STRATEGIC INVESTMENTS AND MULTINATIONAL FIRMS UNDER OLIGOPOLY*

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ABSTRACT

We have developed a simple oligopoly model in which foreign direct investment (FDI) decisions are determined in an endogenous fashion. There is a host oligopoly facing competition from a foreign oligopoly in the form of either foreign investment or exports. Then, we propose a multi-stage game to stress the role played by the interactions among foreign rival firms' decisions, and we identify some of the determinants of a switch from an exporting strategy to an FDI strategy. A delay in the investment is more likely found for big enough country-specific fixed costs and low values of the oligopoly profitability. Our model provides a theoretical basis which leads to predictions in line with previous empirical studies.

Keywords: FDI, exports, Imperfect Competition.
JEL Classification System: F12, F23.

RESUMEN

Desarrollamos un modelo de oligopolio en el que las decisiones de inversión extranjera se determinan de modo endógeno. Un oligopolio doméstico se enfrenta a la competencia de un oligopolio extranjero cuya presencia puede darse bien mediante exportacionesc bien a través de inversión directa extranjera. Después proponemos un juego con varias etapas para enfatizar la interacción entre las decisiones de las empresas extranjeras y así identificar algunos de los determinantes de un cambio desde una estrategia exportadora a una inversora. Es más fácil que las empresas retrasen su decisión de invertir cuanto mayores sean los costes específicos al país doméstico y menores los márgenes de oligopolio. Nuestro modelo proporciona una base teórica que conduce a predicciones acordes con trabajos empíricos realizados.

Palabras Clave: Inversión extranjera, Exportaciones, Competencia imperfecta.

1 INTRODUCTION

The size of both the host and foreign oligopolies is a key element not only regarding the strategic decision on large firms' expansion to other markets (foreign direct investment (FDI) vs exports), but also in their timing. The theoretical analysis of this aspect has not yet been undertaken, perhaps because of the difficulty in combining it with the traditional literature on FDI. This strand of the literature motivates these decisions on the ownership, location and internalisation advantages (the OLI framework, Dunning, 1981).

From a theoretical point of view, there now exist some contributions which make use of a game theoretic approach to model FDI stressing their strategic role (Smith (1987), Horstmann and Markusen (1987, 1992), Motta (1992, 1994)).[1] These game theoretic models assume either one or several potential multinationals, or a host oligopoly, but never contemplate an oligopolistic structure on both sides.[2] We develop an oligopoly model in which investment or exports decisions, and therefore market structure, are determined in an endogenous fashion. Such a setting emphasizes the role played by the interactions among foreign rival firms' decisions and some of the determinants of a switch from one strategic choice to another. Our model provides theoretical support to earlier empirical works pointing out to the relevance of the relative sizes of the host and the foreign oligopolies and lags of exports as explanatory variables affecting the decision about how to enter a host market.

The present paper is related to both the 'new trade theory' literature and the game theoretic approaches to model FDI. More specifically, we set up a model in which a host oligopoly faces competition from a foreign oligopoly

[1] See Markusen (1995) for a survey about recent research on the theory of the multinational enterprise. Jacquemin (1989) is also one of the pioneering papers in the introduction of strategic aspects in international economics modeling.

[2] In particular, the papers by Horstmann and Markusen (1992) and Motta (1994) endogenise the market structures in *two* countries in the number of plants choice and the choice of quality, respectively. Our analysis concentrates on a partial market structure endogenisation since we only consider the host market.

We provide an explanation to the fact of finding foreign firms that export or invest by means of a simultaneous choice process and not through a sequential moves game like that in Motta (1994) who only focuses on the duopoly case. Besides, Section 3 introduces dynamics in the export/investment strategic decisions.

