

North-North FDI, exporting and the first mover advantage

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Abstract

In this paper we study the role of the first mover advantage in the choice between exporting and FDI among developed countries. We identify the conditions necessary for exporting and FDI, depending on trade costs and the cost of foreign investment. We demonstrate that four possible types of equilibria: a monopoly FDI equilibrium, a monopoly exporting equilibrium, a leader-follower duopoly FDI equilibrium, and a leader-follower duopoly exporting equilibrium, may emerge in the short-run depending on various combinations of the key parameters of the model.

Keywords: exporting, foreign direct investment, leader-follower model, proximity-concentration tradeoff

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1. Introduction

Multinational enterprises (MNEs) which are responsible for the world foreign direct investment (FDI) flows have become one of the most important features of the globalized world economy. A number of key stylized facts about the behavior of FDI in the world economy has been identified in the literature by several authors (see, for example, Markusen (2002), Barba Navaretti, Venables (2004) and Caves (2007) for the review of this literature). In particular, during the last decades FDI made by the MNEs grew far more rapidly than both world trade and world GDP. FDI originates predominantly from the developed countries which have also been the major recipients of FDI. Therefore, this part of world FDI flows is called North-North FDI and appears to be horizontal, at least insofar as most of the output of foreign subsidiaries was sold in foreign countries.

These aforementioned facts constituted the basis for the development of the new theory of multinational enterprise (NTME) in the 1980s and 1990s. This new theory has often been viewed as an extension of the new trade theory (NTT) literature which replaced the previous traditional classical and neoclassical trade literatures. The central plank of the proposed new theoretical framework is the so-called proximity-concentration tradeoff. According to this framework “FDI occurs when the benefits of producing in the foreign market outweigh the loss of economies of scale from producing exclusively in the firm’s home plant” (Neary 2008, p. 13). The NTME models usually assume some form of imperfect competition such as monopolistic competition or simple Cournot oligopoly frameworks. This means that competing firms either take their actions simultaneously or simply neglect the actions of their rivals at all.

One of the earliest attempts to integrate MNEs into the NTT was made by Krugman (1983) who extended his model of international trade based on monopolistic competition with symmetric firms (Krugman 1979; 1980) to introduce the possibility of FDI. In contrast to this early approach, more recently Helpman, Melitz and Yeaple (2004) generalized Melitz’s (2003) model with heterogeneous firms to study the role of firm productivity, in the choice between exporting and FDI.¹ In particular, they demonstrated that only high-productivity firms enter foreign markets, with the most productive of these firms entering via FDI, while less productive firms enter via exports.² However, despite its analytical convenience, the monopolistic competition framework is not very realistic as it does not allow for studying the strategic interactions between competing firms.

Therefore, to study these interactions an alternative approach based on the oligopolistic competition model was proposed in the literature. The origin of this approach goes back to the seminal model developed by Markusen (1984). His model was later extended by several authors including, *inter alia*, Horstmann and Markusen (1987; 1992), Markusen and Venables (1998; 2000) and Markusen (2002). They allowed for endogenous market structures and different forms of competition between firms within partial as well as general equilibrium frameworks. In their frameworks firms had different potential channels of entering a foreign market and each of these channels incurred different costs. However, they mostly assumed that entry decisions were made simultaneously at the first stage of the game.³

¹ The development of the new strand in the NTT literature that focuses on the role of firm heterogeneity have been summarized in recent survey papers by Bernard et al. (2012) and Melitz and Redding (2015).

² This proposition has been intensively tested in a number of recent empirical studies including Girma, Kneller, Pisu (2005), Greenaway and Kneller (2007), Cieřlik and Ryan (2009) to mention just a few examples. The recent survey of this strand in the literature has been provided by Antràs and Yeaple (2015).

³ The only exception is a two-period duopoly model by Markusen (2002) presented in Chapter 4, which builds on the earlier framework by Horstmann and Markusen (1987). In his model the multinational firm moves first while the potential entrant can choose to enter at the same time or wait until the next period.

Another early attempt to integrate MNEs into the NTT was made by Smith (1987) and Motta (1992) who provided an alternative framework to study the choice between exporting and FDI in which entry decisions were made sequentially. In the Smith-Motta framework the multinational firm at the first stage of the game decided whether or not to establish a production subsidiary abroad. At the second stage, the indigenous firm from the host country decided whether to enter the market or not. Once both entry decisions were made, the two firms engaged in Cournot competition to determine output quantities.

However, the international business and industrial organization literatures have long been emphasizing the role of first mover advantages and providing recommendations concerning how a firm can establish a leadership position in the market by making a first move (see, for example, Lieberman, Montgomery (1998) and Sutton (1991)). One of the most frequently cited examples of the first mover advantage includes the wet ambient soup industry. In this industry the contrast between the US and the UK is of particular interest as the same two firms dominate each of these markets. Campbell was the first entrant in the US market, while Heinz was the first entrant in the UK market. Later, Campbell entered the UK market while Heinz entered the US market. Their roles in these two markets are exactly the opposite. While Campbell continues to be a leader in the US market and Heinz in the UK, Campbell is filling the same role in the UK market as does Heinz in the US so the first mover in each market continues to dominate.⁴

Therefore, there is an obvious need to investigate the role of the first mover advantage in determining the choice of the optimal foreign market entry mode. Hence, the main goal of this paper is to provide a bridge between the literature on entry and the first-mover advantage on the one hand and a quickly developing strand of the literature on substitutability between exports and FDI on the other. The contribution of this paper to the literature is mainly theoretical.

