# Export-Platform Foreign Direct Investment

Karolina Ekholm
Stockholm School of Economics and CEPR

Rikard Forslid
University of Stockholm and CEPR

James R. Markusen
University of Colorado, Boulder,
NBER, CEPR

Abstract

A poorly-understood empirical phenomenon is export-platform affiliate production (EP), particularly for sale in third countries rather than in the parent or host countries. We develop a three-region model, with two identical large, high-cost countries (collectively called North) and a small, low-cost country (South). The large countries each have one firm. Our theory section analyzes the conditions under which one or both of these firms uses the South to produce for (a) export back to the parent (home-country EP), (b) export to the other large country (third-country EP), or (c) export to both (global EP). A free-trade area between one of the northern countries and South can lead to the insider northern firm choosing home or global EP and the outsider firm choosing third-country EP for a range of parameter values. Our empirical section shows the relevance of this outcome. Foreign manufacturing affiliates of US multinationals inside North America concentrate on home-country EP while affiliates inside Europe concentrate on third-country EP.

This version, April 16, 2006

JEL codes: F12, F23
Key words: Multinational firms, export platform, foreign direct investment, affiliate exports, free-trade area

Corresponding author:

James R. Markusen
Department of Economics
University of Colorado
Boulder, CO 80309-0256
1-303-492-0748(voice) -8960 (fax)
james.markusen@colorado.edu

## 1. Introduction

In 2003, 60 percent of total sales of foreign manufacturing affiliates of US multinationals were sold domestically, while 40 percent were exported (BEA data). Out of the latter figure, about a third were exported back to the US and about two thirds were exported to third countries. The literature on FDI provides a good theoretical and empirical understanding of the phenomenon of affiliate production for local sale, often associated with horizontal FDI. It also provides an understanding of affiliate production for export to the parent country, a phenomenon often associated with vertical FDI. However, we know little about affiliate production for export to third countries, which we will refer to as third-country export-platform FDI. This is likely due to the fact that most of our theoretical understanding is derived from two-country models.

The importance of export-platform (henceforth EP) FDI is documented in a study by Hanson, Mataloni, and Slaughter (2005). Using data on the foreign operations of US multinationals, they report that although the average share of exports in affiliate sales has remained constant at about one third, there has been a substantial increase in Mexico and Canada after the formation of NAFTA[1]

Table 1 Panel A presents some examples that motivate the analysis. The data are sales by foreign manufacturing affiliates of US multinationals, broken down into the share of total sales exported sales back to the US, the share of total sales exported to third markets, and the share of total exports that go to third markets (data from Markusen and Maskus 2001, 2002). The first line of data presents average figures for all 39 host countries in the data set.

The first sub-group of countries, some small and/or low-income countries in the EU, have the highest proportion of affiliate exports going to third countries of all countries in the sample,

[1]Note that according to this definition of export-platform FDI, situations where the foreign affiliate exports back to the home country are included. We will need more precise, if awkward, terminology, and use "third-country EP" FDI to refer to production solely for export to third countries, "global EP" FDI for balanced exports to both parent and third countries, and "home-country EP" FDI for exports back to the parent only (this last is traditionally called vertical FDI, but all of these cases have elements of vertical FDI).

and a very low proportion going to the US. The second group of countries drawn from Southeast Asia, display significantly more balance between exports to the US and exports to third countries. These countries do not make up an integrated regional market, and we interpret the data as meaning that affiliate exports serve global markets. The third group of countries in Table 1 are the US's NAFTA partners, Canada and Mexico. In these data, the shares of export going to the US and to third countries are the reverse of those for the first group of countries.

As indicated above, we have a good understanding of the division of affiliate production into local sales and total export sales in Table 1 Panel A, but the *composition* of export sales remains both a theoretical and empirical puzzle. The purpose of this paper is to present a simple model showing the conditions under which the various forms of EP FDI arise .

We present a three-region model in which two regions are identical, large markets.[2] These regions and their firms are denoted W (west) and E (east) and collectively these two regions are referred to as N (north). We are thinking here of the US-Canada market and high-income EU being W and E respectively. The third country is a small, low-cost country, denoted S (south). We assume that the world has two firms in the multinationalized sector, one headquartered in W and one in E, referred to as firms W and E respectively. We also assume there is no domestic demand in the small, low-cost country, so that all output of affiliate plants (if any) in that country is exported. These two assumptions alone greatly reduce the number of cases that must be considered.

There is a trade cost for the final good, the role of which is well understood. We focus on two other costs. First, there is the relative cost of producing in *south* versus *north*. Second, there is the relative cost of producing *abroad* versus *home*, where abroad refers to both S and the other

[2]Other theoretical treatments of EP production are Motta and Norman (1996), Neary (2002) and Yeaple (2003). All these models and ours make different assumptions for the common objective of limiting the range of possible outcomes. In Neary and Motta-Norman, exporting back to the parent is ruled out by assumption, something we very much want to endogenize. Our model is closer to Yeaple, but our production structure and trade costs are rather different from his. Furthermore, he maintains a symmetry assumption throughout, while we also analyze asymmetric cases, which turn out to be crucial for interpreting the empirical evidence.

N country. Business literature suggests that the latter may fall on either/both fixed costs or variable costs, so we consider both cases.

Two scenarios are considered. As a benchmark case, we analyze a symmetric situation where the cost of trading final goods and the added costs of producing abroad are the same on all links. Then we consider integration between W and S that lowers the costs of shipping final output from S to W (available to both firms W and E) and the cost of producing in S for the insider firm W (not available to firm E). We will refer to the second scenario as a "free-trade area", but have in mind a fuller integration than just zero tariffs, such as the EU and NAFTA, where insider firms enjoy many other advantages in trading goods and services, establishing subsidiaries, stationing personnel abroad and so forth.[3]

One outcome that occurs for a range of parameter values in the second case is that the insider firm W chooses home EP while the outsider firm E chooses third-country EP, while each firm maintains a plant in E to serve E. This is like a US and an EU firm both having a plant in Mexico to serve the US and a plant in Europe to serve Europe.

We then turn to an empirical analysis of sales of foreign manufacturing affiliates of US multinationals, focusing on the composition of their export sales. One finding is consistent with the particular theoretical outcome just mentioned. US affiliates in Canada and Mexico concentrate their exports to the US, while US affiliates in Europe concentrate their exports to third countries. These results are also consistent with Blonigen et. al. (2005).

## 2. A Three-Region Model

We adopt a partial-equilibrium framework which is very familiar from the strategic trade-policy literature. Elements of the model are as follows.

---

[3]While much of our analysis could be done within a simpler monopoly model, we are interested in the asymmetric responses of insider and outsider firms to a regional agreement like NAFTA. These in turn create interesting policy issues such as whether the insiders or outsiders are the relative gainer from regional integration, but they will be beyond the scope of this paper. Analysis of some of these issues are found in our longer, earlier working paper referenced below.

Three countries: E (east), W (west), and S (south). E and W are identical; together referred to as the north (N).
A final good X is produced by one firm located in W and one firm located in E.
South is small and is assumed to have no demand for X.
There is a fixed cost F for the first plant, plus a fixed cost for a second plant.
There is a trade cost for X that is specific to each link, some of these may be zero.
Relative production costs between *north* and *south* can differ.
Relative unit or fixed costs between *home* and *abroad* can differ (fragmentation costs).

