Boomerang Effect of FDI

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March 2004

Abstract

This article develops a duopoly model (one home and one foreign firms) of FDI examining whether the boomerang effect exists and what determines it. We show that for a given cost disadvantage to the home firm there is a range of of shipping costs with which the home firm chooses to be a multinational enterprise (MNE) performing FDI rather than to export its products, and that cost parameters, especially plant-specific fixed cost, and demand parameter affect the range of the shipping cost inducing FDI. We also show that the boomerang effect exists when the home firm reversely imports its products from the foreign country for sales in the home market. Our welfare analysis show that the existence of boomerang effect does not necessarily deteriorate the welfare of the home country, suggesting the firms of a industry facing intensified import competition to conduct more FDI as a policy implication, depending on the shipping cost. Trade liberalization in the foreign country has different effects on the home firm's incentive for FDI.

JEL Classification: F12, F23, O29.
Keywords: Boomerang effect, FDI, Reverse Imports.

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†The author thanks Fukunari Kimura and the seminar participants at Hitotsubashi University, Nagoya City University, and Yokohama National University for their helpful comments. Any remaining errors are mine.

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1 Introduction

The hollowlization of the Japanese economy, especially in the manufacturing industries, has been widely discussed. Because many people believe that the strength of the Japanese Economy stems from its manufacturing sector, they are concerned with the future of the Japanese Economy. One factor often pointed out is the rising Chinese economy. Many Japanese manufacturing firms have partially or completely moved their production facilities to China, which, many argue, has resulted in the loss of employment in the manufacturing sector. Why have many Japanese firms made foreign direct investments (FDI) in China? Two factors often have been argued; (1) very low labor costs, and (2) China's rapidly growing or potentially huge market.

Then, besides the possible decrease in the employment, what is the consequence of growing FDI by the Japanese firms? In the 1970s and the 1980s, FDI by Japanese firms to South Korea and other Asian countries have grown rapidly. At the same time, imports from these countries, especially textile products, have increased substantially. Shinohara (1976, 1982) called this phenomenon "boomerang effect" because the increase in imports was like a boomerang coming back after being thrown as a FDI. Now the increase in imports from China can been seen as another wave of the boomerang effect. However, the imports consist of various kinds of products; not just agricultural products and right-industry products but the so called high-tech products such as machinery and computers.

How can we formulate the boomerang effect as a model? Previous literature on FDI has made efforts to develop Dunning's OLI (Ownership, location, and internalization) framework.[1] However, few literature has discussed the boomerang effect of FDI either theoretically or empirically. Kim (1996) develops a model of one final-good industry with licensing to the foreign firm and one intermediate-good industry, and examine whether the sum of license fees, profits from intermediate-good exports, and an increase in consumer surplus are larger than the losses of final-good imports due to the boomerang effect. He shows examples of constant elasticity demand and linear demand, in both of which losses are larger than benefits. In his model, the decision of licensing is given and thus the incentive for the home firm in the final-good industry to give a license to the foreign competitor is not discussed.

Morikawa (1998) estimated FDI capital stock and other equations of Japanese firms using industry data of the 1970s and the 1980s. He found that on Japanese FDI capital stock, the world export excluding Japan has a positive effect while the

[1] See, for example, Dunning (1988). As a survey of the FDI literature, see Markusen (1995).

relative exporting price taking the exchange rate into account has a negative effect. He also found that the FDI capital stock has a positive effect on the subsidiary exports to Japan. This result might suggest a part of the boomerang effect.[2] Then he performed simulations based on the estimated equations. He assumed that Japanese FDI were larger than that actually occurred in the second half of the 1980s, and how these exogenous increases in FDI would affect the activities of Japanese firms. The result was a gradual increase in Japanese trade surplus, suggesting a small role of the boomerang effect.

This article develops a duopoly model (one home and one foreign firms) of FDI examining whether the boomerang effect exists and what determines it. We show that for a given cost disadvantage to the home firm there is a range of of shipping costs with which the home firm chooses to be a multinational enterprise (MNE) performing FDI rather than to export its products, and that cost parameters, especially plant-specific fixed cost, and demand parameter affect the range of the shipping cost inducing FDI. We also show that the boomerang effect exists when the home firm reversely imports its products from the foreign country for sales in the home market. Our welfare analysis show that the existence of boomerang effect does not necessarily deteriorate the welfare of the home country, suggesting the firms of a industry facing intensified import competition to conduct more FDI as a policy implication, depending on the shipping cost. Comparative statics developed in our model are applied for the effects of trade liberalization, and we show that depending on parameters changed, the trade liberalization has different effects on the home firm's incentive for FDI.

The rest of this article is arranged as follows. Section two develops a two-period model of duopoly. Section three discusses the condition for the home firm to be a MNE. Section four shows some measures of the boomerang effect. Section five performs an welfare analysis. Section six discusses policy implications for the effect of trade liberalization in the foreign country. Finally, Section seven concludes this article and also shows some extensions.

2 Model

The model is based on Horstmann and Markusen (1992). Suppose that there exists one firm in a home country and in a foreign country respectively. These two firms produce the same product and play the following two-period game. In period one,

[2]He estimated the equation of imports excluding the exports of subsidiaries to Japan, and the effect of the latter on the former is not clear from his estimates.

the home firm decides how many plants it builds. There are two options; (1) one plant in the home country, and (2) two plants, one in the home and one in the foreign countries respectively. In period two, the home and the foreign firms compete in quantity in both the home and the foreign markets.

