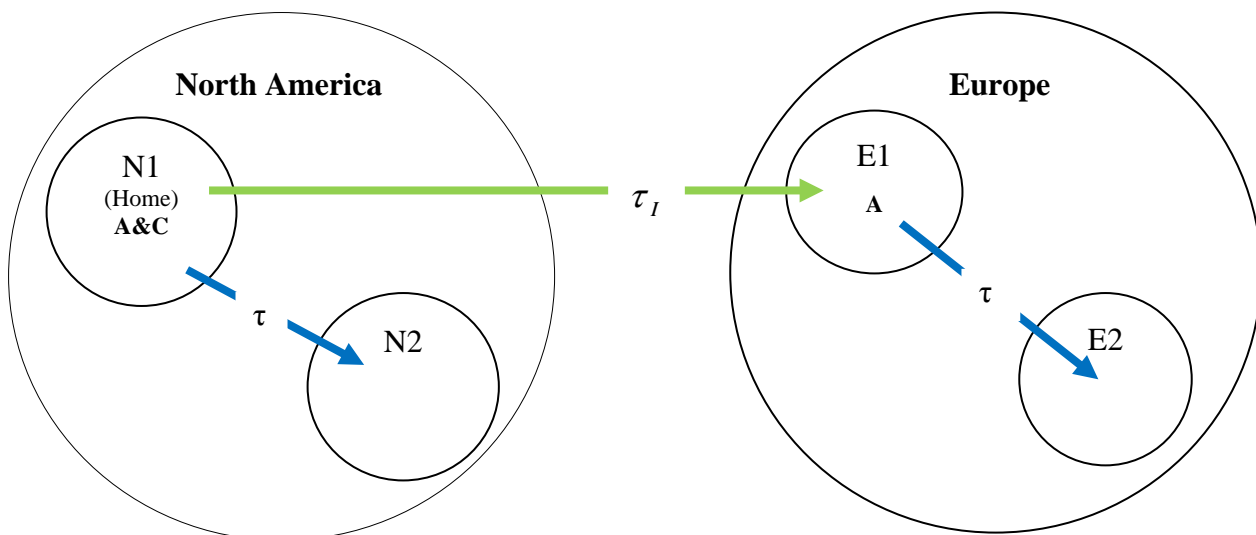


Green arrows represent the flow of components (intermediate goods).

4. Hxp (horizontal export platform) type: Firms have a component plant and an assembly plant at Home to supply both Home and the other country in its own region, and also have a set of component and assembly plants in one of the symmetric countries in the other continent to supply both countries in the other continent.



5. Vxp (vertical export platform): Firms have a set of component and assembly plants at Home to supply Home 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

Firm k in county i maximizes

$$\pi_i^k = (p_i^k - c_i^k) q_i^k \quad (1)$$

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

$$p_i^k (1 - 1/\varepsilon_i^k) = c_i^k \quad (2)$$

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

Plugging (2) into (1) gives

$$\pi_i^k = p_i^k q_i^k / \varepsilon_i^k \quad (3)$$

Denoting the firm's market share as $s_i^k \equiv p_i^k q_i^k / R_i$ where R_i is market size of country i, (3) becomes

$$\pi_i^k = s_i^k R_i / \varepsilon_i^k \quad (4)$$

Assuming that each firm's perceived elasticity of demand depends only on the market share of the firm, $\varepsilon_i^k = \varepsilon [s_i^k]$, (4) becomes

$$\pi_i^k = s_i^k R_i / \varepsilon [s_i^k] \quad (5)$$

Fixed costs

Any type of firm pays H (Firm specific fixed cost, or Headquarter cost). To produce the good, they incur F (Plant specific fixed cost) which includes component plant fixed cost Fc, and assembly plant fixed cost Fa. They can decompose these two stages of component and assembly by paying a 'decomposition cost', D. Fixed costs incurred by each mode of supply are:

1. n-type: H + $Fc + Fa$
⏟ ⏟
Firm specific Plant specific fixed
fixed cost at home country cost at home country
2. m-type: H + $4(Fc + Fa)$
⏟ ⏟
Firm specific Sum of plant specific fixed
fixed cost costs in 4 countries
3. v-type: H + $Fc + Fa$ + $3(Fa + D)$
⏟ ⏟ ⏟
Firm specific Plant specific fixed Assembly plant fixed cost
fixed cost costs in home country at N2, E1 and E2
4. Hxp-type: H + $Fc + Fa$ + $Fc + Fa$
⏟ ⏟ ⏟
Firm specific Plant specific fixed Plant specific fixed
fixed cost cost at home country cost in a country (eg. E1) of the foreign region
5. Vxp-type: H + $Fc + Fa$ + $Fa + D$
⏟ ⏟ ⏟
Firm specific Plant specific fixed Plant specific fixed
fixed cost cost at home country cost in a country (eg. E1) of the foreign region

For the sake of simplicity, we assume the four countries have identical market sizes and all firms have identical marginal costs and face identical fixed costs. Multinationals producing in country i have exactly the same market share as national firms. Imported goods have less market shares due to trade costs τ and τ_i . Using ϕ , the freeness of trade (Baldwin et al. (2003)), which is easier to handle mathematically than iceberg trade costs τ^4 , I define $s_i\phi_j$ as the market share in country i of a supplier from country j .