The last assumption is somewhat less common in trade theory, but it enriches the set of outcomes and, in particular, supports equilibria that are empirically relevant. Firms may incur unit costs on supplying intermediate goods or services to a foreign affiliate. Or they incur added fixed costs of establishing a single plant abroad relative to a single home plant. Economic integration between one northen country and the south discriminates between insider and outside firms by lowering the costs of the insider only, which we feel is empirically important.

The term *regime* will denote the number and location of plants. Regimes will be denoted by a two or three-letter code, with the first letter referring to the firm, and the second and third (if any) letters referring to its plant locations. WW, for example, means that firm W has a plant in W and WWS means that firm W has plants in W and S. In the latter case, it must be true that the plant in S only serves E, since S has no demand. The firm would not have a plant in S to serve its home market (W) when it has a plant there as well and would not serve E from both W and S given the existence of constant marginal costs and plant-specific fixed costs. If a firm wants only one plant in the north, it will choose its home country (firm W will not have a single plant in E given symmetry and fragmentation costs for foreign production).

Let superscript W or E refer to the identity of the firm. A double subscript is used on X quantities along with the firm-identifier superscript. The first subscript is the country of production and the second is the country of sale. $X_{ij}^{k}$ is then production by firm k in country i which is sold in country j. Sales of X in each northern region can come from five possible

sources (firms and countries). Sales in W can come from local production of its own firm, imports from E's production in E, imports of its own firm's production in S, imports of E's production in S and from E's production in a plant in W. Let p denote the price of X in a region. Inverse demand functions are given by:

(1) $$p_w = \alpha - \beta(X^w_{ww} + X^e_{ew} + X^w_{sw} + X^e_{sw} + X^e_{ww})$$

(2) $$p_e = \alpha - \beta(X^w_{we} + X^e_{ee} + X^w_{se} + X^e_{se} + X^w_{ee})$$

The unit production cost will be identical in W and E. A subscript 'n' denotes a common value for W and E. Cost can differ between north and south however, so the unit costs of X in north and south are given by $c_n$ and $c_s$.

The per-unit specific trade costs for the final good will be denoted $\tau$. Throughout the paper, we assume equal trade cost for X between W and E and between S and E, so the common values of these trade costs will be denoted $\tau$. In the symmetric case, this will also equal the cost of shipping from a plant in S to N, while in the free-trade-area case, the latter cost is zero. Hence we only need a single parameter to represent the cost of trading X, this being zero for S-W trade in the free-trade-area case.

As noted earlier, we have in mind a deeper integration than just zero tariffs when we refer to a "free-trade area"; in particular, agreements that allow cost advantages to insider firms over outsider firms. These range from allowing free trade in intermediate goods and services to less costly establishment of foreign subsidiaries. We consider two versions of cost disadvantages of foreign production, referred to as fragmentation costs, the first being the fixed-cost case. Basic fixed costs are F, the added cost of having a second plant is G/2, and the added cost of a plant abroad is G/2. Fixed costs are then: (F) for a single plant at home, (F + G/2) for a single plant in S, (F + G) for two plants, one at home, (F + 3G/2) for two plants, both abroad. The W-S free trade area eliminates the additional fixed cost of fragmentation for firm W for a

plant in S, in addition to the trade cost $\tau$ for final goods shipped from S to W. If firm W has a single plant in S its fixed costs are just F (instead of F + G/2 for firm E) and if it has two foreign plants, in S and E, its fixed costs are F + G (instead of F + 3G/2 for firm E).

The second is a variable-fragmentation-cost version (e.g., trade in intermediates as in Yi 2003) in which a northern firm incurs an added cost $\sigma$ for production outside its home country. This cost is the same for all foreign production, except that the W-S free-trade area eliminates this cost for firm W to produce in S. Firm E incurs $\sigma$ to produce in S but can then ship output to W without incurring $\tau$. Note that without one of these two cost assumptions, insider and outsider firms are in exactly the same position with respect to the free-trade area (e.g., the outsider is not at any disadvantage). Fixed costs are F for a one-plant firm, F + G for any two-plant firm.

Equilibrium is found as the sub-game perfect solution to a two-stage game in which firms first select the number and location of their plants, and then play a Cournot-Nash game in outputs. Solving the second stage problem first, we then have a normal-form representation in which a payoff matrix gives the profits to the firms for the first-stage choices by both firms.[4]

Each firm has five strategies. For firm W these are WW (national), WWE (horizontal), WWS (third-country EP), WS (global EP), WSE (home EP), and similarly for firm E. This generates a 5x5 payoff matrix for the normal form of the game, with 25 cells, each cell having two profit levels. We present the equilibria we found for the symmetric and free-trade-area cases. We believe that this is a complete set, but do not have a formal proof. We work with

---

[4]The firm and "subsidiary" can be viewed as an integrated decision-making unit, or can be viewed as independent. In the second case, there is a well-known issue about the parent strategically (transfer) pricing an intermediate so as to make the subsidiary a more aggressive competitor. Irmen (1998) provides a survey of the literature, and Motta (2004) provides a textbook treatment and references. Also: Gal-Or (1991) and Rey and Stiglitz (1995).

While this is certainly a valid approach, it creates an number of difficulties for us, particularly in the case of global export-platform production where the firm uses the southern subsidiary to supply both markets. Strategic pricing of the intermediate will in general require the parent to set two different prices for the intermediate, depending on which market the (embodied) intermediate is destined for. This in turn opens other cans-of-worms such as the parent being able to monitor the shares of output that the "independent" subsidiary is selling to the two markets. Finally, strategic pricing of intermediates typically means a price less than marginal cost, which is *illegal* according to taxation rules on transfer pricing in all countries (since an arm's length price would never be less than marginal cost). Thus we will make the assumption that the firm and foreign plant are an integrated decision-making unit.

numerical simulation in addition to analytical methods, and the former finds all pure-strategy Nash equilibria for a large range of parameter values.

Consider the second stage first. The algebra of the basic Cournot duopoly game will be quite familiar to most readers, so we will just recap the results. Drop the production location subscript for the moment and let $X_i^i$ and $X_j^i$ denote the supplies of firm i to market j from whatever production location is chosen. Let $\gamma_i^i$ and $\gamma_j^i$ be firm i's unit cost of supplying its own and foreign markets respectively from whatever production location is chosen, inclusive of trade costs for final and intermediate goods (if any). Then Cournot equilibrium quantities supplied are

$$(3) \qquad X_i^i = (\alpha - 2\gamma_i^i + \gamma_i^j)/(3\beta) \qquad X_j^i = (\alpha - 2\gamma_j^i + \gamma_j^j)/(3\beta).$$

It is also fairly well known that profits before fixed costs in this model are just ß times the output squared in each market.

$$(4) \qquad \pi^i = \beta(X_i^i)^2 + \beta(X_j^i)^2 - (fixed costs)$$

Using this general approach, we solve for the profit levels of each of the firms for each of its strategies, given each of the five strategies its rival plays, forming the 5x5 payoff matrix. In the symmetric case, we find four possible equilbria, all symmetric:[5]

| | |
|---|---|
| WW EE | *national firm regime*: each firm serves its rival's market by exports |
| WWE, EEW | *horizontal firm regime*: each firm serves its rival with a local plant |
| WWS, EES | *third-country EP regime*: each firm serves its rival's market from a plant in S (occurs only with $\sigma > 0$, cannot occur in the fixed-cost case) |
| WS ES | *global EP regime*: each firm both markets from a single plant in S |

[5]Asymmetric outcomes with multiple equilibria are possible in this type of model (Horstmann and Markusen 1992, Markusen 2002, chapter 3). Our working paper (Ekholm, Forslid, Markusen 2005) includes an appendix where demand in S is added, showing that there are asymmetric, multiple equilibria. In that appendix, we present an intuitive argument why there are no asymmetric/multiple equilibria in the present symmetric case with no demand in S.