In particular, to derive a broader set of conclusions in this paper we study the choice between exporting and FDI in the context of the leader-follower model instead of the standard Cournot duopoly framework used extensively in the previous theoretical research. This allows us to study the necessary conditions for the short-run leader-follower FDI and exporting duopoly equilibria that may emerge as the outcomes of the Stackelberg (1934) oligopoly game.

The organization of this paper is as follows. Section 2 describes key assumptions, various market entry strategies, payoffs and participation constraints. Section 3 discusses various proximity-concentration tradeoffs facing the foreign firm. Section 4 characterizes possible equilibria. Finally, Section 5 summarizes and provides directions for further empirical and theoretical studies.

2. Model setup

In this section we discuss the main assumptions of the North-North leader-follower model, the entry strategies, the payoffs and participation constraints that imply non-negative levels of profits for foreign and domestic firms. We assume that there are only two firms that operate in a single industry: a domestic and a foreign firm. For simplicity, it is assumed that the good produced by both firms is homogenous and produced under increasing returns to scale. Increasing returns to scale are modeled in a simple way by assuming that the total cost function is:

⁴ In 2013 the shares of Campbell and Heinz in their own markets were about 60%. For more details see: www.washingtonpost.com/blogs/wonkblog/wp/2013/11/20/is-america-over-soup and www.fdin.org.uk/2014/07.

$$TC(x) = F + G + cx \quad (1)$$

where:

- F – the fixed cost of developing the product,
- G – the fixed investment cost of entering the market (i.e. building a production plant there),
- c – the constant marginal cost of production,
- x – output.

The firm- and plant-specific fixed costs F and G are the sunk costs. It can be easily noted that the average cost of production declines with output as the fixed costs are spread over a larger number of units: $AC(x) = (F + G)/x + c$.

For simplicity, it is assumed that the fixed cost F does not apply to the foreign firm as it was incurred in the past when the foreign firm entered the market in its home country and now it can be neglected. The fixed cost G applies to the foreign firm only when it enters the domestic country market via FDI. For the foreign firm exporting is an alternative to the high-fixed cost option of entering the domestic market via FDI. If the foreign firm decides to export from its home plant, it does not have to pay the fixed cost G as this cost was incurred in the past when the firm entered the market in its home country and it can be neglected. Exporting is, however, a high marginal cost option. Following Smith (1987), we assume that in addition to the cost of production the foreign firm has to pay the trade costs which consist of two components: transport cost s and tariff t which increase the marginal cost. The transport cost and the tariff are assumed to be exogenously given.

It is further assumed that the marginal cost of production c is exactly the same when the foreign firm produces its good in the home plant or in the plant located in the host country. Moreover, this cost is assumed to be exactly the same for both foreign and domestic firms. These assumptions are due to the fact that in the case of North-North FDI developed countries are very similar in terms of production technology and relative factor endowments. Moreover, assuming the equality of the marginal costs of production allows us to focus entirely on the role of the first mover advantage.

In addition, we assume that if the domestic firm decides to enter the market, it has to incur both the fixed cost of developing the product F and the fixed cost of building the plant G . Moreover, both firms are assumed not to be capacity constrained which means that the first mover advantage can be sustained only in the short-run.

For simplicity, we use an explicit simple linear inverse demand function that relates price P to total output X supplied by both firms to the market:

$$P(X) = a - X \quad (2)$$

where $a > c$ is the market size in the domestic country. X is the sum of output supplied to the market by both firms: $X = x_F + x_D$, where x_F (x_D) denotes output supplied by the foreign (domestic) firm.

As the foreign firm has the first mover advantage and is the industry leader which discovered the product, it is natural to assume that firms' entry decisions are made sequentially. Furthermore, it is assumed that only FDI and entry decisions made by the leader and follower firms are irreversible as they involve sunk costs G and $F + G$, respectively. A decision to export by the foreign firm or decision not to enter by the home firm is a decision that can be reversed once the rival firm has made its

decision. If the leader makes an revocable decision at the first stage of the game, and this is followed by an irrevocable decision of the follower, the leader then has an opportunity to change its decision.

The extensive form of the game is illustrated in Figure 1 that shows the sequence of all the possible actions and outcomes for both firms. Each line represents an action, and each box represents a decision point. The outcomes of actions are shown in parentheses, where the leader's profits are listed first.

At the first stage of the game the leader chooses between two foreign market entry strategies: exporting and FDI.⁵ If it decides to make an FDI, it incurs an additional fixed cost G of building the plant in the host country. If it decides to export, it incurs trade costs $s + t$ but saves the fixed plant cost G . At the second stage of the game, the follower decides whether to enter the market or not. To determine its optimal entry strategy at the first stage, the leader solves the game backward starting from the top right of the diagram. The decision at the first stage of the game is made in the knowledge of the equilibria of the later stages, so the equilibrium is perfect.

Once the foreign firm decides to enter the domestic market it picks its output level and then the domestic follower firm chooses its optimal quantity given the knowledge of the leader's output, i.e. the firms play the standard Stackelberg (1934) oligopoly game.

If the leader decides to enter via FDI, the follower earns Π_D^{FDI} if it enters or 0 if it does not enter. Next, the leader considers the bottom right corner of Figure 1. However, now it must be remembered that exporting is a reversible decision. If the leader enters via exporting, the follower earns a profit of Π_D^{EX} if it enters and 0 if it does not enter. If the follower enters, the leader can always change its previous decision and make an FDI instead of exporting. In this case the profit of the follower who entered would be Π_D^{FDI} instead of Π_D^{EX} .