Profit

Since we assume symmetry of countries and firms as mentioned above, profits of firms choosing each mode of supply can be expressed as follows.

$$\Pi^n = SR/\sigma + S\phi^a R/\sigma + S\phi_i^a R/\sigma + S\phi_i^a R/\sigma - (H + Fc + Fa) \quad (6)$$

$$\Pi^m = SR/\sigma + SR/\sigma + SR/\sigma + SR/\sigma - (H + 4(Fc + Fa)) \quad (7)$$

$$\Pi^v = SR/\sigma + S\phi^c R/\sigma + S\phi_i^c R/\sigma + S\phi_i^c R/\sigma - (H + Fc + Fa + 3(Fa + D)) \quad (8)$$

$$\Pi^{Hxp} = SR/\sigma + S\phi^a R/\sigma + SR/\sigma + S\phi^a R/\sigma - (H + Fc + Fa + Fc + Fa) \quad (9)$$

$$\Pi^{Vxp} = SR/\sigma + S\phi^a R/\sigma + S\phi_i^c R/\sigma + S\phi_i^c \phi^a R/\sigma - (H + Fc + Fa + Fa + D) \quad (10)$$

where S , R and σ represent the market share, the market size and the firm's perceived elasticity of demand. Due to the symmetry assumption above, neither subscript nor superscript is attached to S and R . The firm's perceived elasticity of demand, ε_i^k does not need either superscript nor subscript. I change the term to σ to link it to the constant elasticity of CES utility function, which is explained in footnote 4. The first term of each equation represents the operating profit the firm earns in its home market (N1 in the above figure). The second term represents the operating profit in the other country within the same region (N2 in the above figure). The third term is the operating profit in one of the two countries in the foreign region (E1 in the above figure). The fourth term is the operating profit in the other country in the foreign region (E2 in the above figure). The difference in profits between firms comes from the difference in market shares, which are affected by the freeness of trade ϕ , and in fixed costs. For example in equation (10), the firm's share in the home country is S while it is $S\phi^a$ in the neighbouring country because the firm incurs the trade cost associated with the transport of assembly from N1 to N2. In E1, the market share is $S\phi_i^c$ because component is to be transported to E1 from N1, "eroding" the market share. Finally in E2, it is $S\phi_i^c \phi^a$ because the full market share S , which firms could enjoy if they produced the product within the market country, is first eroded by ϕ_i^c , the transport of component from N1 to E1 and then by ϕ^a , the transport of assembly from E1 to E2.

Assuming monopolistic competition, free entry drives profits to zero. We can derive the boundary conditions between each mode of supply from the above profit equations from (6) to (10).

4 To be precise, $\phi \equiv \tau^{1-\sigma}$, where σ is the parameter of constant elasticity of substitution in CES utility function, i.e.,

$$U = \left(\sum_{i=1}^N (C_i)^{1-1/\sigma} \right)^{1/(1-1/\sigma)}$$

The boundary conditions

The boundary conditions in equilibrium between two modes of supply can be found from the profit equations. Because of zero profit conditions, a particular mode of supply is the equilibrium choice when it yields zero profits while the other mode of supply yields negative profits.

Between n-type and m-type

The equilibrium condition of firms choosing n-type instead of m-type is that n-type yields zero profits while m-type yields negative profits. Thus, the boundary condition can be written as⁵:

$$\Pi^n = SR/\sigma + S\phi^a R/\sigma + S\phi_1^a R/\sigma + S\phi_1^a R/\sigma - (H + Fc + Fa) = 0$$

$$\Leftrightarrow SR(1 + \phi^a + 2\phi_1^a)/\sigma - (H + Fc + Fa) = 0$$

Solving for S,

$$\Leftrightarrow S = \frac{\sigma(H + Fc + Fa)}{R(1 + \phi^a + 2\phi_1^a)}$$

Plugging this into the inequality condition of Π^m ,

$$\Pi^m = 4 \frac{\sigma(H + Fc + Fa) R}{R(1 + \phi^a + 2\phi_1^a) \sigma} - (H + 4(Fc + Fa)) < 0$$

$$\Leftrightarrow \phi^a + 2\phi_1^a > \frac{3H}{H + 4(Fc + Fa)} \quad (11)$$

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

Between m-type and Hxp-type

$$\phi^a < \frac{H}{H + 4(Fc + Fa)} \quad (12)$$

Between n-type and v-type

$$\frac{1 + \phi^c + 2\phi_1^c}{1 + \phi^a + 2\phi_1^a} < \frac{H + Fc + Fa + 3(Fa + D)}{H + Fc + Fa} \quad (13)$$