In the asymmetric W-S free-trade area, we find additional equilibrium (and symmetric horizontal and national outcomes cannot occur: firm W never has a plant at home with $c_n > c_s$).

WSE EES *home EP* for firm W, *third EP* for firm E

WS, EES *global EP* for firm W, *third EP* for firm E

WS, EE *global EP* for firm W, *national production* for firm E

Figures 1-4 present simulations of the model, solving for the Nash equilibrium regime over a grid of parameter values for the relative cost of producing in the south versus north (expressed as a proportion of northern home costs) plotted against the added costs of producing abroad. Figures 1-2 are for the fixed cost case, so the added costs are expressed as a proportion of home fixed costs (F). Figures 3-4 are for the unit cost case, so the added costs are expressed as a proportion of home unit costs ($c_n$). Values for other parameters are held constant ($\alpha$, $\beta$, $\tau$, F, $\sigma$ (=0) in Figures 1-2; $\alpha$, $\beta$, $\tau$, G, F in Figures 3-4).

Let us stick with the fixed-cost case of Figures 1-2 to simplify the exposition ($\sigma = 0$, no variable costs for trading intermediate goods and services). The full algebraic derivation of the variable-cost case is found in Ekholm, Forslid and Markusen (2005). Let $\Delta c = c_n - c_s > 0$ denote the cost *disadvantage* of the north. Boundaries shown in Figure 1 are given by:

(5) $$\tau - \frac{5\tau^2}{2(\alpha - c_n)} = \frac{9\beta}{2(\alpha - c_n)}G$$ WWE EEW - WW EE

(6) $$2\Delta c = 2\tau - 2(\alpha - c_n) + \left[(2\alpha - 2c_n)^2 - 9\beta G\right]^{0.5}$$ WWE EEW - WS ES

(7) $$2\Delta c = 2\tau - 2(\alpha - c_n) + \left[(2\alpha - 2c_n)^2 - 4\tau(\alpha - c_n) + 9\beta G\right]^{0.5}$$ WW EE - WS ES

Expressions for boundaries are complex because the firm will in general produce different quantities and different prices will prevail in the two regimes it is indifferent between. To get some simple intuition behind the boundaries in Figure 1, consider a non-strategic experiment in which the firm wants to *minimize the costs* of supplying one unit of output to each market.

(a) Firm W is indifferent between a national strategy WW and a horizontal strategy WWE if the cost of shipping X to E is just equal to the added cost per unit of output of producing in E: $\tau = G$. This is independent of the cost of producing in S, and gives the intuition behind the vertical boundary in Figure 1 between horizontal and national regimes.

(b) Firm W is indifferent between a horizontal strategy WWE and a global EP strategy WS if the northern cost disadvantage over both markets ($2\Delta c$) equals the added trade cost from S to both markets ($2\tau$) minus the cost saving of having only one plant in S versus plants in both countries($G/2$): $2\Delta c = 2\tau - G/2$. This gives some intuition for the a positive relationship between $c_s$ and G in Figure 1.

(c) Firm W is indifferent between a national strategy WW and a global EP strategy WS if the northern cost disadvantage of serving both markets from the north rather than the south ($2\Delta c$) equals the added trade cost of serving W from S rather than domestically ($\tau$) plus the added fixed cost of having a single plant in S rather than a single plant at home ($G/2$): $2\Delta c = \tau + G/2$. This gives some intuition for the negative relationship between $c_s$ and G in Figure 1.

Figure 3 presents the corresponding results for the symmetric variable-cost case. The boundary between the horizontal and global EP regimes now has the opposite slope: raising the fixed cost of foreign production tends to make the firm switch to single-plant production (Figure 1) while raising the unit cost of foreign production tends to lead the firm to switch from one-plant to two-plant production (Figure 3). The other thing that can occur when the fragmentation costs of foreign production fall on variable rather than fixed costs in the symmetric case is that a symmetric third-country EP strategy can be an equilibrium. The unit costs of shipping intermediate goods and services to S may mean that the firm wishes to retain a home plant and serve the other northern market from the export platform for some parameter values.

Now consider the W-S free-trade area, shown in Figures 2 and 4, concentrating on the fixed-cost case of Figure 2. Again using $\Delta c = c_n - c_s$ to denote the cost disadvantage of the north, the boundary conditions are given by:

(8) $\Delta c = \tau - \frac{3}{4}\left[\frac{3\beta}{\alpha - c_s - \tau}\right]G$ boundary between: WSE EES - WS EES

(9) $\Delta c = \tau - \frac{3}{8}\left[\frac{3\beta}{\alpha - c_n}\right]G$ boundary between: WS EES - WS ES

(10) $\Delta c = -\tau + \frac{3}{4}\left[\frac{3\beta}{\alpha - c_n - \tau}\right]G$ boundary between: WS EES - WS EE

These expressions help provide some of the intuition behind Figure 2. In the northwest section, there is a region in which each firm has a plant in S to serve W and a plant in E to serve E (WSE EES). Even though firm W has two foreign plants, it only incurs one G by our assumption that the free-trade area allows it to avoid fixed costs in S. As G rises, firm W will switch to global EP, dropping its plant in E, which saves the fixed cost G. Firm E is in an asymmetric position, since it can only save G/2 by closing its plant in E and having a single plant in S: thus there are a range of parameters such that the regime is WS EES in Figure 2. Further increases in G or fall in $c_s$ lead firm E to also switch to global EP.

At a very small cost advantage for S (high $c_s$) and a high G we also get an asymmetric outcome WS EE in the northeast corner of Figure 2. Adopting a national-firm strategy for firm E saves it the fixed cost G/2, while it would not save firm W anything.

As we did in Figure 1, we can get some intuition about the boundaries in Figure 2 by considering a non-strategic experiment in which the firm wants to *minimize the costs* of supplying a one unit of output to each market.

(a) The boundary between WSE EES and WS EES involves just firm W, and is an indifference condition between home and global EP, which is in turn just a condition on serving market E. With home EP, the cost of a serving E with a local plant is ($c_n$ + G) while the cost of serving E from S in global EP is ($c_s$ + $\tau$). Thus there is cost-indifference if $\Delta c = \tau$ -G, which has a positive slope of 1 between $c_s$ and G.