By this reasoning, the leader infers how the follower would behave conditional on the leader's decision at the first stage of the game. As a result, at the first stage of the game the leader decides whether to enter, via exporting or FDI. If the leader decides to enter via FDI and the follower decides not to enter, the leader captures the monopoly profit of Π_F^{M-FDI} . If the leader decides to enter via FDI and the follower decides to enter the leader has to share the market with the follower and earns the duopoly profit of Π_F^{FDI} .

If the leader decides to export and the follower decides not to enter, the leader captures the monopoly profit of Π_F^{M-EX} . If the leader decides to export and the follower decides to enter, the leader has to share the market with the follower and earns the duopoly profit of Π_F^{EX} .

We start with the benchmark case when the foreign firm is a monopolist and discuss two standard host market entry strategies for the foreign company: the FDI and exporting. We consider the case when the market entry costs for the domestic firm ($F + G$) are so high that the domestic firm decides not to enter the market in the domestic country and the foreign firm becomes a monopolist in the domestic market. Then, we discuss a more complex case when the foreign firm has to compete with the domestic firm in the Stackelberg manner.

FDI monopoly

If the foreign firm decides to serve the domestic market via FDI, it must incur the cost of building the plant G in the domestic country and its profit function can be written as:

⁵ It is assumed that the foreign leader's sales to the domestic market are profitable irrespectively of the chosen method of supply.

$$\Pi_F^{M-FDI} = [a - X_F^{M-FDI}] X_F^{M-FDI} - cX_F^{M-FDI} - G \quad (3)$$

Using the first order condition we can obtain the FDI monopoly equilibrium output:

$$X_F^{M-FDI} = \frac{a - c}{2} \quad (4)$$

The equilibrium monopoly price in the domestic market can be determined by substituting the FDI monopoly equilibrium output of the foreign firm (4) into the inverse demand function (2) which yields:

$$p_F^{M-FDI} = \frac{a + c}{2} \quad (5)$$

Substituting equilibrium solutions for output (4) and price (5) into the profit function (3) yields the equilibrium monopoly profit from FDI for the foreign firm:

$$\Pi_F^{M-FDI} = \left(\frac{a - c}{2} \right)^2 - G = [X_F^{M-FDI}]^2 - G \quad (6)$$

The foreign firm enters the domestic country market via FDI only if its operating profit is bigger than the fixed cost of entry:

$$G < \left(\frac{a - c}{2} \right)^2 \quad (7)$$

Exporting monopoly

If the foreign firm decides to serve the domestic market by means of exporting, its profit function can be written as:

$$\Pi_F^{M-EX} = [a - X_F^{M-EX}] X_F^{M-EX} - (c + s + t) X_F^{M-EX} \quad (8)$$

Using the first order condition, we can obtain the exporting monopoly equilibrium output:

$$X_F^{M-EX} = \frac{a - c - s - t}{2} \quad (9)$$

The equilibrium monopoly price in the domestic market can be determined by substituting the exporting monopoly equilibrium output of the foreign firm (9) into the inverse demand function (2), which yields:

$$p_F^{M-EX} = \frac{a + c + s + t}{2} \quad (10)$$

Substituting equilibrium solutions for output (9) and price (10) into the profit function (8) yields the equilibrium monopoly profit from exporting:

$$\Pi_F^{M-EX} = \left(\frac{a - c - s - t}{2} \right)^2 = [X_F^{M-EX}]^2 \quad (11)$$

The foreign firm enters the market in the domestic country via exporting only if its profit in that market is positive, which implies the following participation constraint:

$$s + t < a - c \quad (12)$$

Leader-follower FDI duopoly

If a foreign firm decides to enter the domestic market via FDI and the domestic firm decides to compete, we have the standard Stackelberg leader-follower problem. In this case if the foreign firm enters the market in the host country and competes with the domestic firm, its profit function can be written as:

$$\Pi_F^{FDI} = [a - (x_F^{FDI} + x_D^{FDI})]x_F^{FDI} - cx_F^{FDI} - G \quad (13)$$

In a similar way we can write down the profit function of the domestic firm:

$$\Pi_D^{FDI} = [a - (x_F^{FDI} + x_D^{FDI})]x_D^{FDI} - cx_D^{FDI} - F - G \quad (14)$$

Using the first order condition for the domestic firm, we can first calculate its reaction function given the output of the foreign firm:

$$x_D^{FDI} = \frac{a - c - x_F^{FDI}}{2} \quad (15)$$

Subsequently, we substitute this reaction function into the profit function of the foreign firm (13) and calculate its equilibrium level of output supplied to the host country market:

$$x_F^{FDI} = \frac{a - c}{2} \quad (16)$$

We can note that the volume of output supplied by the foreign firm to the host country market when it enters via FDI and faces competition from the domestic firm is exactly the same as in the case when the foreign firm is a monopolist. Therefore, the first-mover advantage for the leader firm is that it can behave exactly like the monopolist and supply a bigger amount of output to the host country market compared to the standard symmetric Cournot-Nash equilibrium.

Substituting the equilibrium level of output for the foreign firm into the reaction function of the domestic firm (15) yields its equilibrium level of output:

$$x_D^{FDI} = \frac{a - c}{4} \quad (17)$$

We can note that the equilibrium level of output supplied to the market by the domestic firm is equal to the half of the output supplied by the foreign firm. Hence, it is smaller compared to the standard symmetric Cournot-Nash equilibrium in which firms have equal market shares.

The total equilibrium level of output supplied to the host-country market is the sum of outputs (16)–(17) supplied jointly by the foreign and domestic firms which can be written as:

$$X^{FDI} = x_D^{FDI} + x_F^{FDI} = \frac{3(a-c)}{4} > X_F^M \quad (18)$$

It can be easily noted that despite the fact that the foreign firm enjoys the first-mover advantage and behaves exactly like the monopolist the total level of output supplied to the market is now bigger compared to the previously discussed foreign monopoly equilibrium due to the positive output response of the domestic follower-firm. Moreover, the equilibrium level of output is bigger than in the standard symmetric Cournot-Nash equilibrium which means that the equilibrium price is lower.