Following Horstmann and Markusen (1992), we assume the following cost structure. G denotes a plant-specific fixed cost. It increases as the number of plant increases. s denotes a unit shipping cost for exports. By becoming a MNE, the home firm has to expend extra G while it may save the shipping costs for its foreign sales. We make an assumption of a lower marginal cost in the foreign country. This low marginal cost may be due to low wages in the foreign country and thus be an incentive for the home firm to build a plant in the foreign country. In both periods, the marginal cost of the foreign firm is m. The marginal cost of the home firm depends on where its plant is located. At the plant located in the home country, its marginal cost is $m + n$. On the other hand, at the plant located in the foreign country, its marginal cost is m, same as the foreign firm's. This causes a possibility of reverse imports by the home firm, i.e., importing the products made in the foreign country.

To derive demands of home consumer for home and foreign products, we consider the following problem. X denotes the quantity sold by the home firm in the home market and Y denotes the foreign counterpart. X^* and Y^* denote the quantities sold by the home firm and the foreign firm in the foreign market respectively.

$$\begin{aligned} \max\ U &= u(X) + u(Y) - XY + Z, \qquad (1) \\ \text{s.t.}\ \ L + \pi_x &= P(X + Y) + Z, \\ \text{where}\ \ u(x) &= ax - \frac{1}{2}x^2, \\ Z &= \text{numeraire, } L = \text{labor, and} \\ \pi_x &= \text{the profits of the home firm.} \end{aligned}$$

The labor market is assumed to be at the full employment. We assume that the all labor supplies are determined at the beginning of period two. Solving this utility maximization problem yields inverse demand functions used below.

Let us consider the case when the home firm decides to become a MNE. It needs to build two plants, one in the home and one in the foreign countries, so the total fixed costs are $2G$. Depending on the location of production for sales in each country, there are two subcases. The first subcase is that all production is done in the foreign plant and the products sold in the home market are imported (reverse imports). The second subcase is that products sold in the home market

are produced in the home plant while those sold in the foreign market are produced in the foreign market.

The profits of the home firm in the first subcase, $\pi_x(MNE1)$ are

$$\pi_x(MNE1) = (a - X - Y)X + (a - X^* - Y^*)X^* - (m + s)X + mX^* - 2G.$$

We assume the same utility of the foreign consumers as that of the home consumers. We also assume that the foreign firm enters the home market only by exports and thus expends a plant-specific fixed cost of G. Then, the profits of the foreign firm are

$$\pi_y(MNE1) = (a - X - Y)Y + (a - X^* - Y^*)Y^* - (m + s)Y + mY^* - G.$$

From the first order conditions, the equilibrium outputs of the home firm and foreign firm in the home and foreign markets are:

$$X_{MNE1} = Y_{MNE1} = \frac{a - m - s}{3}, \tag{2}$$

$$X^*_{MNE1} = Y^*_{MNE1} = \frac{a - m}{3}. \tag{3}$$

Substituting the equilibrium outputs of the home firm to its profits (equations 2 and 3) yields

$$\pi_x(MNE1) = (X_{MNE1})^2 + (X^*_{MNE1})^2 - 2G.$$

By the same way, we get the foreign counterpart:

$$\pi_y(MNE1) = (Y_{MNE1})^2 + (Y^*_{MNE1})^2 - G.$$

Next, we calculate profits of the home firm and the foreign firm in the second subcase of MNE. The profits of the home firm are

$$\pi_x(MNE2) = (a - X - Y)X + (a - X^* - Y^*)X^* - (m + n)X - mX^* - 2G.$$

In the second subcase, home firm's products sold in the home country are produced in the home-country plant. Thus the marginal cost of production is $m + n$. The home firm can save shipping costs for its foreign sales as in the first subcase.

The profits of the foreign firm are the same as in the first subcase. Using the first order conditions for the both firms yields the following equilibrium outputs of

the home firm and its foreign counterpart:

$$\begin{aligned} X_{MNE2} &= \frac{a-m-2n+s}{3}, \\ Y_{MNE2} &= \frac{a-m+n-2s}{3}, \\ X^*_{MNE2} &= Y^*_{MNE2} = \frac{a-m}{3}. \end{aligned}$$

Substituting the equilibrium outputs to the profits of the home firm in each subcase and comparing the profits of the home firm in the two subcases, we get

$$\pi_x(MNE1) > \pi_x(MNE2) \Leftrightarrow n > s.$$

Thus, if the cost disadvantage to the home firm is larger than the shipping cost, the home firm chooses reverse imports.

Now we consider the case when the home firm chooses exports instead of FDI. The profits of the home firm are

$$\pi_x(Exports) = (a-X-Y)X + (a-X^*-Y^*)X^* - (m+n)X - (m+n+s)X^* - G.$$

Without the marginal-cost reduction by FDI, the home firm must expend more for producing its products sold both in the home and the foreign markets. Instead, it can save the plant-specific fixed cost G. The profits of the foreign firm has the same form as in the MNE cases. From the first order conditions, the equilibrium outputs are:

$$X_{Ex} = \frac{a-m-2n+s}{3}, \tag{4}$$

$$Y_{Ex} = \frac{a-m+n-2s}{3}, \tag{5}$$

$$X^*_{Ex} = \frac{a-m-2n-2s}{3}. \tag{6}$$

$$Y^*_{Ex} = \frac{a-m+n+s}{3}. \tag{7}$$

Substituting the equilibrium outputs of the home firm to its profits yields

$$\pi_x(Exports) = (X_{Ex})^2 + (X^*_{Ex})^2 - G.$$

Now we are ready to examine how the home firm decides to be a MNE or an exporter.

3 What Makes the Home Firm a MNE?

We compare the profits of the home firm under two strategies, FDI and exports. In the last section, we show that the home firm performing FDI takes two different strategies about products sold in the home market, depending on which is larger, the cost disadvantage to the home firm or the shipping cost. Thus we need to check each subcase of FDI.