(the multinationals) in the form of either foreign investment or exports. In fact we are concerned with horizontal multinationals. We characterise the equilibrium solutions and discuss the role played by the different parameters in determining the choice between exports and foreign investment. It is particularly interesting to study the strategic effects between the multinationals. We find that there are three possible equilibria in this partially endogenised market structure: (i) all the foreign firms choose to export, (ii) all of them opt for foreign investment and become multinationals, (iii) a fraction of them export while the rest invest. Typically, FDI will be more likely observed when the additional variable cost (tariff / transportation cost) is large relative to fixed costs (plant-specific and country-specific). This result accords with some of the papers cited above. In addition, and given the conditions just mentioned, more foreign firms will invest the smaller the size of the host oligopoly and the bigger the size of the foreign oligopoly.[3]

Then, we move to a two-period game and allow that fraction of foreign firms that are exporting in the first period to be able to choose between foreign investment and exports. We describe the conditions under which a potential multinational would switch from an exporting strategy to an investing one. We want to emphasize the relevance of the timing at which a firm will become a multinational. This theoretical setting provides a basis to explain the direct relationship reported in some empirical papers that lags of exports cause current FDI.[4] Interestingly enough, there is no need to introduce market growth or any other dynamic element for this result to follow. In fact, and given that the total size of the oligopoly does not change, it is the share of established versus exporting firms what becomes one of the crucial elements in explaining a delay in the investment. Variations in that proportion suppose a change in the firms' strategic interactions since one more investor causes a fall in profits for both the rest of investors and

[3]The relevance of the relative sizes of the oligopolies can be found in Yamawaki and Audretsch (1988), Audretsch and Yamawaki (1988) and Kogut and Chang (1991). These papers distinguish between the relative technological capabilities of the source and recipient countries. In particular, the former two papers find that Japanese exports are sensitive to competitive conditions in the home and foreign markets. Kogut and Chang obtained that US concentration deters entry, while concentration in Japan increases the likelihood of entry.

[4]For evidence about the sequentiality of the export and investment decisions, see Caves (1993).

exporters, but the reduction in an investor's profits is bigger. On the one hand, a delay in the investment supposes a fixed cost saving effect in that the country-specific costs are incurred only once. On the other, this cost saving must not be compensated by the higher marginal costs associated to the first stage exporting activity. Concerning the role of the different parameters in explaining the existence of a switching firm, there are only two of them with an unambiguous sign. The oligopoly profitability has an unfavourable effect because were it big enough no single firm would wait and invest in the second stage. Also, a switching firm will be more likely found when the country-specific recurrent fixed costs are closer to the plant-specific costs.

The paper is organised as follows. Section 2 presents the oligopoly model in which foreign firms decide on how to be present in the host market: either as investors or as exporters, and then host and foreign firms compete in quantities. Assuming linear demand and constant marginal cost allow us to easily write the payoffs and analyse the role played by the relevant parameters. A numerical example further stresses this point. The two-period game is studied in section 3. We characterise the equilibrium number of investing firms at each period and specify when it is more likely to find a foreign firm switching from exporting to investing. Some conclusions and extensions are given at the end.

2 THE MODEL

We analyse the market for a homogeneous good that is produced by two distinct industries. Let n_h denote the number of firms in the host country and n_f the number of foreign firms that we call the multinationals.[5] We will denote by N the sum of n_h and n_f. As we are concerned with the multinationals' decisions on entry into the host market, we will only specify

[5] As Thiran and Yamawaki (1995) suggest in an empirical paper, this situation would describe the locational choice of Japanese multinationals within the European Union. In fact, it is understood as the entry decisions of firms in a free trade area. Note also that we are somewhat abusing terminology since strictly speaking these firms are *potential* multinationals.

the demand function for this country. A simple way to take the size of the market into account is by a linear demand of the form[6],

$$Q = \gamma(a - p), \quad \gamma > 0 \tag{1}$$

where p denotes the price of the good in the host country, γ is market size and $Q = \sum_{l=1}^{N} q_l$ is the total quantity of the good sold in this market. We assume that the marginal cost of output is constant and equal to c for all firms. If a multinational exports its output to the host country, the firm incurs an additional variable cost τ. It can be interpreted as due to natural (e.g. transportation costs) or artificial (e.g. tariffs) barriers to trade. If, alternatively, it establishes a plant in the host country, it must incur a plant-specific sunk cost G. There is, in addition to this fixed cost, a country-specific fixed cost F, which is recurrent across time and is incurred by both the host firms and the multinational investors. This per-period fixed cost will be particularly useful to take dynamics into account in a simple way.[7] Further note that normally $G > F$. We propose the following two-stage game. In the first stage the foreign firms decide simultaneously and non-cooperatively whether to invest or to export to the host market. Then, and given the earlier choice, the host and the foreign firms play à la Cournot. As usual we solve the game in the standard backward way to characterise the subgame perfect equilibria. This constitutes the one-period game which is analysed here. In the next Section, we will allow those firms which were exporters in period one to choose between foreign investment and export before producing. Such a game will be referred to as the two-period game. We may now write the strategic problem as,