The equilibrium price in the domestic market can be determined by substituting the sum of output (18) into the inverse demand function (2) which yields:

$$p^{FDI} = \frac{a+3c}{4} < p_M^{FDI} = \frac{a+c}{2} \quad (19)$$

Using our solutions for the equilibrium quantities (16)–(17) and price (19) the total profits for the foreign and domestic firms can be written as, respectively:

$$\Pi_F^{FDI} = 2 \left(\frac{a-c}{4} \right)^2 - G \quad (20)$$

$$\Pi_D^{FDI} = \left(\frac{a-c}{4} \right)^2 - F - G \quad (21)$$

It can be noted that the operating profit of the foreign firm is now lower compared to the foreign monopoly equilibrium as now the foreign firm has to compete with the domestic firm. In the leader-follower FDI equilibrium the profit of the foreign firm is twice as big as the operating profit of the domestic firm as the market share of the foreign firm is twice as high as the market share of the domestic firm. Hence, the leader-follower FDI equilibrium allows the foreign firm to benefit from the first-mover advantage compared to the standard symmetric Cournot-Nash equilibrium in which firms split the market equally and have the same levels of profit. Moreover, the overall profit of the foreign firm is even bigger compared to the profit of the domestic firm which has to pay a fixed market entry cost F in addition to the fixed cost of building the plant G .

To ensure that both firms are active in the host-country market we need to impose the market participation constraints stating that both firms have non-negative levels of equilibrium profits. These conditions require that operating profits in the domestic market must be bigger than the fixed costs. The participation constraint for the foreign firm requires that:

$$G < 2 \left(\frac{a-c}{4} \right)^2 \quad (22)$$

The participation constraint for the domestic firm requires that:

$$F + G < \left(\frac{a - c}{4} \right)^2 \quad (23)$$

It can be noted that it is easier to satisfy the participation constraint for the foreign firm than for the domestic firm, hence if (23) is satisfied, then also (22) is satisfied. The foreign firm earns a higher operation profit and has to pay a lower fixed cost while domestic firm earns a lower operating profit and has to pay a higher fixed cost. If both (22) and (23) are met, then both firms have non-negative profits and supply positive amounts of output to the domestic market.

Leader-follower exporting duopoly

If the foreign firm decides to enter the domestic market via exporting and the domestic firm decides to compete, we also have a leader-follower problem. In this case the profit function of the foreign firm can be written as:

$$\Pi_F^{EX} = [a - (x_F^{EX} + x_D^{EX})] x_F^{EX} - (c + s + t)x_F^{EX} \quad (24)$$

For the foreign firm exporting to the domestic market from the production facility located abroad implies a high marginal cost option due to the existence of transport costs s and tariffs t . However, this strategy allows the foreign firm to save on the fixed cost of investment G . In this case the profit function for the domestic firm can be written as:

$$\Pi_D^{EX} = [a - (x_F^{EX} + x_D^{EX})] x_D^{EX} - cx_D^{EX} - F - G \quad (25)$$

Using the first order conditions, we can determine the equilibrium levels of output supplied by the foreign and domestic firms to the domestic market, respectively:

$$x_F^{EX} = \frac{a - c - 2(s + t)}{2} \quad (26)$$

$$x_D^{EX} = \frac{a - c + 2(s + t)}{4} \quad (27)$$

We can note that compared to FDI solutions now the equilibrium levels of output contain the transport cost and the tariff. As a result the domestic firm's output is higher and the foreign firm's output is lower compared to the earlier case when the foreign firm serves the domestic market via FDI. In the special case when trade is completely free, i.e. $s + t = 0$ the output levels of both firms are the same as in the previous case.

The total equilibrium level of output supplied to the domestic market is the sum of outputs (26)–(27) supplied jointly by the foreign and domestic firms that equals:

$$X^{EX} = x_D^{EX} + x_F^{EX} = \frac{3(a-c) - 2(s+t)}{4} < X^{FDI} \quad (28)$$

It can be noted that the equilibrium level of total output supplied to the domestic market when the foreign firm enters this market via exporting is smaller compared to the equilibrium level of output in the case when it enters via FDI (18) due to the inefficiencies associated with the existence of the transport cost and the tariff.

The equilibrium price in the domestic market can be determined by substituting the sum of output (28) into the inverse demand function (2), which yields:

$$p^{EX} = \frac{a + 3c + 2(s+t)}{4} > p^{FDI} \quad (29)$$

It can be noted that the price in the leader-follower exporting equilibrium will always be higher compared to the leader-follower FDI equilibrium due to the technical inefficiency associated with the existence of the trade cost.

Using our solutions for the equilibrium quantities (26)–(27) and the equilibrium price (29) we can determine the equilibrium profits for the domestic and foreign firms, respectively:

$$\Pi_F^{EX} = 2 \left(\frac{a-c-2(s+t)}{4} \right)^2 \quad (30)$$

$$\Pi_D^{EX} = \left(\frac{a-c+2(s+t)}{4} \right)^2 - F - G > \Pi_D^{FDI} \quad (31)$$

It can be noted that for the domestic firm it is always better if the foreign firm enters the domestic market via exporting rather than via FDI. The domestic firm's profit is higher when the foreign firm exports than when it enters via FDI for two reasons: i) the domestic firm's larger sales, ii) a higher equilibrium price. Hence, for the domestic firm $\Pi_D^{EX} > \Pi_D^{FDI}$ is always satisfied.