Between v-type and Vxp-type

$$\frac{1 + \phi^a + \phi_1^c + \phi_1^c \phi^a}{1 + \phi^c + 2\phi_1^c} < \frac{H + Fc + Fa + Fa + D}{H + Fc + Fa + 3(Fa + D)} \quad (14)$$

Between m-type and v-type

$$\phi^c + 2\phi_1^c < \frac{3(H + 4(Fa + D))}{H + 4(Fc + Fa)} \quad (15)$$

Between v-type and Hxp-type

$$\frac{1 + \phi^a}{1 + \phi^c + 2\phi_1^c} < \frac{H + 2Fc + 2Fa}{2H + 2Fc + 8Fa + 6D} \quad (16)$$

Between n-type and Hxp-type

⁵ The only endogenous variable in the equations is market share S. So, we solve the equality condition for S and then by plugging this S into the inequality condition, we can find the boundary condition, which is the relationship between the parameters, ϕ, H, Fc, Fa .

$$\frac{1 + \phi^a}{1 + \phi^a + 2\phi_1^a} < \frac{H + Fc + Fa + Fc + Fa}{2(H + Fc + Fa)} \quad (17)$$

Between n-type and Vxp-type

$$\frac{1 + \phi^a + \phi_1^c + \phi_1^c \phi^a}{1 + \phi^a + 2\phi_1^a} < \frac{H + Fc + Fa + Fa + D}{H + Fc + Fa} \quad (18)$$

Between m-type and Vxp-type

$$1 + \phi^a + \phi_1^c + \phi_1^c \phi^a < \frac{4(H + Fc + Fa + Fa + D)}{H + 4(Fc + Fa)} \quad (19)$$

Between Hxp-type and Vxp-type

$$\frac{1 + \phi^a + \phi_1^c + \phi_1^c \phi^a}{1 + \phi^a} < \frac{2(H + Fc + Fa + Fa + D)}{H + 2Fc + 2Fa} \quad (20)$$

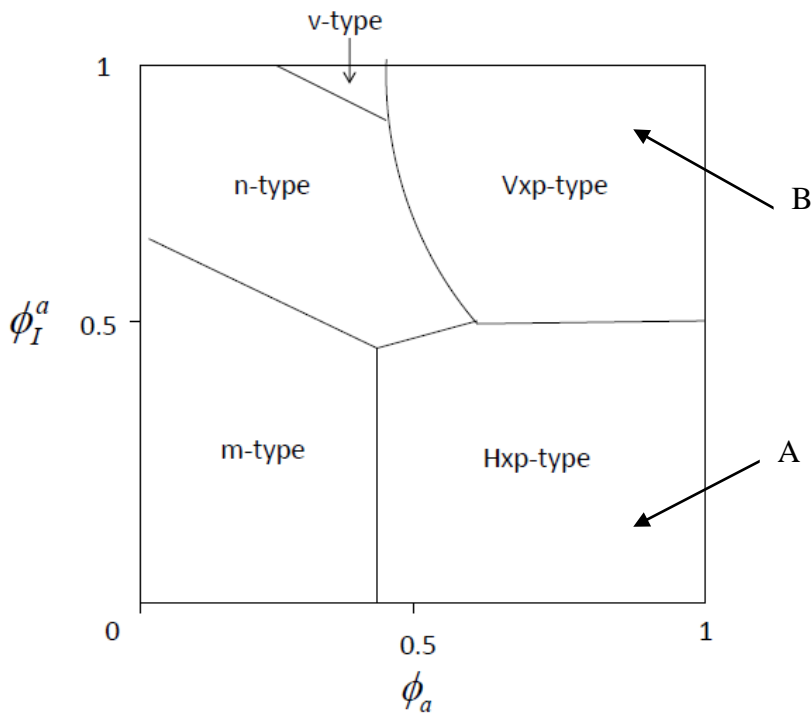
Numerical solutions

We incorporate the difference in iceberg trade costs between components and assembly. While $1+\alpha$ units need to be shipped to deliver 1 unit of assembled products, $1+\alpha t$ units need to be shipped out to deliver 1 unit of components. We assume here $0 < \alpha < 1$, i.e., the iceberg trade cost of components is cheaper than that of assembled products. We adopt this assumption for two reasons. First, this assumption sounds reasonable because freights for components are considered to be generally cheaper than that of assembled goods, e.g., engines or chassis versus final cars. Moreover, it is widely known that tariffs are generally lower for intermediate goods than final goods (Olsen's asymmetry). Secondly, in this symmetric model, firms' choices come from the trade-off between 'decomposition (or unbundling)' costs incorporated as an additional fixed cost versus lower trade cost of components. Thus, unless $0 < \alpha < 1$, 'decomposition' never pays off. So, $\phi^c > \phi^a$, $\phi_1^c > \phi_1^a$.