[6]This presentation is a simplification of Donsimoni and Gabszewicz (1989), who follow a demand specification derived in Gabszewicz and Thisse (1979), where consumers' tastes and incomes are identically distributed across the two countries but the density of consumers is different.

[7]This presentation is common in the literature once a multi-period model is assumed. Buckley and Casson (1981) distinguish three types of cost associated with market servicing (either through an FDI or a licensing strategy): a) a non-recoverable set-up cost, b) a recurrent fixed cost which is due to indivisibilities in the factor inputs hired in connection with the market servicing activity and c) a recurrent variable cost. More recently, Horstmann and Markusen (1996), and adopting an agency approach, consider a per-period fixed cost aimed to represent various administrative and overhead costs to study a multinational's mode of entry to a new market.

$$\begin{array}{ll} \max_{q_i} \pi_h = (a - \frac{1}{\gamma}\sum_{l=1}^{N} q_l - c)q_i - F & i = 1, ..., n_h \\ \max_{q_j} \pi_I = (a - \frac{1}{\gamma}\sum_{l=1}^{N} q_l - c)q_j - F - G & j = 1, ..., n_I \\ \max_{q_k} \pi_E = (a - \frac{1}{\gamma}\sum_{l=1}^{N} q_l - c - \tau)q_k & k = 1, ..., n_f - n_I \end{array} \tag{2}$$

where n_I denotes the number of multinationals that decide to invest and of course $n_f - n_I$ those that choose to export. This means that all the expressions are in terms of n_I. Expressions π_h, π_I, and π_E will denote profits of a typical host firm, an investing firm and an exporting firm, respectively. By solving the above program we obtain the profits of each type of firm and then analyse the invest/export decision of a multinational. In such an oligopolistic setting the interactions among the multinational firms can be studied in addition to the role played by the other parameters already analysed in the references cited in the introduction.

We may write profits for each type of firm, given that n_I choose to invest, as

$$\pi_h(n_I) = \gamma \left(\frac{a - c + (n_f - n_I)\tau}{N + 1} \right)^2 - F \tag{3}$$

$$\pi_I(n_I) = \gamma \left(\frac{a - c + (n_f - n_I)\tau}{N + 1} \right)^2 - F - G \tag{4}$$

$$\pi_E(n_I) = \gamma \left(\frac{a - c - (n_h + n_I + 1)\tau}{N + 1} \right)^2 \tag{5}$$

for a host firm, for a foreign investor and a foreign exporter, respectively.

Let us use a numerical example to highlight the role played by the parameters F, G and τ in determining the number of multinationals that opt for foreign investment. We take the case of $n_f = 3$ so that we may represent the game in normal form. We impose two conditions, that is, *all* the multinationals are able to export or invest with positive profits, whatever the choice made by their foreign rivals. It amounts to saying that the solutions to the system (2) are interior in output for both strategies. Note that when $n_I = 0$ there is no single firm choosing to invest and that when $n_I = 3$ no firm exports. Then, the most unfavourable case for a foreign investor, from (4), follows from $n_I = 3$. Similarly, the most unfavourable case for an exporting

firm 2

firm 3		firm 1	E	E	I
	E		E	$\left(\frac{49}{36}, \frac{49}{36}, \frac{49}{36}\right)$	$(1, 4-R, 1)$
			I	$(4-R, 1, 1)$	$\left(\frac{121}{36}-R, \frac{121}{36}-R, \frac{25}{36}\right)$
	I		E	$(1, 1, 4-R)$	$\left(\frac{25}{36}, \frac{121}{36}-R, \frac{121}{36}-R\right)$
			I	$\left(\frac{121}{36}-R, \frac{25}{36}, \frac{121}{36}-R\right)$	$\left(\frac{100}{36}-R, \frac{100}{36}-R, \frac{100}{36}-R\right)$