However, for the foreign firm such a simple generalization cannot be made. Although the operating profit associated with FDI is higher than the exporting profit, the fixed cost of investment G can make the foreign firm's overall profit of FDI lower than the profit from exporting. Hence, whether the profit from exporting is bigger or smaller compared to the profit from FDI for the foreign firm depends on the interplay between the trade and investment costs ($s+t$ and G). This "proximity-concentration" tradeoff will be studied in the next section.

To ensure that both firms are active in the domestic market we must impose market participation constraints on the domestic and foreign firms stating that they must have non-negative levels of profits. The participation constraint for the foreign firm requires that:

$$2(s+t) < a - c \quad (32)$$

Similarly, the participation constraint for the domestic firm requires that:

$$F + G < \left(\frac{a - c + 2(s+t)}{4} \right)^2 \quad (33)$$

It can be noted that now it is easier for the domestic firm to satisfy the participation constraint as it has a higher operating profit compared to the previous case when the foreign firm entered the domestic market via FDI. If both (32) and (33) are satisfied, then both firms have non-negative profits and supply positive amounts of output to the domestic market.

4. Proximity-concentration tradeoffs

In this section we discuss various proximity-concentration tradeoffs facing the foreign firm. First, we discuss the tradeoff between FDI monopoly and exporting monopoly for the foreign firm, then the tradeoff between FDI and exporting under duopoly, and finally we discuss the tradeoff between FDI monopoly and exporting duopoly.

Tradeoff between FDI monopoly and exporting monopoly

To study the tradeoff between FDI monopoly and exporting monopoly we compare profits of the foreign firm for FDI monopoly (6) and exporting monopoly (11). The profits of the foreign firm from FDI monopoly and exporting monopoly are equal when:

$$G = \frac{2(a-c)(s+t) - (s+t)^2}{4} \quad (34)$$

If the fixed cost of investment G is bigger (smaller) than the threshold value (34), the foreign firm prefers exporting (FDI) monopoly to FDI (exporting) monopoly.

Tradeoff between FDI duopoly and exporting duopoly

To analyze the tradeoff between FDI duopoly and exporting duopoly we compare profits of the foreign firm from FDI duopoly (20) and exporting duopoly (30). The profits of the foreign firm from exporting duopoly and FDI duopoly are equal when:

$$G = \frac{(a-c)(s+t) - (s+t)^2}{2} \quad (35)$$

If G is bigger (smaller) than the threshold value (35), then exporting (FDI) is the preferred entry strategy for the foreign firm. It can be noted that the threshold value of the fixed cost (35) is bigger

than (34). This means that increased competition in the domestic market makes the entry of the foreign firm via FDI less likely. Moreover, FDI can always be preferred to exporting for certain combinations of model parameters such as high trade cost and low fixed cost of investment. Similarly, exporting can always be a preferred to FDI for certain combinations of model parameters such as low trade cost and high fixed cost of investment.

Tradeoff between FDI monopoly and exporting duopoly

To analyze the tradeoff between FDI monopoly and exporting duopoly we compare profits of foreign firm from FDI monopoly (22) and exporting duopoly (33). The profits of the foreign firm from FDI monopoly and exporting duopoly are equal when:

$$G = \frac{(a-c)^2}{8} + \frac{(a-c)(s+t) - (s+t)^2}{2} \quad (36)$$

If the fixed cost of investment G is bigger (smaller) than the threshold value (36), then exporting (FDI) is the preferred entry strategy for the foreign firm. In addition, FDI can always be a preferred to exporting for certain combinations of model parameters such as high trade cost and low fixed cost of investment. Similarly, exporting can always be a preferred to FDI for certain combinations of model parameters such as low trade cost and high fixed cost of investment.

5. Equilibria

In this model four possible equilibria can be identified depending on various combinations of model parameters: a FDI monopoly equilibrium, an exporting monopoly equilibrium, a FDI duopoly equilibrium, and an exporting duopoly equilibrium. We distinguish between three types of trade and investment costs:

- low, i.e. $2(s+t) < a-c$ and $G < 2[(a-c)/4]^2$, respectively,
- high, i.e. $a-c < 2(s+t) < 2(a-c)$ and $2[(a-c)/4]^2 < G < [(a-c)/2]^2$, respectively,
- prohibitively high, i.e. $(s+t) > a-c$ and $G > [(a-c)/4]^2$, respectively.

When low costs occur the foreign firm is able to enter the host market and compete with the domestic firm. When high costs occur the foreign firm is able to enter the host market only if the domestic firm does not enter. Finally, when these costs are prohibitively high the foreign firm does not enter at all.

We also distinguish three ranges of the fixed costs for the domestic firm:

- low, i.e. $F + G < [(a-c)/4]^2$,
- high, i.e. $[(a-c)/4]^2 < F + G < [(a-c + 2(s+t))/4]^2$,
- prohibitively high, i.e. $F + G > [(a-c + 2(s+t))/4]^2$.

When the low fixed costs occur the domestic firm is able to compete with the foreign firm irrespectively of its entry strategy. When the high fixed costs occur then the domestic firm is able to compete with the foreign firm only when it exports. Finally, if the cost is prohibitively high, the domestic firm does not enter at all.

Figures 2–4 and Table 1 provide the summary of the results for different cases of ranges of participation constraints for domestic and foreign firms as well as tradeoffs between FDI and exporting.