3.1 Subcase 1: Reverse Imports

If the home firm chooses to be a MNE and if $n > s$, the home firm produces all of its products in the foreign-country plant and imports part of them to the home country. The home firm chooses this strategy if the following inequality holds.

$$\pi_x(MNE1) > \pi_x(Exports).$$

This inequality is changed to:

$$-4n^2 + 8(a-m)n - 9G > 4(s + \frac{n}{2})^2. \tag{8}$$

Using inequality (8), we show the range of the shipping cost s with which the home firm decides to be a MNE, for a given cost advantage to the home firm, n. In Figures 1, the height of the straight line parallel to the horizontal axis is the value of the left hand side of inequality (8). The right hand side is a quadratic function of s, whose minimum is 0 at $s = -\frac{n}{2}$. Figure 1a shows a situation where the home firm chooses to be a MNE for all $s < n < \frac{a-m}{2}$.[3] Figure 1b shows a slightly different situation: the home firm chooses to be a MNE if $s < \overline{s}_\pi$ and to be an exporter if $s > \overline{s}_\pi$. $\overline{s}_\pi$ equates the both sides of inequality (8) and

$$\overline{s}_\pi = \sqrt{-n^2 + 2(a-m)n - \frac{9G}{4}} - \frac{n}{2}.$$

Comparative statics for various parameters help us understand how the home firm's decision may change when external environment changes. First, an increase in the plant-specific fixed cost G shifts down the straight line in Figure 1b and

[3]For the outputs of both the home and the foreign firms to be positive, we need $n < \frac{a-m}{2}$ and $s < \frac{a-m}{2}$. These conditions imply that the demand is high enough relative to costs.

thus decreases $\overline{s}_\pi$.[4] Thus, FDI is less likely. An increase in the demand parameter a or a decrease in marginal cost m have the opposite effect. The effect of the cost disadvantage n is not obvious because both the straight line and the quadratic curve shift. An increase in n shifts leftward the quadratic curve. It also shifts down the straight line if the demand parameter a is large enough relative to G and n. For a large enough a, an increase in n increases $\overline{s}_\pi$, which makes FDI more likely. We use these results later to discuss the effects of trade liberalization in the foreign country.

3.2 Subcase 2: No Reverse Imports

If the home firm chooses to be a MNE and if $n < s$, the home firm's products sold in the home country are produced in the home-country plant, i.e., no reverse imports. The home firm chooses this strategy if the following inequality holds.

$$\pi_x(MNE2) > \pi_x(Exports).$$

This inequality is changed to:

$$(a-m)^2 - 9G > 4\left(s - \frac{a-m-2n}{2}\right)^2.$$

Figures 2 show the cases when $n < s$. Figures 2a are the cases of relatively low n ($n < \frac{a-m-2n}{2}$) while Figures 2b are the cases of relatively high n ($n > \frac{a-m-2n}{2}$). In Figure 2a1, $\overline{s}_\pi$ is a threshold for home firm's decision: if $s < \overline{s}_\pi$, the home firm chooses to be a MNE. If $s > \overline{s}_\pi$, the home firm chooses to be an exporter. Figure 2a2 shows a case of higher G than in Figure 2a1. Besides $\overline{s}_\pi$, there is another threshold $\underline{s}_\pi$ such that if $s < \underline{s}_\pi$, the home firm chooses to be an exporter.

In cases of high n, FDI is less likely. In Figure 2b1, the range of s for FDI is narrower than that in Figure 2a1. In Figure 2b2, besides high n, high G makes the possibility of FDI zero.

Comparative statics are more complicated than those in Figures 1 (reverse-imports case). As shown, an increase in the plant-specific fixed cost G makes FDI less likely. The effect of either an increase in the demand parameter a or an decrease in the marginal cost m is not obvious because it shifts both the straight

[4]Note that the model is symmetric. That is, we assume the same G, a, and m for both firms. For instance, an increase in G implies that for both the home and the foreign firms, their fixed costs get larger, although the fixed cost of the home firm is two times higher than that of the foreign firm as before.

line and the quadratic curve. The straight line shifts up, which makes FDI more likely. However, the quadratic curve shift rightward, which could make another threshold $\underline{s}_\pi$.

4 Boomerang Effect

By comparing the imports under the different cases, we can see whether the boomerang effect associated with FDI exists. If $n > s$, from equations (2) and (6), the imports to the home market is larger when the home firm is a MNE than when an exporter.[5] Thus the boomerang effect exists, mainly due to the reverse imports by the home firm.

On the other hand, if $n < s$, the imports are only foreign-firm products because the home firm sales its products produced in its home-country plant. The boomerang effect does not exist. Thus we see whether the boomerang effect occurs depends on the relative cost structure of the home and foreign firms; if the cost disadvantage to the home firm is large relative to shipping cost, the boomerang effect is likely due to the reverse imports by the home firm.

In terms of import penetration, the ratio of imports to the total demand in the home country, i.e., $\frac{\text{imports}}{X+Y}$ might be more desirable. It is easily shown that even with this measure, the boomerang effect is likely when $n > s$ while it is not when $n < s$.

5 Welfare Analysis

To compare the welfare of the home country under different strategies by the home firm, we have to specify the total welfare. By substituting the equilibrium outputs into π_x and U of equation (1) and by substituting the budget constraint into the utility function to erase Z, we get the total surplus (TS) of the home country.[6] When the home firm chooses to be a MNE, the total surplus is

$$TS(MNE) = \frac{1}{2}(3X^2 + 2X^{*2} + Y^2) + XY + L - 2G. \tag{9}$$

[5] In the former case, the imports are the sum of home-firm products reversely imported and foreign-firm products, equal to $\frac{2(a-m-s)}{3}$. In the latter case, the imports are only foreign-firm products, equal to $\frac{a-m+n-2s}{3}$. If the former is greater than the latter, we get $a - m > n$, which always holds.

[6] The total surplus is not the sum of consumer and producer surpluses. Rather, it is an indirect utility of the home consumer, who is also the shareholder of the home firm.