Table 1: The normal form of the game played by three foreign firms.

firm will show up for $n_I = 2$. Strategies are denoted I and E for invest and export, respectively. We assume in the example that $(a-c)^2 = 10$, $\gamma = 1$ and $n_h = 2$.[8] Then, the two conditions can be written as: i) $F+G$ such that $\left(\frac{10}{6}\right)^2 - F - G > 0$, that is, $F+G < \frac{25}{9}$ and, ii) τ such that $10 - 5\tau > 0$, that is, $\tau < 2$. For the example to be illustrative let us take $\tau = 1$, which ensures that all three firms may export and earn positive profits be it one, two or the three of them that choose to export. Table one shows the game in normal form to be played by the three multinationals in which firm one chooses rows, firm two chooses columns and firm three chooses matrices. The payoffs in each cell are those to firm one, two and three, respectively. The Nash equilibrium, as a function of $F+G$, which we denote R for the example, are the following:

$$\begin{cases} \frac{95}{36} < R \leq \frac{100}{36} & \text{all firms export} \\ \frac{85}{36} < R \leq \frac{95}{36} & \text{one investor and two exporting firms} \\ \frac{75}{36} < R \leq \frac{85}{36} & \text{two investors and one exporting firm} \\ R \leq \frac{75}{36} & \text{all firms invest} \end{cases}$$

[8]The payoffs used in constructing table 1 are $\pi_E(n_I) = \left(\frac{10-(3+n_I)\tau}{6}\right)^2$ for $n_I = \{0,1,2\}$, and $\pi_I(n_I) = \left(\frac{10+(3-n_I)\tau}{6}\right)^2 - F - G$ for $n_I = \{1,2,3\}$.

Moving back to the general model, the conditions for the investment and export strategies to yield positive profits, independently of the foreign rivals' behaviour, can be formalised as follows,

(C.1) $\pi_I(n_I) > 0 \; \forall n_I \in \{1, ..., n_f\}$ which ensures an interior output solution under the investment strategy, that is,

$$\left(\frac{a - c + (n_f - n_I)\tau}{N+1}\right)^2 > \frac{F+G}{\gamma} \quad \forall n_I \in \{1, ..., n_f\} \tag{6}$$

and a sufficient condition, since the left hand side of (6) is decreasing in n_I (the most unfavourable case), is for $n_I = n_f$.

(C.2) $\pi_E(n_I) > 0 \; \forall n_I \in \{0, 1, ..., n_f - 1\}$ which ensures an interior output solution under the export strategy, that is,

$$\tau < \frac{a - c}{n_h + n_I + 1} \tag{7}$$

meaning that the numerator in (5) is positive. Again, the right hand side of (7) is decreasing in n_I, so that a sufficient condition applies for $n_I = n_f - 1$.[9]

In order to characterise that n_I firms is an equilibrium, two conditions are required: i)$\pi_I(n_I) \geq \pi_E(n_I - 1)$, that is, the $n_I th$ firm is better off investing than exporting and ii)$\pi_I(n_I + 1) < \pi_E(n_I)$, the $(n_I + 1)th$ firm finds it unprofitable to change from exporting to investing. The equilibrium n_I^* satisfies the following two conditions formally written as,

$$\frac{[2(a-c) - (n_h - n_f + 2n_I)\tau]N\tau}{(N+1)^2} \geq \frac{F+G}{\gamma} > \frac{[2(a-c) - (n_h - n_f + 2(n_I+1))\tau]N\tau}{(N+1)^2} \tag{8}$$

The above analysis has considered n_I as a discrete variable. Now we assume it to be a continuous variable in order to analyse the role played by the parameters. Note that n_I^* is defined by the l.h.s. of (8) with an equality.[10]

$$n_I^* = \frac{a-c}{\tau} + \frac{n_f - n_h}{2} - \frac{(F+G)(N+1)^2}{2\gamma N \tau^2} \quad for \; n_I^* \in [0, n_f] \tag{9}$$

The comparative statics yield the following derivatives,

[9]Note that $n_I = n_f$ implies that there are no exporting firms.