We draw a picture of modes of supply in the space of freeness of trade to obtain a testable hypothesis about the relationship between the freeness of trade and the modes of supply. The empirical study in the next section tests the hypothesis.

The area of n-type is the one which simultaneously solves the inequality conditions (11), (13), (17) and (18). Similarly, we can find the area of each mode of supply by simultaneous inequality conditions derived above. There are four types of freeness of trade in our model, $\phi^a, \phi^c, \phi_1^a, \phi_1^c$. To yield figures in two dimensions, we assume $\phi^a = \rho\phi^c, \phi_1^a = \rho\phi_1^c; 0 < \rho < 1$. Figure 2 is a numerical solution for one set of parameters. This is the case where all the five 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, such as 0.8, neither v-type nor Vxp-type is within the choice set because the merit of transporting components instead of assembly is small. In Figure 2, when either intra-regional freeness of trade ϕ^a or inter-regional freeness of trade ϕ_1^a is high, firms choose export platform FDI. This qualitative feature does not change depending on the parameter values although the size of area for each mode of supply does change.

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



Parameter values: $H=1$, $F_a=0.1$, $F_c=0.2$, $D=0.2$, $\rho=0.5$

Intuition

Intuition is straightforward. At a high ϕ^a and a low ϕ_I^a , such as A in Figure 2, inter-regional trade cost is high (low ϕ_I^a (inter-regional freeness of trade)) and 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 make use of the low trade costs within region. Thus, the optimal choice is horizontal export platform FDI. 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 vertical export platform FDI.

3. DATA, EMPIRICAL MODEL AND RESULTS

This section aims to see if the data are in line with the theoretical prediction of Section 2, using US FDI data. We use US FDI data from the US Bureau of Economic Analysis (BEA). We have chosen the US data for our analysis since the US is the largest FDI home country and also the US BEA makes the detailed and long-period data publicly available.

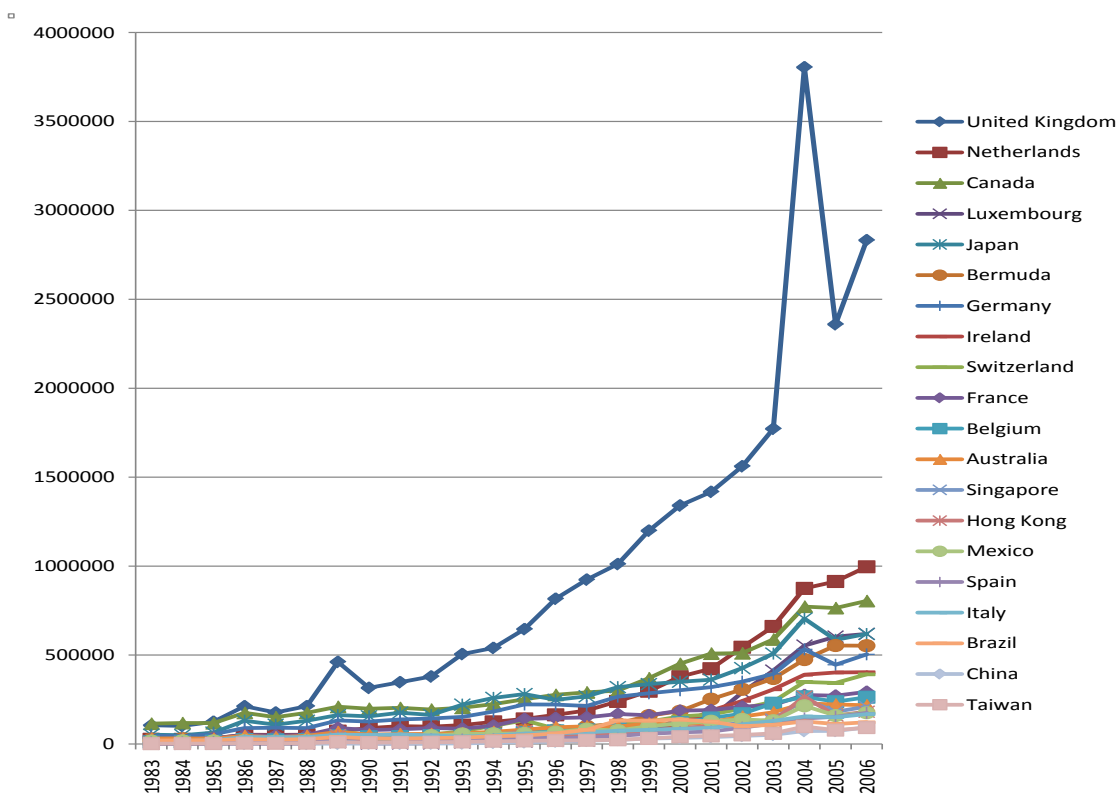
3.1. Descriptive Analysis

In this sub-section, we show how US FDI stock and the third country export ratio have evolved over the years. Figure 3 shows the evolution of US FDI stock for the top 20 host countries in terms of its FDI stock in 2006. The United Kingdom is the largest US FDI recipient, having a three times higher stock amount than the second largest recipient, the Netherlands. To examine the evolution of the other 19 countries more closely,