The total surplus has the same form regardless of whether the home firm performs reverse imports. However, the values of the total surplus may be different because of different levels of outputs under the two subcases of FDI. When the home firm chooses to be an exporter, the total surplus is

$$TS(Exports) = \frac{1}{2}(3X^2 + 2X^{*2} + Y^2) + XY + L - G. \tag{10}$$

Because the equilibrium outputs are different between the two strategies, FDI or exports, the difference in the total welfare is not just the difference in the plant-specific fixed cost, G or $2G$.

Because this article focuses on the boomerang effect of FDI, we compare the total welfare when a FDI with reverse imports is performed with that when exports are chosen. The total welfare with reverse-imports FDI is higher than that with exports if the following inequality holds.

$$TS(MNE1) > TS(Exports)$$

This inequality is changed to:

$$-11n^2 + 8(a-m)n - 18G > -s^2 + 16(a-m) - 2ns. \tag{11}$$

Figure 3a shows a situation where FDI should be chosen for the total welfare. On the other hand, Figure 3b shows a situation with a high G where exports should be chosen for all $\overline{s}_w < s$. $\overline{s}_w$ is a threshold and

$$\overline{s}_w = 8(a-m) - n - \sqrt{64(a-m)^2 - 24(a-m)n + 12n^2 + 18G}.$$

One might ask if this threshold $\overline{s}_w$ is higher or lower than that for the home firm's decision, $\overline{s}_\pi$. Although it seems very hard to compare these thresholds, we can say that if $\overline{s}_\pi > \overline{s}_w$, the home government may improve the total welfare by subsidies to the home firm to change home firm's decision from exports to reverse-imports FDI.

Another thing we should note is that the boomerang effect made by reverse-imports does not necessarily deteriorate the welfare of the home country. If the inequality (11) holds, we observe the boomerang effect due to reverse imports, but the welfare is higher than the case of imports. Because we assume the full employment, a possible unemployment issue due to FDI is out of scope in this article.

6 Trade Liberalization in the Foreign Country

In December 2001, China became a member of WTO. It is expected that the Chinese market will be more open to the foreign firms. How does such a change to trade liberalization affect the decision of FDI for firms in Japan and other developed countries? We discuss the effects of trade liberalization in the foreign country on the home firm, using the comparative statics we developed in Subsection 3.1.

As noted in Subsection 3.1, we have assumed the same demand parameter a, the same shipping cost s, and the same plant-specific fixed cost G for both countries or firms. However, to analyze the effect of trade liberalization, we need to distinguish the variables for the home firm/country and the foreign firm/country. We denote the demand parameter for the home country by a_h and that for the foreign country by a_f. By the same way, we denote the shipping cost in the home country by s_h and that in the foreign country by s_f. Note that in case of reverse imports, the home firm expends s_f, not S_h, because the shipment is from the foreign to the home countries. We denote the plant-specific fixed cost for FDI by G_h so that in case of FDI, the home firm expends the fixed cost of $G + G_h$.

Then, the outputs of the home firm will be changed as follows:

$$\begin{aligned} X_{MNE1} &= \frac{a_h - m - s_f}{3}. \\ X^*_{MNE1} &= \frac{a_f - m}{3}. \\ X_{Ex} &= \frac{a_h - m - 2n + s_f}{3}. \\ X^*_{Ex} &= \frac{a_f - m - 2n - 2s_h}{3}. \end{aligned}$$

By substituting these outputs to the profits of the home firm in each case, We examine how the above new defined parameters related to the trade liberalization affect the incentive for the home firm to be a MNE with reverse imports.

First, trade liberalization would open the foreign market more. This may be interpreted as an increase in a_f in our model. An larger a_f increase the profits of the home firm in both FDI and export cases, but in the FDI case the increase in the profits is larger than in the exports case. The intuition is that with exports, the home firm's net cost disadvantage is $n + s_h$. With FDI, the home firm has no cost disadvantage and thus it can benefit the larger foreign markets more. We conclude that more open foreign market makes FDI with reverse imports more likely.

Second, trade liberalization would change the shipping costs. Lowering tariffs and other trade barriers would decrease s_h, the cost of shipment from the home

to the foreign country. s_h has no effect on the home firm performing FDI with reverse imports because no shipment from the home country. On the other hand, the exporting home country benefits from a reduction in s_h. Thus, lowering trade barrio resulting from s_h makes FDI with reverse imports less likely.

However, a reduction in s_f (for instance, a foreign firm's policy beneficial for the exports by the home firm with reverse-imports FDI), the cost of shipment from the foreign to the home country has the opposite effect. The home firm performing FDI with reverse imports benefits from the reduction in s_f while the exporting home firm receives no benefit and it even suffers a loss due to more imports by the foreign firm. Thus, a reduction in s_f makes FDI with reverse imports more likely.

Third, trade liberalization would decrease the home firm's fixed cost for FDI G_h. For instance, more open market could make various goods and equipments necessary for the new plant cheaper. In such a case, the profits of the home firm with FDI increases while those with imports unchanged, which makes FDI more likely.

Finally, if the trade liberalization works to decrease the cost disadvantage to the home firm n due to, for instance, cheap low materials imported from the foreign country, it increases the profits of the exporting home firm while those of the FDI home firm unchanged. Thus, a reduction in the cost disadvantage to the home firm makes FDI with reverse imports less likely.

7 Conclusions and Extensions

This article explores the theoretical possibility of the boomerang effect, i.e., an increase in imports occurring after the home firm makes a FDI. With a two-period model, we show that whether the home firm chooses to be MNE depends on the cost disadvantage to the home firm, the shipping cost of exports, and the plant-specific fixed cost. We also show that the boomerang effect may exist when the home firm reversely imports its products from the foreign country for the sales in the home market. Our welfare analysis shows that when the home firm is a MNE, the boomerang effect does not necessarily decreases the total surplus of the home country. Our model has various suggestions for the effect of trade liberalization in the foreign country. We show that a more foreign demand, a less cost of shipment from the foreign to the home country, and a lower fixed cost peculiar to FDI make FDI with reverse imports more likely.