(b) The boundary between WS EES and WS and ES involves just firm E, and is an

indifference condition on how firm E serves its own market E. Having two plants in EES means that the cost of serving E is ($c_n$ + G) while if it pursues global EP (ES) then firm E's cost of serving E from S is ($c_s$ + τ + G/2). The cost-indifference condition is thus Δc = τ - G/2, which has a positive slope of ½ between $c_s$ and G.

(c) The boundary between WS EES and WS EE again involves just firm E, and involves changing the way it serves market W. If it chooses third EP (EES), then its costs are ($c_s$ + G) while if it chooses the national strategy (EE) its costs are ($c_n$ + τ). Thus it is cost indifferent if Δc = - τ + G. This is a negatively-sloped relationship between $c_s$ and G.

Finally, note that under our assumptions, firm W will never have a home plant (provided of course that $c_s$ is strictly less than $c_n$ (Δc > 0)). Similarly, firm E will never have a plant in W under these assumptions. Thus symmetric horizontal and national strategies cannot be equilibria.

Figure 4 shows the case where the added costs of foreign production fall on variable costs. The only significant difference is that the slope of the boundary between WS EES and WS ES is negatively sloped instead of having a positive slope in Figure 2. This is for the same reason noted earlier: increased unit fragmentation costs of foreign production encourage firm E to have a home plant (Figure 4) while increased fixed costs discourage firm E from having a home plant (Figure 2). Once again, WS EES only exists when there is the fragmentation cost of foreign production for E.

In summary, the symmetric case produces only symmetric Nash equilibria. Production in the south is chosen when the south has a significant cost advantage, and when the unit fragmentation cost of producing abroad is small (unit cost case) or when the fixed fragmentation cost of producing abroad is moderate. Eliminating trade costs on the W-S link and the fragmentation cost for insider firm W producing in S, leads to very significant regime shifts, except when both firms chose global EP to start with in the symmetric case. When the cost advantage of S is small and the fragmentation cost is small, both firms switch from horizontal strategies to having a plant in E to serve E and a plant in S to serve W (both fixed and variable

cost cases). As the fragmentation cost rises, firm W will switch first to global EP, allowing it to save these costs, while firm E cannot make a saving by doing so (both cases). This interesting asymmetric outcome only exists given our assumption of a fragmentation cost of foreign production. In other words, at 0.0 on the horizontal axis of either Figure 2 or Figure 4, no fragmentation cost of foreign production, the asymmetric region WS EES does not exist for any values of $c_s$.

## 4. Empirical Analysis

In the symmetric case, affiliates either have balanced exports between sales to the parent country and to third countries, or exports concentrated in sales to third countries. For affiliates in countries which are members of free-trade areas, affiliates exports may be concentrated to other countries in the free trade area, but while this seems intuitive, we showed that it is in fact only true for certain ranges of parameters. In particular, the insider firm chooses global EP for a wide range of parameter values for which the outsider firm chooses third EP. Because of the number of possible outcomes (number of regimes that can be equilibria), it is especially valuable here to turn to the data for some insights.

In this section, we shall utilize data on exports from affiliates of US multinationals to show that the pattern of exports sales of foreign affiliates of US multinationals resembles the regime WSE EES for North America and Europe; i.e. the one in which an outsider firm chooses third-country EP while an insider firm chooses home-country EP (northwest region of Figures 2,4). Other countries show a much more balanced pattern of exports, consistent with the global EP regions in Figures 1 and 3.

Our dataset contains information about US manufacturing affiliates' in 39 host countries 1984-2003. It is based on publicly available data on US multinationals collected by the Bureau of Economic Analysis (BEA). A weakness of the data is that exports to third countries are aggregated over all countries. Thus while we might reasonably conjecture that US affiliate

exports from Ireland to third countries are almost exclusively to other EU countries, we cannot know this for sure.

The US is an insider country with respect to the NAFTA countries, Canada and Mexico, while it is an outsider country with respect to the integrated European market. We carry out two sets of regressions, both using exports to third countries as a share of total affiliate exports as dependent variable: (i) random-effects regressions estimating the effect of being located in the North American and European region, respectively, as well as the effect of entering the NAFTA and EU free-trade areas, and (ii) fixed effect regressions estimating the effect of the latter. While both regressions will give us estimates of the effect of entering a free-trade area on the share of third-country exports, the random-effects regression will also tell us whether or not geography places a major role: these time-invariant variables are stripped out in the in the random-effects regressions. This is a problem since North American and European locations are constitute relatively integrated markets independent of the formation of formal free-trade areas through NAFTA and the EU. The fixed effect regressions, however, may better capture the effect of a country entering a free-trade area that makes the firms either insiders or outsiders.

The independent variables used are dummy variables:[6]

North American geography (NA GEO) = 1 for Canada and Mexico in all years

European geography (EU GEO) = 1 for 17 European countries in all years
(EU 15 plus Norway and Switzerland)

NAFTA = 1 for Mexico at/after 1994, Canada at/after 1989

EU = 1 for an EU 15 country at/after accession (Portugal, Spain, Austria, Finland and Sweden enter during the sample period)

[6] With respect to the NAFTA and EU dummies, countries joining a free-trade area often have preferential trading agreements prior to accession, so these dummies may not capture much and we find this to be the case.. Furthermore, although countries such as Norway and Switzerland are not members of the EU, they are still integrated with the rest of Europe through membership in the European Free Trade Association (EFTA). Norway is part of the European Economic Area (EEA) since 1992. When Canada and the US formed a free-trade area in 1989, Canadian affiliates already exported very little to third countries. Mexico began very unilateral liberalizations, including on FDI, well before entry into NAFTA in 1994. Furthermore, its accession was an agreement with both a parent and third country (Canada) so there is little reason to expect a significant change in its exports in favor of the parent country.

A group of control variables from the Markusen-Maskus data set are also used (Carr, Markusen, and Maskus, 2001, Markusen and Maskus 2001, 2002).[7]

GDP host-country GDP (real US$, trillions)

Skilled share (SKL) host-country skilled labor as a share of total labor (ILO)[8]

Investment cost (INVC) an index of host-country investment costs/barriers (Global Competitiveness Report, 0.0-100)

Trade cost (TC) an index of host-country trade costs/barriers (Global Competitiveness Report, 0.0-100)

Distance (DIST) distance from Washington DC (1000s kilometers)

Table 2 shows the results from the regressions. We have added time dummies to take out any time effects affecting the whole sample. One reason for including time dummies is that there may be trend-wise changes in the overall pattern of exports to different destinations. Another is that it is a way to deal with potential problems arising from the way data is collected. The observations used are based on comprehensive surveys including the universe of US multinationals, so-called benchmark surveys, in some years, while they are based on a combination of the latest benchmark survey and a survey of a smaller sample of firms in intermittent years. Since there may be systematic differences between firms included in the samples and firms only included in the benchmark surveys, we need to control for the possibility that there are systematic differences in the composition of affiliate sales and exports between benchmark years and intermittent years.

The estimated coefficients in Table 2 of the dummy variables for North American and European geography give us the predicted deviation in the dependent variable for countries belonging to these regions. The results of the random-effects regression in column (1) show that affiliates in Canada and Mexico export much less to third countries than affiliates in other

[7] Previous studies using this data-set have shown that these variables are important in determining levels of affiliate activity and the composition of sales between local sales and exports.