Figure 4 shows the same data excluding the United Kingdom. Countries with strong economic ties with the US, such as Canada, Japan and European countries have registered steady increases in FDI stock. Drastic increases in US FDI stock in the Netherlands, Luxembourg and Ireland stand out. The evolution of third country export ratios are in Unit: Million dollars, Source: Author's computation from US BEA data

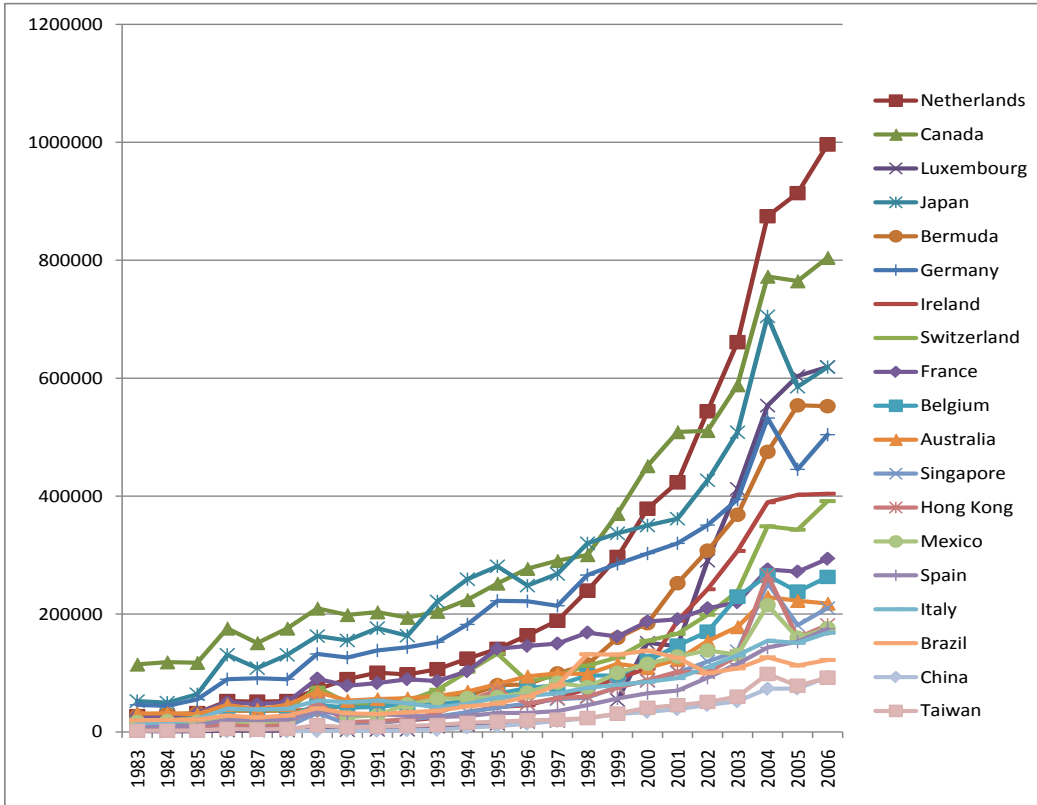
Figure 5. The ratio for the largest US FDI recipient, the United Kingdom, goes from 20 to 25%. Luxembourg and Switzerland have the highest ratios ranging from 60% to 80%. Ireland has also a high ratio at the range between 60% and 70%. The ratios of the Netherlands and Belgium are relatively stable at around 55%. The lowest ratios are for Canada and Japan at less than 10%. We notice here that countries that have received the highest amount of US FDI, except the UK, show high ratios. This can be said especially for EU countries.