In this article we discuss the case when a lower wage is an incentive for the home firm to be a MNE. However, depending on technological advantage to the

home firm, we may discuss the case that the home firm has a cost advantage. In such a model, we may discuss a possibility of technological spillovers by FDI (and by exports). How such a spillovers affect the home firm's decision on FDI is an interesting issue.

References

[1] Dunning, John H., *Explaining International Production,* Urwin Hyman Ltd., 1988.

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

[3] Kim, Jai-June, "Boomerang Effects or Wells Effects?" *Seoul Journal of Economics* 9 (1996) 203-215.

[4] Markusen, James R., "The Boundaries of Multinational Enterprises and the Theory of International Trade," *Journal of Economic Perspectives* 9 (Spring 1995) 169-189.

[5] Morikawa, Koichiro, "Impact of Japanese Foreign Direct Investment on the Japanese Trade Surplus," *Journal of Policy Modeling* 20(4) (1998) 427-460.

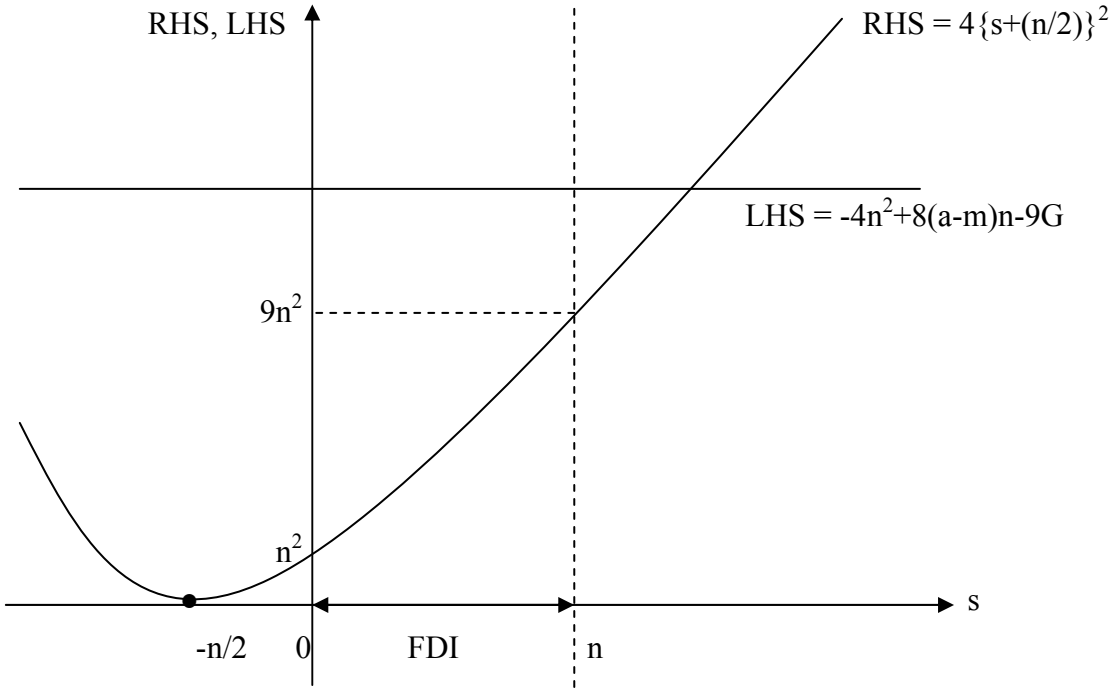
[6] Shinohara, Miyohei, *Industrial Structure,* Chikuma Shobo, 1976 (In Japanese).

[7] ————————-, *Industrial Growth, Trade, and Dynamic Patterns in the Japanese Economy,* University of Tokyo Press, 1982.

[8] The International Centre for the Study of East Asian Development, *Trends and Perspectives of the East Asian Economy,* Special Spring Issue 2001 of A Viewpoint to East Asia, Vol.12, No. 1.

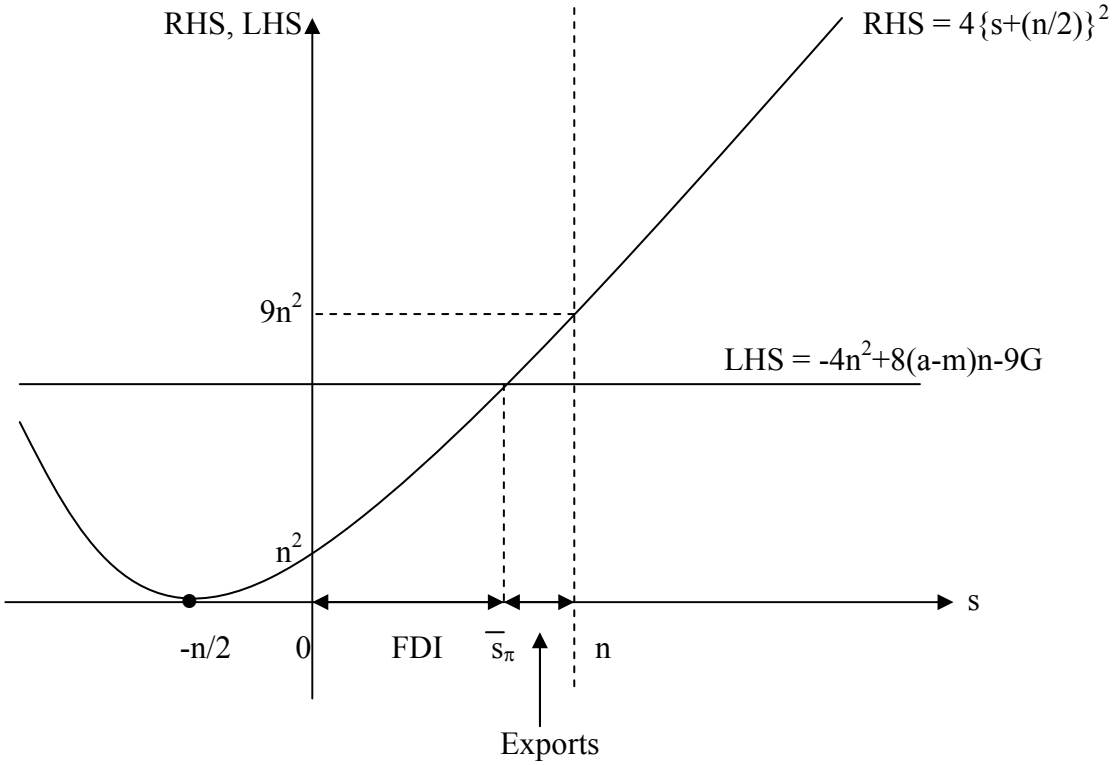
[9] van Pottelsberghe, Bruno and Frank Lichtenberg, "Does Foreign Direct Investment Transfer Technology Across Borders?" *Review of Economics and Statistics* 83(3) (August 2001) 490-497.