[8] The sum of occupational categories 0/1 (professional, technical and kindred workers) and (administrative workers) in employment in each country, divided by total employment.

countries.[9] Affiliates in Europe exhibit the opposite pattern: they export much more to third countries. The difference between North America and Europe is striking. According to our estimates in column (1), the share of third country exports is about 83.5 percentage points (30.6 - (-52.9) = 83.5) higher in affiliates in Europe than in affiliates in North America when controlling for other factors. The estimated coefficients themselves indicate that, controlling for other factors, affiliates in North America are predicted to have a share of exports to third countries that is 52.9 percentage points lower than affiliates in other countries. Similarly, affiliates in Europe are predicted to have a share of exports to third countries that is 30.6 percentage points higher than affiliates in other countries. These differences are summarized in Table 1, Panel B.

The difference in the estimated effect on third-country exports between being located in North America, on the one hand, and being located in Europe, on the other, is consistent with the predictions of the asymmetric model under the parameterization whereby the regime WSE EES arises in equilibrium. When the affiliates belong to an insider firm (affiliates located in Canada and Mexico) their exports are mainly directed to the parent country because third countries are served by local affiliates. However, when affiliates belong to an outsider firm (affiliates located in Europe), their exports are mainly directed to other countries within the region because the parent country is served by a local plant. This particular equilibrium regime arises when the host ("south" in the theory model) has a moderate cost advantage and the added cost of producing abroad are moderate (Figures 2,4).

Implicitly, the results also indicate that other affiliates not in a free-trade area have a much more balanced pattern of exports, consistent with the global EP outcome in the symmetric model (Figures 1,2). The coefficients on the constant term in the regression (0.591) which takes into account the controls does not differ much from the simple sample mean of 0.66 shown in Panel A of Table 1.

[9] According to a Hausman's specification test we cannot reject the null hypothesis of no systematic difference between coefficients of the fixed and random effect models, implying that we find no evidence of correlation between the random effects and the regressors (assuming that the model is correctly specified).

The results from the fixed–effects regression are presented in column (2). Only the estimated coefficient of entering EU is statistically significant.[10] However, this estimate is negative, implying that the share of third-country exports on average is lower after entering EU than before for those countries that enter during the sample period. This result is mainly driven by a noticeable decline in the share of third-country exports in *total exports* of affiliates located in the countries joining the EU in 1995 (Austria, Finland and Sweden). In column (3) we present results from a fixed-effect regression using third country exports in *total sales* as the dependent variable and distinguishing between the 1986 and 1995 entrants into the EU. The estimated coefficient of EU95, which is a dummy variable taking the value one for Austria, Finland and Sweden in 1995 and all subsequent years, is positive and significant. According to this estimate, entry into the EU was associated with an increase in third country exports as a share of total sales by about ten percentage points for these countries. Apparently, for these countries, EU membership was associated with a big increase in overall exports, which indicates a move towards global export platform production.

The fixed effects regressions, designed to capture unobservables, "overcompensates" in our view by stripping out the crucial (observable) characteristic of geography. The added effects of formal NAFTA or EU entry are small and generally statistically insignificant (except EU entry in the fixed-effects regressions: statistically significant but still dominated by geography).. As suggested in an earlier footnote (6), we feel that this is because both Canada and Mexico were highly integrated with the US prior to formal entry; affiliates there exported little to third countries before entry, so that the dependent variable cannot fall much. Similarly and conversely, the five EU entrants during the sample period all exported little back to the US before entry, so there was not a lot of scope for the third-country share to rise after entry.

Few of the estimated coefficients of the control variables turn out statistically significant.

[10] The low precision of the estimate of entering NAFTA is perhaps not very surprising considering that this effect is identified solely through changes in the share of third country exports by Canadian and Mexican affiliates, which were quite low prior to entry.

The coefficients on the skilled share and investment costs are the only ones significant in at least one specification. But theory gives us little guidance as to how these controls should affect the share of third-country exports (as opposed to levels of sales, for example) in any case.[11]

A few concluding remarks on the relationship between the theory and empirical work are in order. The constant terms in regressions 1 and 2, the predicted share of total exports to third countries for non-North American non-European countries indicates a balance between home and third-country exports. This is consistent with the global EP outcomes which we see in Figures 1-4. But the theory predicts the global EP outcome for both the symmetric and asymmetric cases under similar parameter values (large southern cost advantage, high added fixed cost or low added marginal cost of foreign production).

Because of this, the distinct differences for a US affiliate being an insider in North America and an outsider in Europe is especially useful in establishing the plausibility of the model. The empirical outcome that an insider affiliate adopts a home-country EP strategy and an outsider a third-country EP strategy is consistent with the asymmetric case when the host has a moderate cost advantage and the fragmentation costs of foreign production are low. This in turn suggests that our theory model is a good vehicle for analyzing questions such as the gains to insiders versus outsiders from a free trade area: this is beyond the scope of this article, but treated fully in our longer working paper.

As a final point, we acknowledge that our empirical results on geography could be generated by other market structures, probably including a simple one-firm monopoly model, so we cannot claim that our model is favored over plausible alternatives by the results. We chose the duopoly framework insofar as there has been much interest in both theory and policy about effects on insiders and outsiders as to who gains and loses from a regional FTA (e.g, Japanese firms benefitting from NA or EU integration (Lopez-de-Silanes, Markusen, Rutherford 1995)).

[11] Note that our results are not immediately comparable to the result in Hanson and Slaughter (2001), and Hanson, Mataloni and Slaughter (2005) about export platform exports since their measure is based on third country exports as a share to total sales rather than total exports.

5. Summary

Export-platform direct investment is usually taken to refer to a situation where the output of a foreign affiliate is largely exported rather than sold in the host country. Our approach adopts a three-country model, with two identical large, high-cost countries and a small, low-cost country. This requires somewhat more precise terminology, so we differentiate between third-country, home-country and global EP production.

We consider two cases. In the first, the added costs of foreign production (fragmentation costs) are the same on all trade links as are the trade costs for final goods. The northern firms both choose a plant in S and choose third-country strategies when S has a moderate cost advantage, and trade costs for intermediates are moderate but not too low relative to the costs of shipping final goods. When the south has a large cost advantage and fixed (variable) fragmentation costs are high (low), the firms chose a global EP strategy.

Our second case involves a free-trade area, reducing both the cost of foreign production and the cost of trading the final good between one high-demand, high-cost country and the low-cost, low-demand country. When S has a moderate cost advantage and fragmentation costs are moderate, the insider northern firm chooses a home EP strategy and the outsider firm chooses a third-country EP strategy.[12]

We then turn to empirical analysis, examining the shares of exports by affiliates to the parent and third countries. Results for US affiliates in North America and Europe are most consistent with the WSE EES equilibrium of Figures 2 and 4, where the insider firm pursues a home-country EP strategy, serving itself from S and serving the other high-income country from a plant in that country. The outsider firm pursues a third-country EP strategy, serving itself with

[12]While it is beyond the scope of this paper, our longer working paper shows that, when fragmentation costs fall on variable costs, it may be the outsider firm which may benefit relative to the insider firm and indeed the insider firm can actually lose from the free-trade agreement. The intuition is that the outsider's ability to export final goods cheaply to the insider country from the plant in S is worth more than the insider's ability to export intermediates cheaply to a plant in S. In the negotiations over NAFTA, US firms were particularly concerned with raising barriers to European and Japanese firms to prevent them from or at least penalize them for using Mexico as an export platform to the US, which is consistent with this result (see Lopez-de-Silanes, Markusen and Rutherford, 1996).

a local plant and serving the insider country from a plant in S. This is closely consistent with the outcome mentioned in the previous two paragraphs.