Figure 3: The evolution of US FDI stock of the top 20 recipient countries, 1983-2006



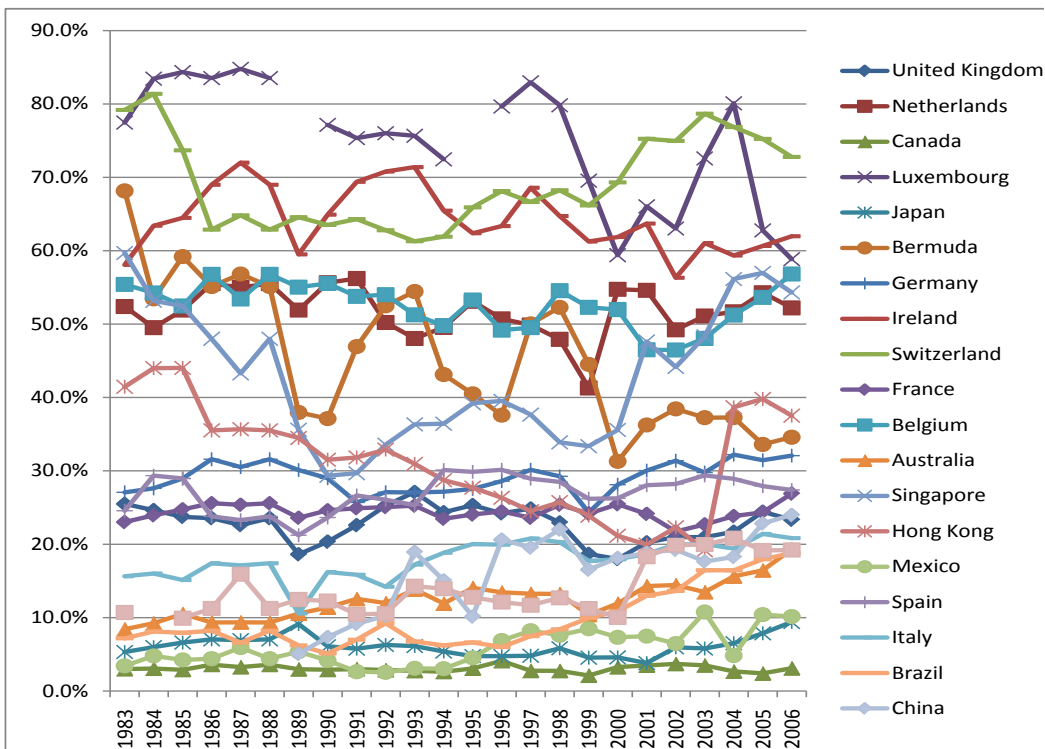
Unit: Million dollars, Source: Author's computation from US BEA data

Figure 4: The evolution of US FDI stock of the top 20 recipient countries except UK, 1983-2006



Unit: Million dollars, Source: Author's computation from US BEA data

Figure 5: The evolution of the third country export ratio of the top 20 US FDI recipient countries, 1983-2006



Source: Author's computation from US BEA data

3.2. Econometric Analysis

We estimate the following regression.

$$FDIforThirdCountryExports_{c,t} = \beta_0 + \beta_1 MarketPotential_{c,t} + \beta_2 TradeCost_{c,t} + \tilde{\beta}_3 RTA + \tilde{\beta}_4 Y + \tilde{\beta}_5 H + \varepsilon_{c,t}$$

where $FDIforThirdCountryExports_{c,t}$ is the US FDI stock multiplied by the third country export ratio of host country c at time t . $MarketPotential_{c,t}$ is the market potential values of Mayer (2008)⁶ of host country c at time t . We use this variable as a major explanatory variable instead of other variables such as GDP of host countries, since, when choosing locations of their plants, firms look not only at the domestic market of host countries but also at the potential demand coming from the host countries' neighbours.⁷ $TradeCost_{c,t}$ is the ratio of trade related cost over goods' value for host country c at time t .⁸ Details for its computation is in Appendix A. This variable corresponds to ϕ_I^a , inter-regional freeness of trade, in the above theoretical model, because it is the trade cost between the US and the host country. RTA is a vector of Regional Trade Agreement dummy. Those dummies are EU dummy, MERCOSUR dummy, ASEAN dummy and NAFTA dummy. This variable corresponds to ϕ^a , intra-regional freeness of trade, because RTA enhances the freeness of trade. Y is a vector of year dummies. H is a vector of host country dummies. $\varepsilon_{t,d}$ is an iid error. The variables of our interest are $TradeCost_{c,t}$ and RTA , while the others are control variables. In the above theoretical model, market sizes are assumed to be constant. By including the variable, $TradeCost_{c,t}$, we are controlling market sizes. All the variables except dummy variables are in natural log. The data covers the years from 1983 to 2003. The starting year of 1983 comes from the constraint of US FDI data while the end year of 2003 comes from the availability of the Market Potential data. Fifty eight countries available from the US FDI data are included. The list of countries is in Appendix B.

3.3. Results

Table 1 shows the estimation results. The first column gives the results using the whole data. There is an issue worth being considered. The location choice of natural resource seeking FDI hinges on the availability of natural resources, not on the possibility of third country exports. While we do not have the third country export data by industry as mentioned above, we do have FDI stock data by industry, at least for recent years. Thus, we have run the second regression excluding US FDI recipient countries whose share of mining sector in the total US FDI stock exceeds 50% in the year 2003, the last year of the data for the regression. The mining sector includes Oil and Gas Extraction, Coal Mining, Metal Mining, etc.⁹ The third column gives results when we exclude more countries by setting the cut-off point at 25%.