a. LHS ≥ $9n^2$: the home firm chooses to be a MNE for all s<n.



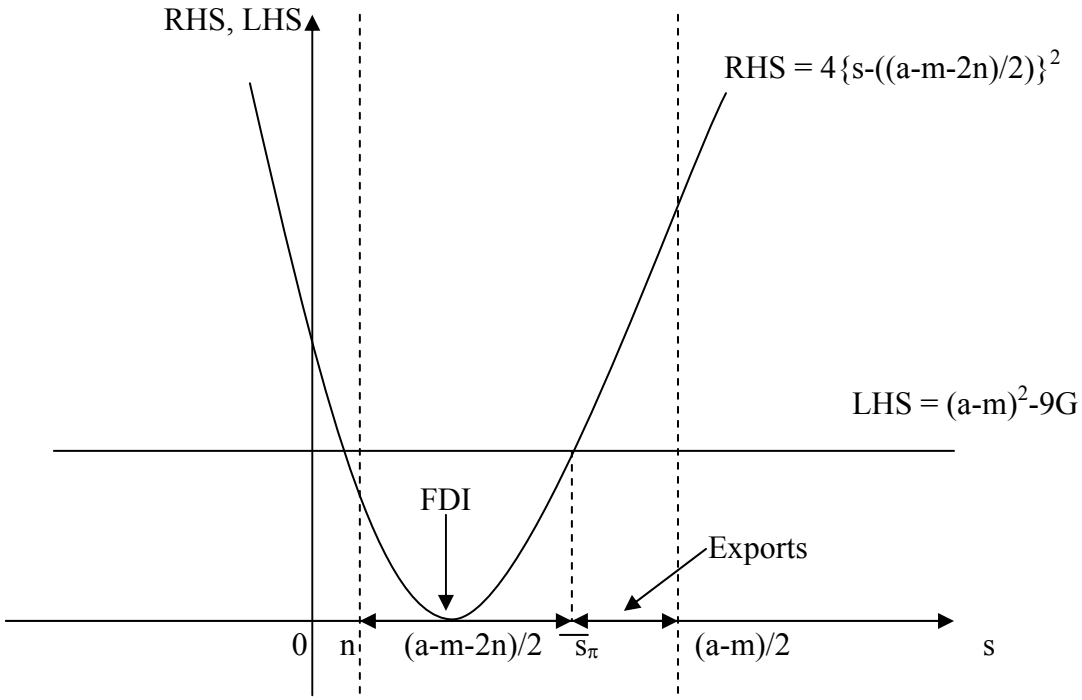
b. LHS < $9n^2$: the home firm chooses to be a MNE for all $\overline{s} < s_\pi$.

For all $\overline{s} < s_\pi < n$, the home firm chooses to be an exporter.



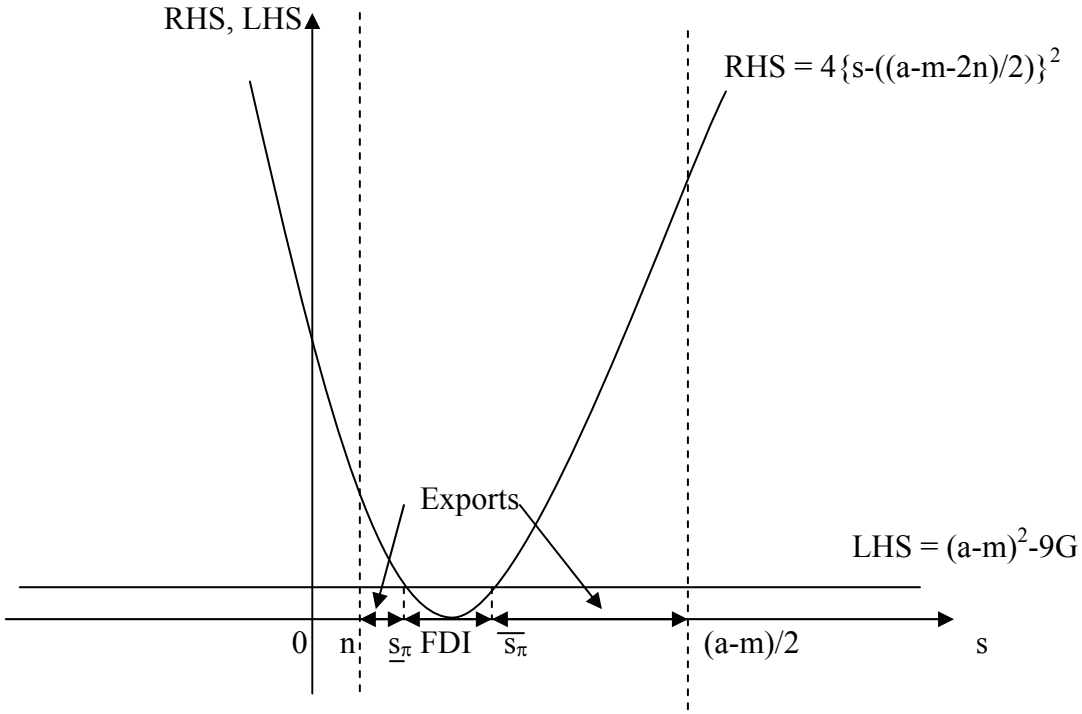
Figures 1 Home firm's decision depending on given n and s (n > s).

a1. The home firm chooses to be a MNE for all $n < s < \overline{s_\pi} \leq (a-m)/2$.