Results show that being located in North America or Europe has a large effect, whereas formal entry into NAFTA or the EU does not. We gave reasons why we think that this is the case. (1) The entering countries were highly integrated with their regional partners before formal entry. (2) Third-country exports from Canada and Mexico were low prior to entry and thus had little scope to fall. (3) Parent-country exports from EU entrants were small prior to entry and thus had little scope to fall. (4) To the extent that there is some explanatory power in the fixed-effects regressions (for the EU only), it indicates a move toward global EP.

For countries not in North America or Europe, we implicitly find a much more balanced pattern of exports. This is in turn consistent with the symmetric case that generates global or third-country EP production in Figures 1 and 3.

Returning to the North American and European empirical results that are consistent with the WSE EES equilibrium of Figures 2 and 4, these results may be consistent with the theoretical scenario in which it is the *outsider firm* which is the relatively larger beneficiary of the free-trade area (Ekholm, Forslid and Markusen, working paper 2005).

One final point relates our results to earlier theory. Referring back to Figures 1-4, our empirical results resemble the WSE EES outcome for the asymmetric case. Our theoretical results in Figures 2 and 4 indicate that these occur when trade costs for intermediates or added fixed costs of fragmentation are modest relative to trade costs for final goods. This may fit well with some relatively new theory that assumes parents supply knowledge-based services to affiliates which, although they require large fixed costs to develop, may be supplied to affiliates at low costs once created (e.g., the knowledge-capital model by Markusen, 2002).

The authors thank participants at the NOITS conference in Copenhagen, the ERWIT conference in Bern, the ETSG conference in Madrid, and a conference at Hitosubashi University during 2003 for important comments and suggestions. Also to workshop participants in Trinity College Dublin, the European University Institute, CERGE Prague. Financial support from the Bank of Sweden Tercentenary Foundation is gratefully acknowledged. Thanks especially to two referees who put a lot of effort into improving the paper.

REFERENCES

Blonigen, Bruce (2001), "In Search of Substitution between Foreign Production and Exports", *Journal of International Economics* 53, 81-104.

Blonigen, Bruce A,. Ronald B. Davies, Glen R. Waddell, and Helen T. Naughton (2005), "FDI in space: spatial autoregressive relationships in foreign direct investment", University of Oregon working paper, October 2205.

Braconier, Henrik and Karolina Ekholm (2001), "Foreign Direct Investment in Central and Eastern Europe: Employment Effects in the EU", CEPR working paper No. 3052.

Braconier, Henrik and Karolina Ekholm (2000), "Swedish Multinationals and Competition from High and Low-Wage Countries", *Review of International Economics* 8, 448-461.

Brainard, S. Lael (1997), "An Empirical Assessment of the Proximity-Concentration Tradeoff between Multinational Sales and Trade", *American Economic Review* 87, 520-544.

Carr, David, James R. Markusen and Keith E. Maskus (2001), "Estimating the Knowledge-Capital Model of the Multinational Enterprise", *American Economic Review* 91, 693-708..

Ekholm, Karolina, Rikard Forslid and James R. Markusen (2005), "Export-Platform Foreign Direct Investment", updated working paper: http://spot.colorado.edu/~markusen/workingpapers.html

Feinberg, Susan E. and Michael P. Keane (2003), "Accounting for the Growth of MNC-based Trade using a Structural Model of US MNCs", working paper.

GalOr, Ester (1991), Duopolistic Vertical Restraints, *European Economic Review* 35, 1237-1253.

Hanson, G. H., Mataloni, R. J., Slaughter, M. J. (2001), "Expansion Strategies of U.S. Multinational Firms", in Dani Rodrik and Susan Collins (eds.), *Brookings Trade Forum 2001*, 245-294.

Hanson, G. H., Mataloni, R. J., Slaughter, M. J. (2005), "Vertical Production Networks in Multinational Frims", *Review of Economics and Statistics*.

Horstmann, Ignatius J. and James R. Markusen (1992), "Endogenous Market Structures in International Trade", *Journal of International Economics* 32, 109-129.

Hummels, David (2001), "Toward a Geography of Trade Costs", mimeo, Purdue University.

Irmen, Andreas (1998), "Precommitment in Competing Vertical Chains, *Journal of Economic Surveys* 12, 333-359.

Lopez-de-Silanes, Florencio, James R. Markusen and Thomas Rutherford, "Trade Policy Subtleties with Multinational Firms", *European Economic Review* 40 (1996), 1605-1627.

Markusen, James R (2002), *Multinational Firms and the Theory of International Trade*, Cambridge: MIT Press.

Markusen, James R. and Keith E. Maskus (2001), "Multinational Firms: Reconciling Theory and Evidence", in Magnus Blomstrom and Linda Goldberg (editors), *Topics in Empirical International Economics: A Festschrift in Honor of Robert E. Lipsey*, Chicago: University of Chicago Press, 71-98.

Markusen, James R. and Keith E. Maskus (2002), "Discriminating among Alternative Theories of the Multinational Enterprise", *Review of International Economics* 10, 694-707.

Motta, Massimo and George Norman (1996), "Does Economic Integration Cause Foreign Direct Investment", *International Economic Review* 37, 757-783.

Motta, Massimo (2004), *Competition Policy: Theory and Practice*, London: Cambridge University Press.

Neary, J. Peter (2002), "Foreign Direct Investment and the Single Market", *The Manchester School* 70, 291-314.

Rey, P. and Stiglitz, Joseph E. (1995), "The Role of Exclusive Territories in Producer Competition", *Rand Journal of Economics* 26, 431-451.

Yeaple, Stephen Ross (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.

Yeaple, Stephen Ross (2003), "The Role of Skill Endowments in US Outward Foreign Direct Investment", *Review of Economics and Statistics* 85, 726-734.

Yi, Kei-Mu (2003), "Can Vertical Specialization Explain the Growth of World Trade", *Journal of Political Economy* 111, 52-102.