We start with the discussion of the benchmark equilibria in which the domestic firm decides not to enter the market and the foreign firm becomes a monopolist serving the host country market either via FDI or via exporting. The FDI monopoly equilibria may occur when the domestic firm is unable to compete with the foreign firm irrespectively of its entry strategy, or only when it enters via FDI. These outcomes are reported in the last two columns of Table 1.

It can be noted that if the domestic firm is unable to compete with the foreign firm only when it enters via FDI and both trade and investment costs are low, then the foreign firm always chooses FDI and captures the entire market in the host country. However, if the trade costs are low while the investment cost is high, then the foreign firm faces the tradeoff between becoming a monopolist when it enters via FDI and sharing the market with the local firm when it exports. Hence, it chooses FDI and becomes a monopolist only if the investment cost is below the threshold level (36). In addition, the foreign firm chooses FDI and becomes the monopolist when: i) trade costs are high and the investment cost is low, ii) both trade and investment costs are high, iii) trade costs are prohibitively high and the investment cost is low, and iv) trade costs are prohibitively high and the investment cost is high.

If the domestic firm is unable to compete with the foreign firm irrespectively of its entry strategy and both trade and investment cost are low, then foreign firm faces the tradeoff between FDI and exporting. It chooses FDI only if the investment cost is below the threshold level (34). Similarly, if the trade costs are low and the investment cost is high or when both trade and investment costs are high, the foreign firm chooses FDI only if the investment cost is below the threshold level (34). In addition, the foreign firm chooses FDI and becomes a monopolist when: i) trade costs are high and the investment cost is low, ii) trade costs are prohibitively high and the investment cost is low, and iii) trade costs are prohibitively high and the investment cost is high.

Exporting monopoly equilibria may occur only when the domestic firm is unable to compete with the foreign firm irrespectively of its entry strategy. These outcomes are reported in the last column of Table 1. If both trade and investments costs are low, then the foreign firm faces a tradeoff between FDI and exporting. It chooses exporting only if the investment cost is above the threshold level (34). Similarly, if trade costs are low and the investment cost is high or when both the trade and investment costs are high, the foreign firm chooses exporting only if the investment cost is above the threshold level (34). In addition, the foreign firm chooses exporting and becomes the monopolist when: i) trade costs are low and the investment cost is prohibitively high, and ii) trade costs are high and investment cost is prohibitively high.

Next, we discuss the short-run leader-follower duopoly equilibria in which the domestic firm decides to enter the market and compete with the foreign firm. These outcomes are reported in the middle columns of Table 1. The leader-follower duopoly FDI equilibria occur only when the domestic firm is able to compete with the foreign firm irrespectively of its entry strategy. If both trade and investment costs are low, the foreign firm faces a tradeoff between FDI and exporting. It chooses FDI only if the investment cost is below the threshold level (35). In addition, the foreign firm always chooses FDI when: i) trade costs are high and the investment cost is low, and ii) trade costs are prohibitively high and the investment cost is low.

The leader-follower duopoly exporting equilibria occur when the domestic firm is able to compete with the foreign firm irrespectively of its entry strategy, or when it only exports. If the domestic

firm is able to compete with the foreign firm irrespectively of its entry strategy and both trade and investment costs are low, the foreign firm faces a tradeoff between FDI and exporting. It chooses exporting only if the investment cost is above the threshold level (35). In addition, the foreign firm always chooses exporting when: i) trade costs are low and the investment cost is high there, and ii) trade costs are low and the investment cost is prohibitively high.

Finally, if the domestic firm is able to compete with the foreign firm only when it exports and the trade costs are low while the investment cost is high, the foreign firm faces a tradeoff between becoming a monopolist when it enters via FDI and sharing the market with the local firm when it exports. It chooses exporting only if the investment cost is above the threshold level (36). In addition, the leader-follower exporting duopoly equilibrium occurs when trade costs are low and the investment cost is prohibitively high.

6. Conclusions

In this paper we investigated the role of the first mover advantage in the choice between exporting and FDI. In contrast to the earlier studies based on the simple Cournot approach in studying the choice of the optimal entry strategy we used the Stackelberg leader-follower model. First, we identified the conditions necessary for exporting and FDI, depending on the trade costs and the cost of foreign direct investment. Then, we demonstrated that four types of possible equilibria might emerge depending on various combinations of the parameters of the model: the monopoly FDI equilibrium, the monopoly exporting equilibrium, the leader-follower FDI duopoly equilibrium, and the leader-follower exporting duopoly equilibrium.

The leader-follower duopoly equilibria were in line with the observed patterns described in the international business literature confirming the importance of the first mover advantage. In particular, in the leader-follower FDI duopoly equilibrium the output supplied by the foreign firm to the host country market was bigger compared to the standard Cournot duopoly equilibrium and equal to the FDI monopoly output. Similarly, in the leader-follower exporting duopoly equilibrium output supplied by the foreign firm to the host country market was bigger compared to the standard Cournot duopoly equilibrium but smaller than the exporting monopoly equilibrium output. However, it must be noted that the leader-follower equilibria discussed in this paper represent only the short-run equilibria which are not stable in a multi-period game.

If the game between the leader and the follower is played repeatedly, each firm will be following its best response function and the equilibria will eventually converge to the standard Cournot-Nash outcomes in the long-run.⁶ This suggests an empirically testable hypothesis that the initial role of the first mover advantage should be decreasing over time. In particular, it should be expected that the market share of the leader should be falling while the share of the follower rising over time. This “convergence” hypothesis deserves more attention in future empirical studies.