As specification tests, we have run Pooled regression and Panel regression and have performed Likelihood ratio test. The likelihood ratio test has rejected the null hypothesis of no systematic difference between Pooled regression and Panel regression, leading us to go with the Panel regression.

6 I thank Thierry Mayer for kindly sharing with me the market potential data he constructed.

7 Being inspired by the idea of "market potential" by Harris (1954), Head and Mayer (2004) and Mayer (2008) have estimated "market potential" using equations they derived from the New Economic Geography.

8 We compute trade costs as above so that it captures the real trade cost, including transportation, tariff, and insurance, instead of using distance, which does not have variation over time.

9 Industry classification with which the data are available is NAICS 2002.

Among the Panel regressions, we have performed Hausman test and chosen between Fixed Effects or Random Effects according to the test results.¹⁰

In all the three cases, the coefficient estimates for Market Potential variable is positive and statistically significant, indicating one percent increase of Market Potential is associated with an increase of 0.248 to 0.319 percent of “FDI stock for third country exports”. The Trade Cost variable captures inter-regional freeness of trade between the US and the recipient countries. Its coefficient estimates are negative and statistically significant in all three cases, indicating that a one percent increase in trade cost is associated with 0.266 to 0.298 percent decrease of “FDI stock for third country exports”. This is equivalent to saying: one percent increase in inter-regional freeness of trade is associated with 0.266 to 0.298 percent increase in “FDI stock for third country exports”. This result sits well with the theoretical prediction shown above. Namely, as ϕ_i^a gets larger (given a sufficiently high level of ϕ^a), firms choose (Vertical) export platform FDI¹¹. The other variable of our interest, Regional Trade Agreement dummies, i.e., EU, MERCOSUR, ASEAN, NAFTA dummies show different coefficient estimates. The EU dummy exhibits large positive coefficient estimates with high statistical significance in all three cases. The MERCOSUR dummy also shows positive coefficient estimates with statistical significance in all three cases. And the numbers are not negligible. The ASEAN dummy’s drastic change from the first column to the second and the third columns comes from the exclusion of Indonesia and some other countries whose share of mining sector is high. Indonesia ranks 24 out of 57 countries as US FDI recipients and has a high third country export ratio. The mean of third country export ratio of Indonesia over the whole period is 45.3%. The share of mining sector over the total US FDI stock in Indonesia is 65.6%. Namely, US FDI in Indonesia is primarily natural resource seeking FDI, which is outside of the framework of the Export Platform FDI. We conjecture that the first column’s large positive statistically significant coefficient might be an Indonesia effect. Thus, in the second regression, we exclude those countries for which the share of mining exceeds 50%. In the third regression, we relax the threshold from 50% to 25%. Once we exclude Indonesia and other countries using the above threshold levels, the coefficient estimates become statistically insignificant. As to the NAFTA dummy, given no large third country neighbours of Canada and Mexico, a statistically insignificant coefficient estimate of NAFTA dummy is not surprising.

Table 1: Estimation results

	(1)	(2)	(3)
	Whole Data	Mining Excluded1	Mining Excluded2
Market Potential	0.248* (0.012)	0.319*** (0.000)	0.289** (0.002)
Trade Cost	-0.266** (0.002)	-0.298*** (0.001)	-0.298** (0.001)
EU	0.737*** (0.000)	0.807*** (0.000)	0.792*** (0.000)
MERCOSUR	0.374* (0.045)	0.387* (0.041)	0.382* (0.042)

10 The first column is Fixed Effects model, while the second and the third columns are Random Effects model.

11 Here, we put the word “vertical” into the parenthesis because the third country export data do not distinguish between vertical and horizontal FDI. This is unfortunate because a contribution of this paper on theoretical side is the model construction which includes both of horizontal and vertical FDI.

ASEAN	3.077*** (0.000)	0.658 (0.369)	0.562 (0.449)
NAFTA	-0.309 (0.128)	-0.378 (0.061)	-0.357 (0.076)
Constant	2.575 (0.052)	1.313 (0.252)	1.761 (0.137)
N	946	881	838

p-values in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

(2) Mining excluded 1: Excluded countries are Nigeria, Egypt, Indonesia, Norway

(3) Mining excluded 2: Excluded countries are Nigeria, Egypt, Indonesia, Norway, Peru, Russia, Ecuador, United Arab Emirates

4. CONCLUSION

This paper contributes a model that accounts for “export platform” FDI – a form of FDI that is common in the data but rarely discussed in the theoretical literature. Unlike the previous literature, this paper’s theory nests all the typical modes of supply, including exports, horizontal and vertical FDI, horizontal and vertical export platform FDI. The theory yields the testable hypothesis that a decrease in inter-regional or intra-regional trade costs induces firms to choose the export platform FDI. The empirical part of the paper provides descriptive statistics, which point to large proportions of third country exports of US FDI, and an econometric analysis, whose results are in line with the model’s predictions. A strong positive impact of the EU dummy on the export platform FDI suggests policy implications for nations seeking to attract FDI. More precisely, the easier access to third countries’ markets brought about by regional trade agreements shows to be a strong determinant of the locational decisions of US firms. This shows a non-obvious rarely mentioned benefit of smaller countries joining RTAs.