Table 1

Panel A: Sales by US manufacturing affiliates: exports to the US and exports to third countries as shares in total sales and total exports, 2003

| | export sales to the US | export sales to third countries | share of total export sales to third countries | share of total export sales to third countries group average |
|---|---|---|---|---|
| All countries in sample (39) | 0.13 | 0.26 | 0.66 | **0.66** |
| Ireland | NA | 0.69 | NA | |
| Belgium | 0.05 | 0.56 | 0.92 | **0.93** |
| Greece | 0.01 | 0.08 | 0.91 | |
| Holland | 0.05 | 0.53 | 0.92 | |
| Portugal | 0.02 | 0.38 | 0.94 | |
| Spain | 0.02 | 0.39 | 0.96 | |
| Hong Kong | 0.15 | 0.28 | 0.65 | **0.66** |
| Indonesia | 0.02 | 0.13 | 0.86 | |
| Malaysia | 0.39 | 0.28 | 0.42 | |
| Philippines | 0.35 | 0.38 | 0.52 | |
| Singapore | 0.15 | 0.43 | 0.74 | |
| China | 0.08 | 0.23 | 0.75 | |
| Canada | 0.34 | 0.05 | 0.12 | **0.22** |
| Mexico | 0.31 | 0.15 | 0.32 | |

Panel B: Random effects regressions: predicted differences in percentage points from an "other" country (first regression of Table 2)

| | Exports to third countries share of total exports: point estimates* |
|---|---|
| NA GEO | -53 |
| NA GEO + NAFTA | -54 |
| EU GEO | 31 |
| EU GEO + EU | 26 |

*We present point estimates regardless of statistical significance. NA GEO + NAFTA, for example, adds together the coefficients on NA GEO and NAFTA from Table 2.

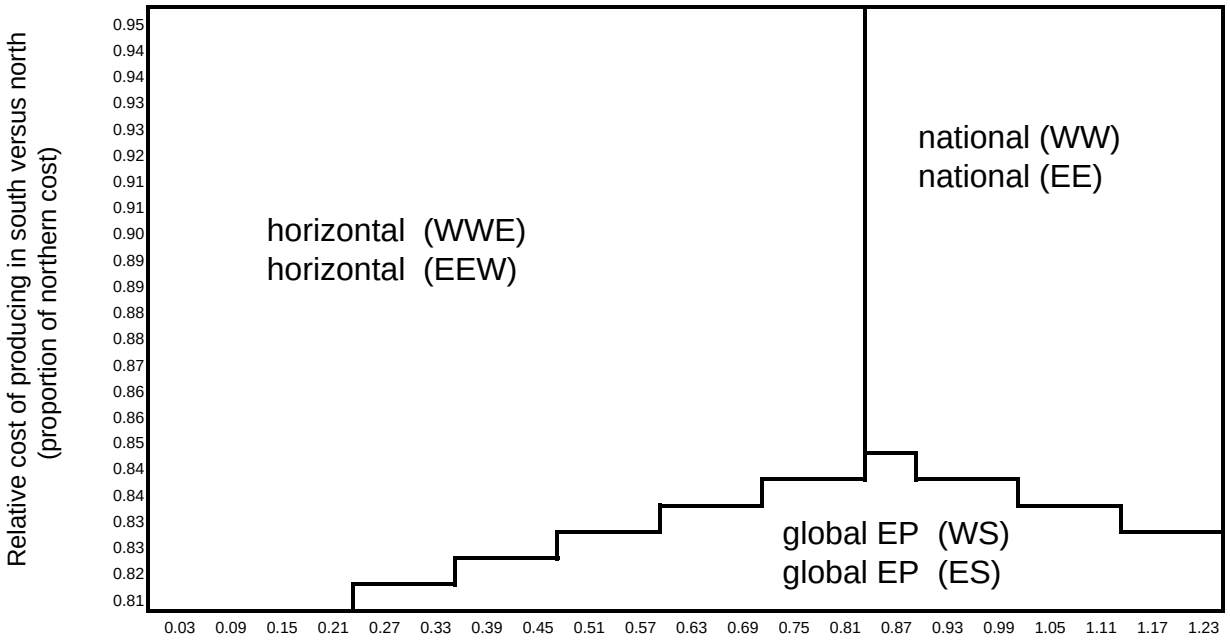
Note: "NA GEO + NAFTA" refers to a North American country in a year in which it is a member of NAFTA (Canada at/after 1989, Mexico at/after 1994). Similarily, "EU GEO + EU" refers to a European country in a year in which it is an EU member. Thus, for example the difference between "NA GEO" and "NA GEO + NAFTA" is the added effect of joining NAFTA.

Table 2: Results from random effects and fixed effects regressions: third-country exports as a share of total exports and as a share of total sales, 1984 2003

| Dependent variable | Third-country exports as a share of total exports | Third-country exports as a share of total exports | Third-country exports as a share of total sales |
|---|---|---|---|
| *Method* | *random effects* | *fixed effects* | *fixed effects* |
| | (1) | (2) | (3) |
| USgeo | -0.529 | | |
| | (8.04)** | | |
| dNAFTA | -0.014 | -0.023 | 0.009 |
| | (0.37) | (0.66) | (0.42) |
| EUgeo | 0.306 | | |
| | (7.86)** | | |
| dEU | -0.051 | -0.076 | 0.063 |
| | (1.73) | (2.39)* | (3.12)** |
| gdp | -0.002 | -0.003 | -0.002 |
| | (1.07) | (1.07) | (1.22) |
| sklj | -0.195 | -0.361 | -0.076 |
| | (1.58) | (2.31)* | (0.74) |
| invcj | 0.003 | 0.002 | 0 |
| | (2.90)** | (1.75) | (0.27) |
| tcj | 0 | 0.001 | 0 |
| | (0.72) | (1.50) | (0.83) |
| distance | -0.002 | | |
| | (0.56) | | |
| Constant | 0.591 | 0.722 | 0.250 |
| | (8.27)** | (14.22)** | (7.62)** |
| Observations | 558 | 558 | 587 |
| Number of ct | 39 | 39 | 39 |
| R-squared | 0.66 (overall) | 0.11 (within ) | 0.12 (within) |

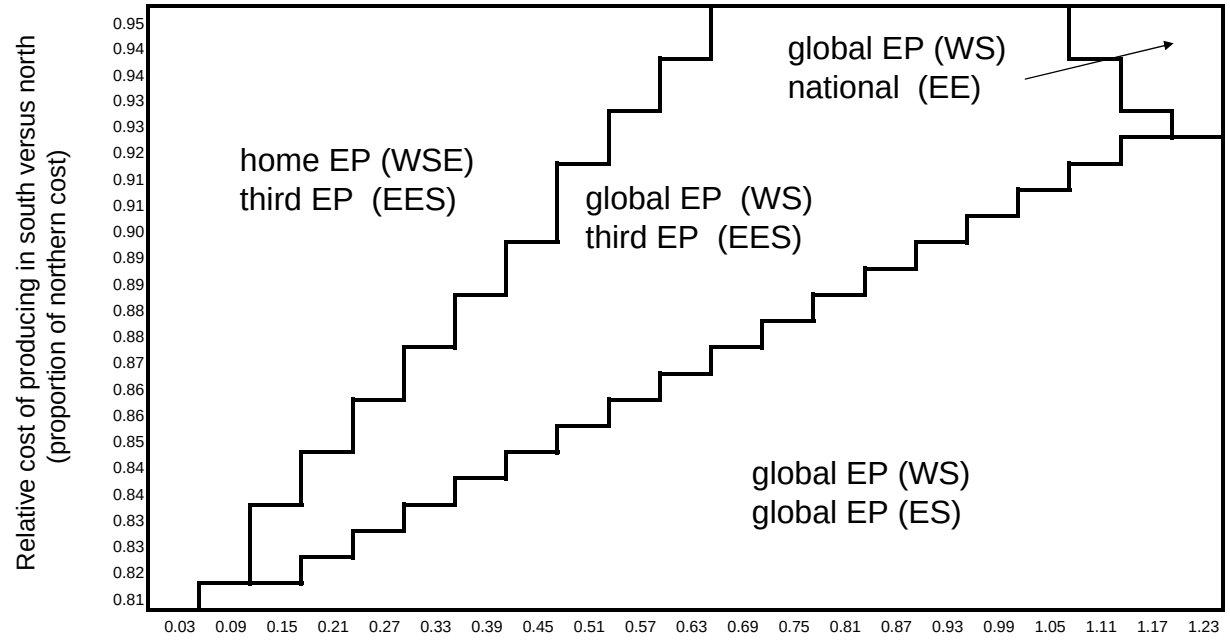
Absolute value of t statistics in parentheses
* significant at 5%; ** significant at 1%