The theoretical framework employed in this paper was based on specific assumptions, in particular it was assumed for simplicity that the demand function was linear. Therefore, in future studies it would

⁶ In the industrial organization literature the only way for the leader firm to remain in the first-mover advantage position in the long-run is to make a pre-commitment by a choice of production capacity before the Stackelberg game is played. This pre-commitment can prevent the game from coming back to the standard Cournot-Nash equilibrium in the long-run. This issue deserves more detailed attention in subsequent theoretical studies.

be useful to investigate whether the theoretical findings reported in this paper generalize to other demand functions, for example such as iso-elastic demand functions derived from CES utility. Finally, in this paper we did not study the antitrust policy and welfare implications of particular equilibria that should be considered in future theoretical studies.

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Appendix

Figure 1

The extensive form of the game between the leader and the follower

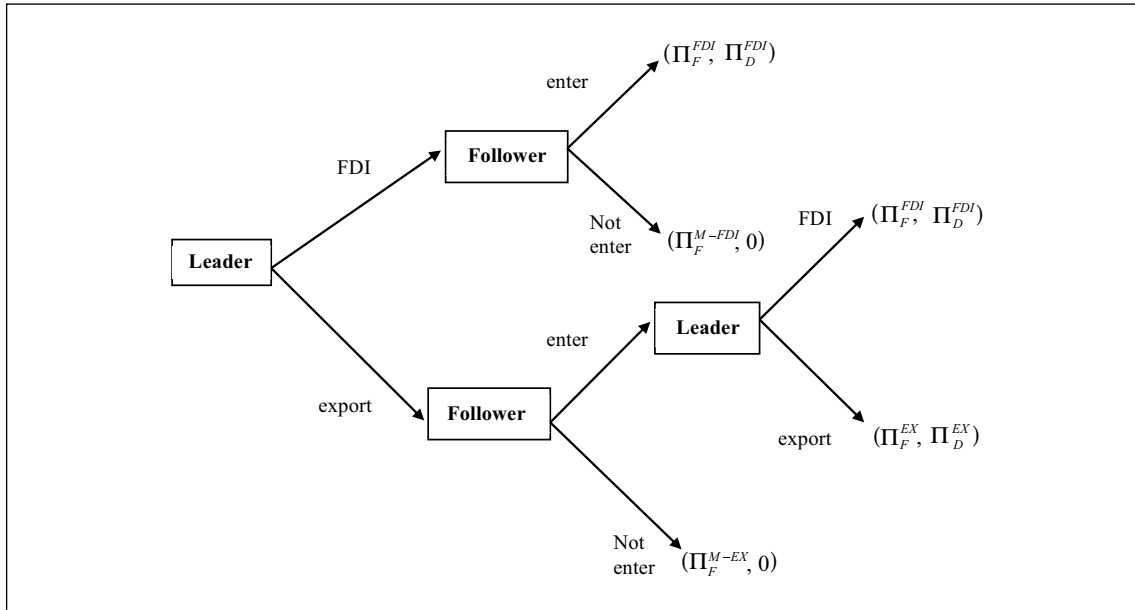


Figure 2

Possible equilibria when the fixed costs for the domestic firm are low, i.e. $F + G < \left(\frac{a-c}{4}\right)^2$

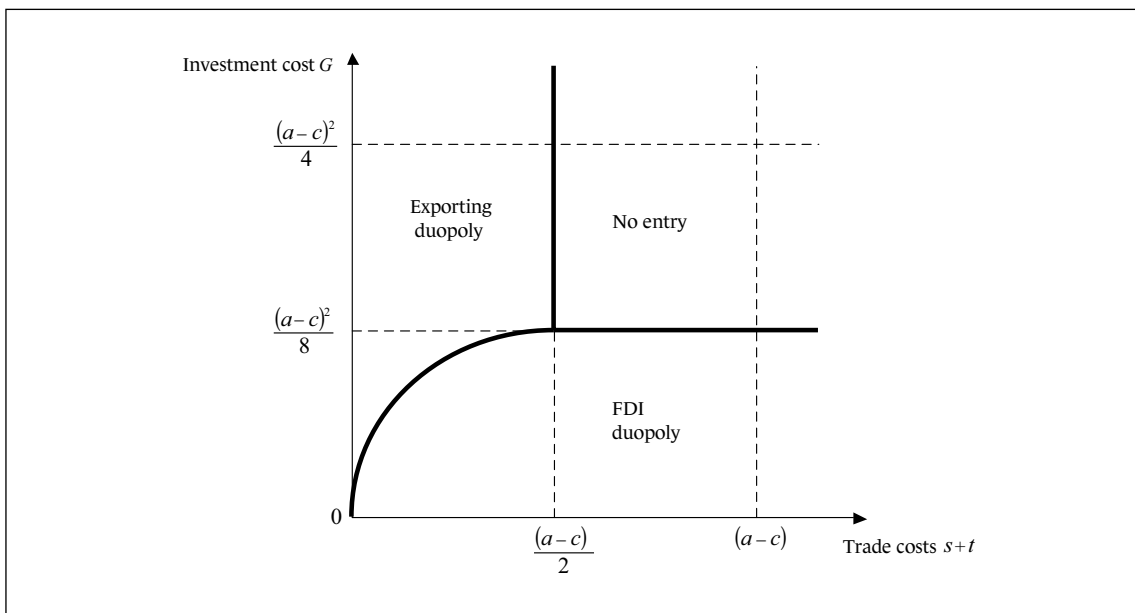


Figure 3

Possible equilibria when the fixed costs for the domestic firm are high, i.e. $\left(\frac{a-c}{4}\right)^2 < F+G < \left(\frac{a-c+2(s+t)}{4}\right)^2$