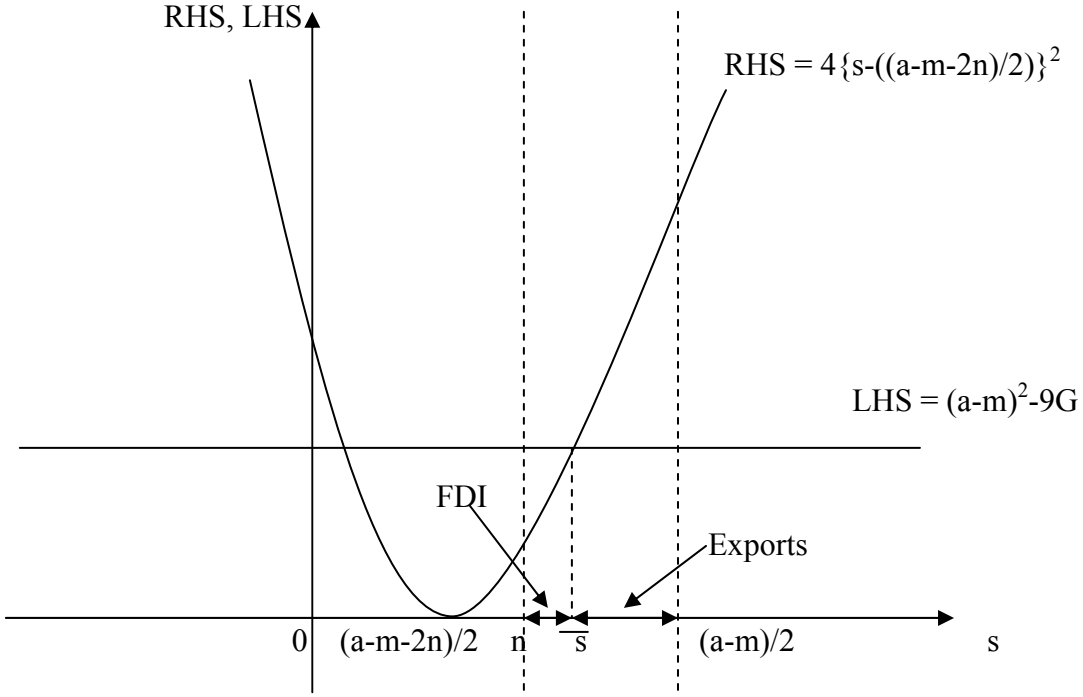
a2. The home firm chooses to be a MNE for all $\underline{s_\pi} < s < \overline{s_\pi} \leq (a-m)/2$.

The home firm chooses to be an exporter if $s < \underline{s_\pi}$ or $\overline{s_\pi} < s$

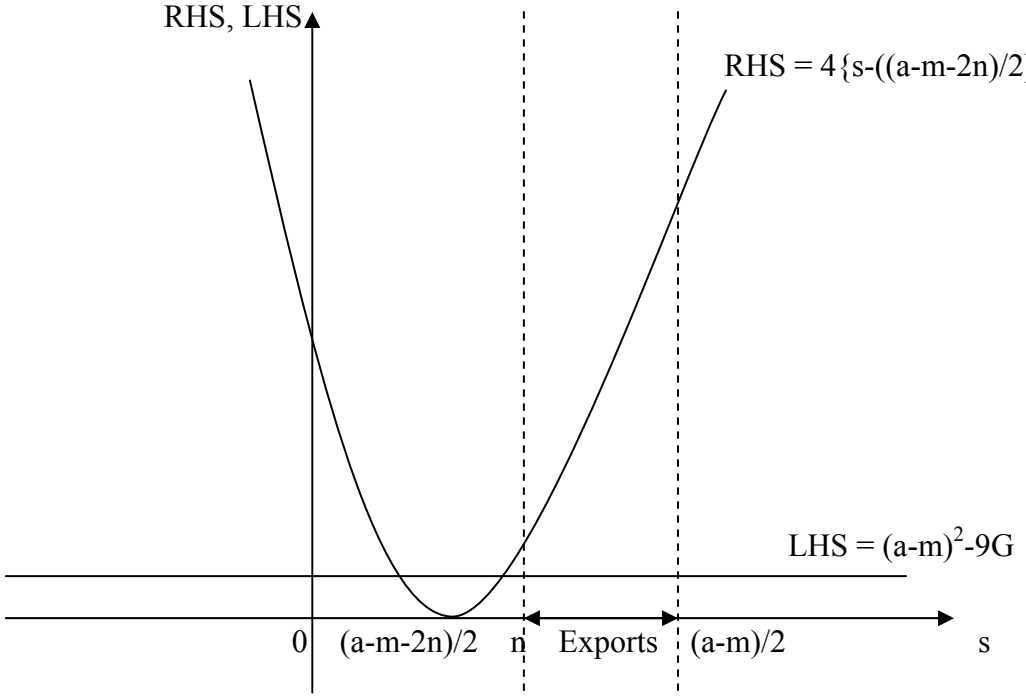


Figures 2a Home firm's decision depending on given n and s (n < s and n < (a-m-2n)/2).

b1. The home firm chooses to be a MNE for all $n < s < \overline{s_\pi} \leq (a-m)/2$.