Figure 1: Symmetric base case: trade / fixed costs the same on all links



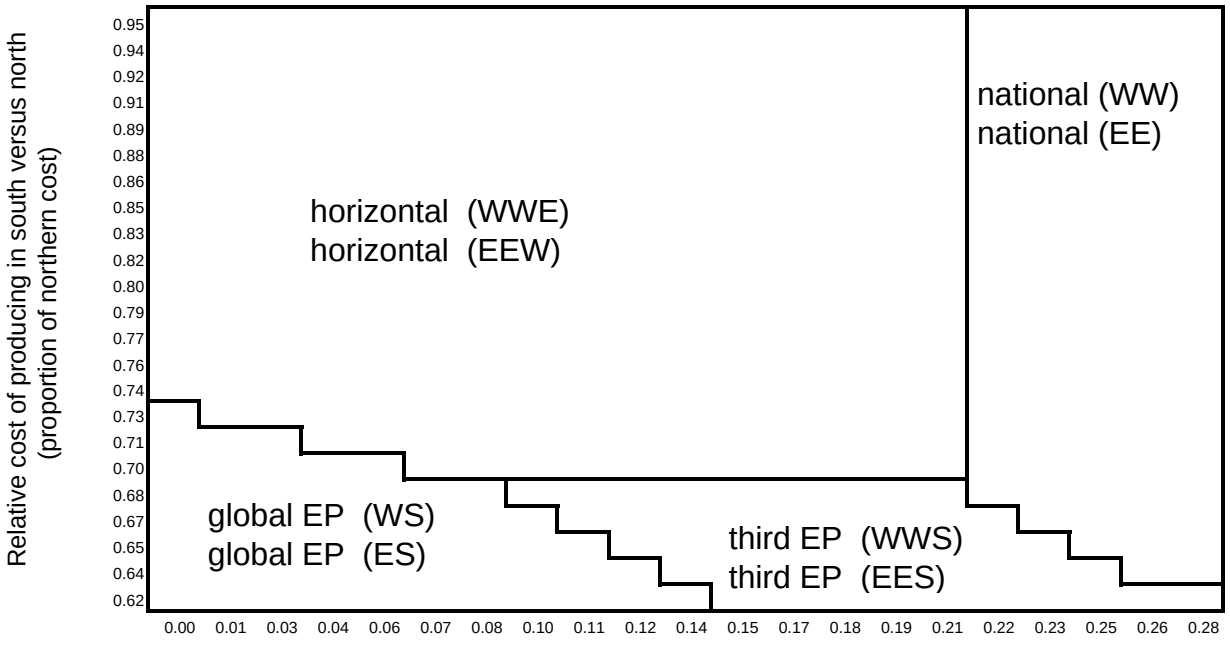

Interpretation of the horizontal axis: if the fixed cost of a single home plant is 1, then the added cost of a second plant is given by G. (A single plant in S adds G/2 to the home fixed cost)

Figure 2: W-S trade / fixed costs reduced by 100% from Figure 1



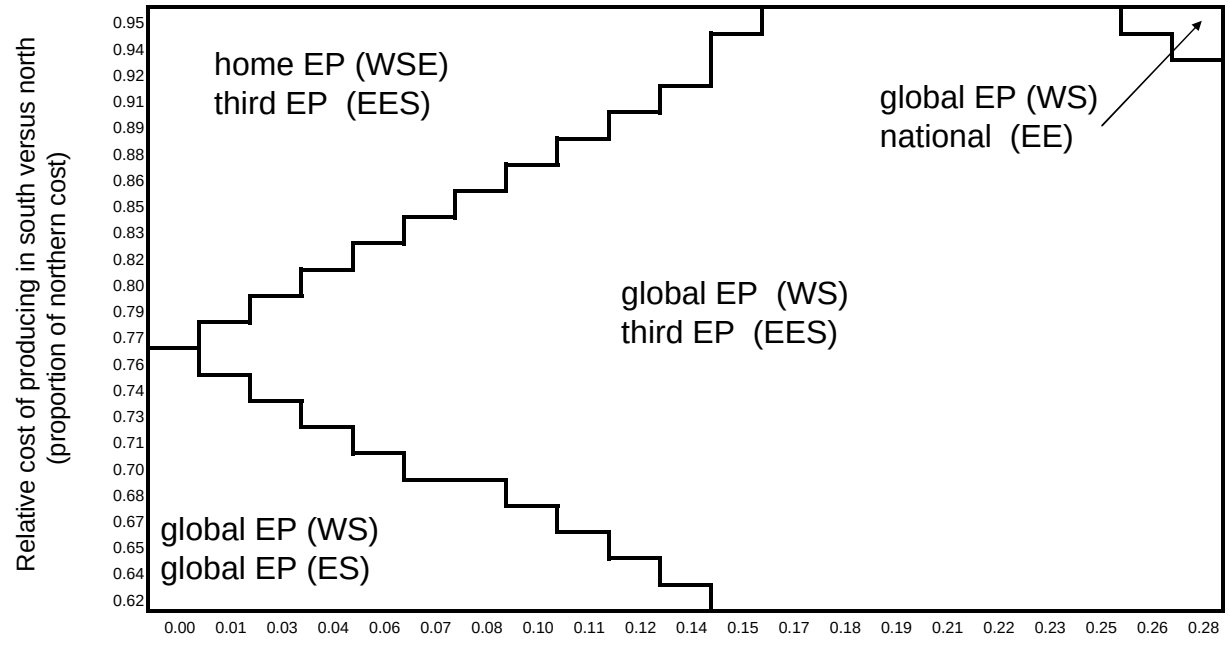

Horizontal axis is the added fixed cost G for firm E producing in W or S, firm W producing in E. There is no added fixed cost for firm W producing in S

Figure 3: Symmetric base case: trade costs the same on all links




Interpretation of cell (row 0.80, column 0.15): for firm W with home cost = 1, producing in E costs 1.15 (1.00 + 0.15), producing in S costs 0.95 (0.80 + 0.15)

Figure 4: W-S trade costs reduced by 100% from Figure 1




Horizontal axis "added cost" is now for firm E producing in W or S, firm W producing in E. There is no added cost for firm W producing in S