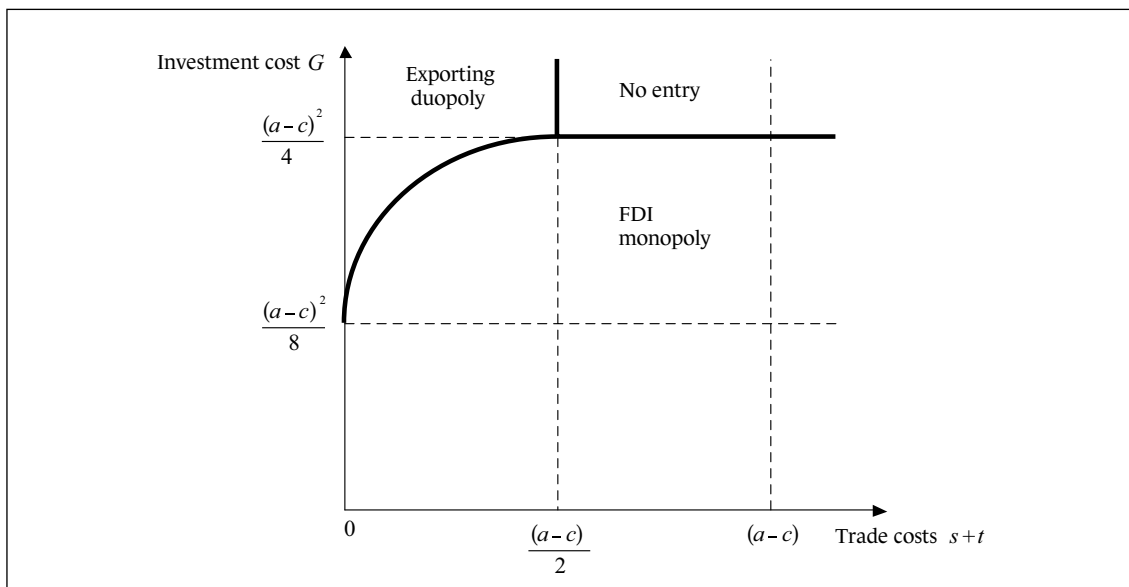
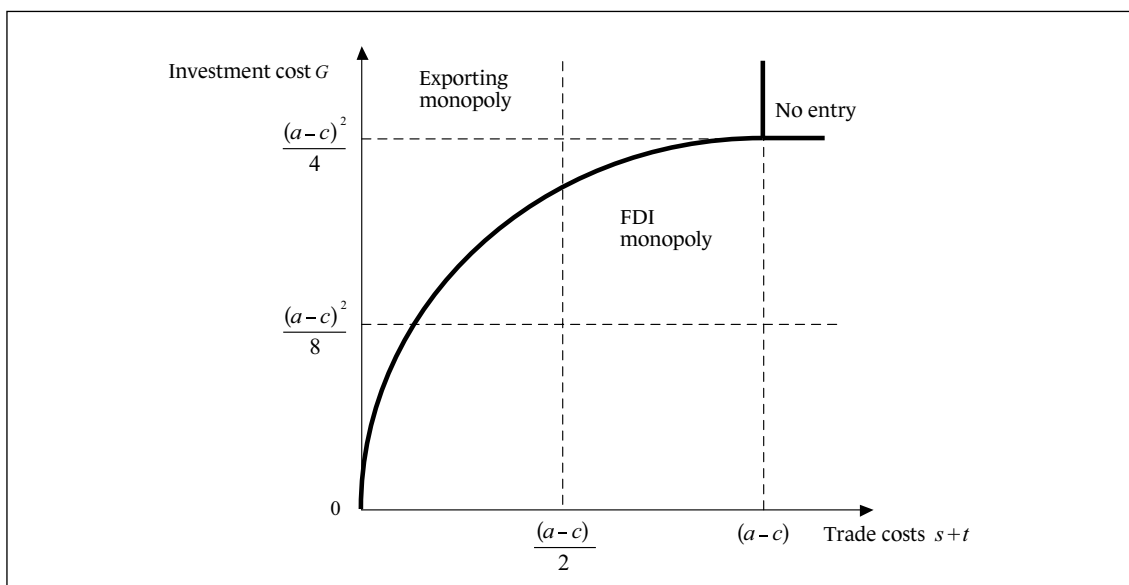


Figure 4

Possible equilibria when the fixed costs for the domestic firm are prohibitively high, i.e. $F+G > \left(\frac{a-c+2(s+t)}{4}\right)^2$



$a - c < 2(s + t) < 2(a - c)$	No entry	FDI monopoly	FDI monopoly if $G < \frac{2(a - c)(s + t) - (s + t)^2}{4}$
and $2\left(\frac{a - c}{4}\right)^2 < G < \left(\frac{a - c}{2}\right)^2$		FDI monopoly	Exporting monopoly if $G > \frac{2(a - c)(s + t) - (s + t)^2}{4}$
$2(s + t) < a - c$	Exporting duopoly	Exporting duopoly	Exporting monopoly
and $G > \left(\frac{a - c}{4}\right)^2$			
$a - c < 2(s + t) < 2(a - c)$	No entry	No entry	Exporting monopoly
and $G > \left(\frac{a - c}{4}\right)^2$			
$(s + t) > a - c$	FDI duopoly	FDI monopoly	FDI monopoly
and $G < 2\left(\frac{a - c}{4}\right)^2$			
$(s + t) > a - c$	No entry	FDI monopoly	FDI monopoly
and $2\left(\frac{a - c}{4}\right)^2 < G < \left(\frac{a - c}{2}\right)^2$			
$(s + t) > a - c$	No entry	No entry	No entry
and $G > \left(\frac{a - c}{4}\right)^2$			

Foreign firm