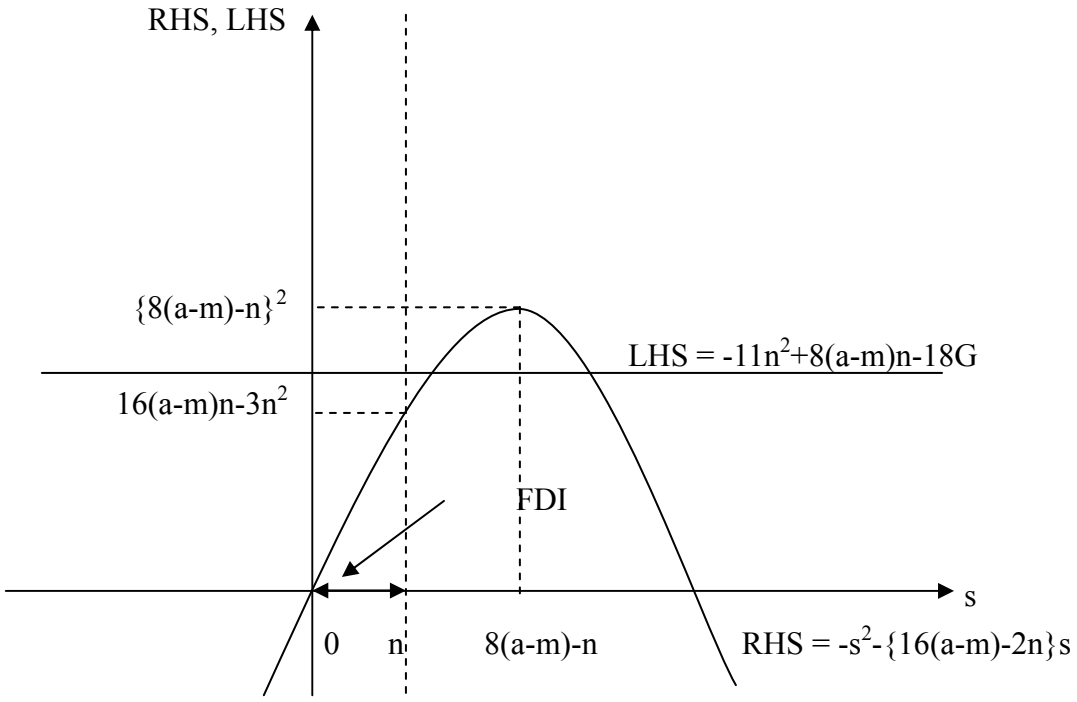


b2. The home firm chooses to be an exporter for all $n < s < (a-m)/2$.

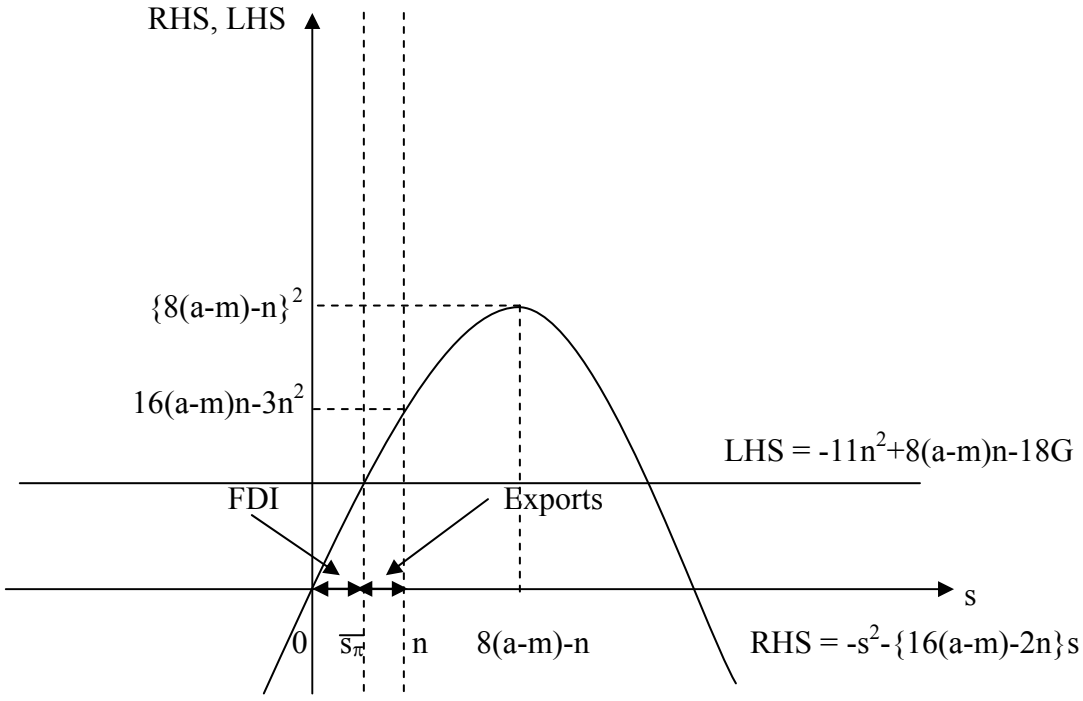


Figures 2b Home firm's decision depending on given n and s (n < s and n > (a-m-2n)/2).

a. The home firm's welfare is higher with reverse-imports FDI for all s<n.



b. The home firm's welfare is higher with reverse-imports FDI for all $s < \bar{s}_{\pi}$.
The home firm's welfare is higher with exports for all $\bar{s}_{\pi} < s < n$.



Figures 3 the home firm's welfare depending on given n and s (n > s).