REFERENCES

- Ando, M., Kimura, F., 2005. The Formation of International Production and Distribution Networks in East Asia. In : Ito, T., Rose, A. (Eds.), International Trade in East Asia, NBER-East Asia Seminar on Economics, vol. 14., National Bureau of Economic Research
- Ando, M., Kimura, F., 2005. The Economic Analysis of International Production/Distribution Networks in East Asia and Latin America: The Implication of Regional Trade Agreements., Business and Politics, vol. 7., issue 1
- Baldwin, R., Forslid, R., Martin, P., Ottaviano, G., Robert-Nicoud, F., 2003. Economic Geography and Public Policy. Princeton University Press
- Baltagi, B., Egger, P., Pfaffermayr, M. 2007. Estimating models of complex FDI: Are there third-country effects?, Journal of Econometrics, 140 260-281
- Bergstrand, J., Egger, P. 2007. A knowledge-and-physical-capital model of international trade flows, foreign direct investment, and multinational enterprises, Journal of International Economics, vol. 73(2) 278-308, November
- Blonigen, B., Davies, R., Waddell, G., Naughton, H. 2007. FDI in space: Spatial autoregressive relationships in foreign direct investment, European Economic Review, 51 1303-1325

- Ekholm, K., Forslid, R., Markusen, J., 2007. Export Platform Foreign Direct Investment., *Journal of the European Economic Association*, 5(4), 776-795
- Feinberg, S., Keane, M., 2006. Accounting for the Growth of MNC-Based Trade Using a Structural Model of U.S. MNCs., *American Economic Review*, vol.96, No.5, pp.1515-1558
- Grossman, G., Helpman, E., Szeidl, A., 2006. Optimal integration strategies for the multinational firm., *Journal of International Economics*, 70, 216-238
- Hanson, G., Mataloni, R., Slaughter, M., 2001. Expansion strategies of U.S. multinational corporations., *Brookings Trade Forum* 2001, pp.245-294
- Head, K., Mayer, T., 2004 Market Potential and the Location of Japanese Investment in the European Union., *The Review of Economics and Statistics*, 86(4), 959-972
- Helpman, E., Krugman, P., 1985. *Market Structure and Foreign Trade*. MIT Press
- Markusen, J., 2002. *Multinational Firms and the Theory of International Trade*. MIT press
- Mayer, T., 2008. *Market Potential and Development.*, CEPR Discussion Paper No. 6798
- Motta, M., Norman, G., 1996. Does Economic Integration Cause Foreign Direct Investment?, *International Economic Review*, Vol.37, No.4
- Murázová, M., Neary, P., 2010. *Firm Selection into Export-Platform Foreign Direct Investment*. Working Paper.
- Neary, P., 2009. Trade Costs and Foreign Direct Investment., *International Review of Economics & Finance*. Vol. 18(2), pages 207-218, March
- Yeaple, S., 2003. The complex integration strategies of multinationals and cross country dependencies in the structure of foreign direct investment, *Journal of International Economics*, 60 293-314

Appendix A:

We have used US import data provided by The Center for International Data at UC Davis. The variable “charge” in the data represents trade related costs except import duty. For the years prior to 1989, the data do not include “charge”. Thus, we have computed the “charge” as “cifvalue” minus “cusvalue”, i.e., CIF value – FOB value. Since the data are at 7 or 10 digit product code depending on years, we have computed total “cusvalue”, total “charge” and total “duty” by summing over product codes for each pair of years and partner countries. Finally we defined the trade cost as the total “charge” + total “duty” divided by the total “cusvalue”.

Appendix B:

US FDI econometric analysis, List of countries

Argentina	Greece	Panama
Australia	Guatemala	Peru
Austria	Honduras	Philippines
Bahamas	Hong Kong	Poland
Barbados	Hungary	Russia
Belgium	India	Saudi Arabia
Bermuda	Indonesia	Singapore
Brazil	Ireland	South Africa
Canada	Israel	Spain
Chile	Italy	Sweden
China	Jamaica	Switzerland
Colombia	Japan	Thailand
Costa Rica	Korea, Republic of	Trinidad and Tobago
Czech Republic	Malaysia	Turkey
Denmark	Mexico	United Arab Emirates
Ecuador	Netherlands	United Kingdom
Egypt	Netherlands Antilles	Venezuela
Finland	New Zealand	
France	Nigeria	
Germany	Norway	