[10]Note that the appropriate description of the equilibrium number of investors is, $\min[n_f, \max(0, n_I^*)]$.

$$\frac{\partial n_I^*}{\partial(a-c)} > 0;\ \frac{\partial n_I^*}{\partial \gamma} > 0;\ \frac{\partial n_I^*}{\partial n_h} < 0;\ \frac{\partial n_I^*}{\partial n_f} \gtreqless 0;\ \frac{\partial n_I^*}{\partial(F+G)} < 0;\ \frac{\partial n_I^*}{\partial \tau} \gtreqless 0$$

where all the signs are as expected. There are only two ambiguous signs. One is the impact of the trade policy or transportation cost variable on the equilibrium number of investing firms, the other one is the role played by the size of the foreign oligopoly. Note that an increase in τ implies two things: first, exporting is relatively worse than investing, and second, more investing firms makes it less profitable to be an investor. This ambiguity is in line with the results obtained by Smith (1987), Horstmann and Markusen (1992) and Motta (1992) in the sense that tariffs may induce or deter FDI since there is a strategic effect (investors prefer to compete against exporters rather than against other investors). In fact, we find that, when the total size of the oligopoly tends to infinity, the ambiguity disappears and increases in τ suppose an increase in the number of investing firms. The other ambiguous sign arises from the fact that an increase in the number of foreign firms can be allocated either to the investing portion or to the exporting one. It would be allocated to the investing group ($\frac{\partial n_I^*}{\partial n_f} > 0$) the bigger the τ and the lower $\frac{F+G}{\gamma}$. Formally $\frac{\partial n_I^*}{\partial n_f} > 0$ if and only if $\frac{F+G}{\gamma} < \frac{\tau^2 N^2}{N^2-1}$. The second term in (9) reveals that the relative sizes of the host and the foreign oligopolies influence the equilibrium number of investors. In particular, when the host oligopoly is greater than the foreign one the number of multinationals decreases. As stated in the introduction, there is empirical evidence in concordance with our theoretical results.

3 THE TWO-PERIOD GAME

Adding a second period is a simple way to introduce dynamics in this model and to analyse the optimal timing of foreign investment under oligopoly. We allow those firms that chose to export in the first period, $n_f - n_I^1$, to decide between the same two strategies in the second period. It is assumed

that the firms that have already become multinationals in period one, n_I^1, remain as investors. In other words, the market structure in the host country has been endogenised to be $n_h + n_I^1$, where the upperscript stands for the period. In fact, this is the only remarkable change between the first and the second periods. There are no market growth considerations or any other dynamic element involved in the analysis. As far as we know, Buckley and Casson (1981) and Horstmann and Markusen (1987) have derived models in which the decision about when to invest is determined endogenously. In contrast with us, these models contemplate the case of one multinational under the possibility of no host production (Buckley and Casson) or with host production (Horstmann and Markusen) but where market growth is explicitly introduced. Finally, Horstmann and Markusen (1996) analyse the optimal timing decision following an agency approach and where uncertainty in the market size is introduced. Figure one shows the decisions faced by the multinationals in this two stage game.

Depending on the multinationals' choice three types of firms may appear in equilibrium: (i) firms that invest in the initial period, (ii) firms that invest in the second period having been exporters in the first one and, (iii) exporting firms in both periods. For explanatory purposes we will refer to them as purely multinationals, switching firms and purely exporters, respectively. Case (ii) is particularly interesting since it supposes that delaying the investment is a subgame perfect equilibrium for at least one firm. We will concentrate on the conditions leading to case (ii). In fact, we give the conditions for an equilibrium where there are n_I^{1*} and n_I^{2*} firms. Special cases of our general formulations are: (a) $n_I^{1*} = 0$ and $n_I^{2*} = 0$ implying the purely exporting firms case, and this coincides with the familiar two-way trade oligopoly models, (b) $n_I^{1*} = n_f$ and $n_I^{2*} = 0$, the case of all foreign firms as purely multinationals, and (c) $n_I^{1*} = 0$ and $n_I^{2*} = n_f$ when all the firms are switching firms.

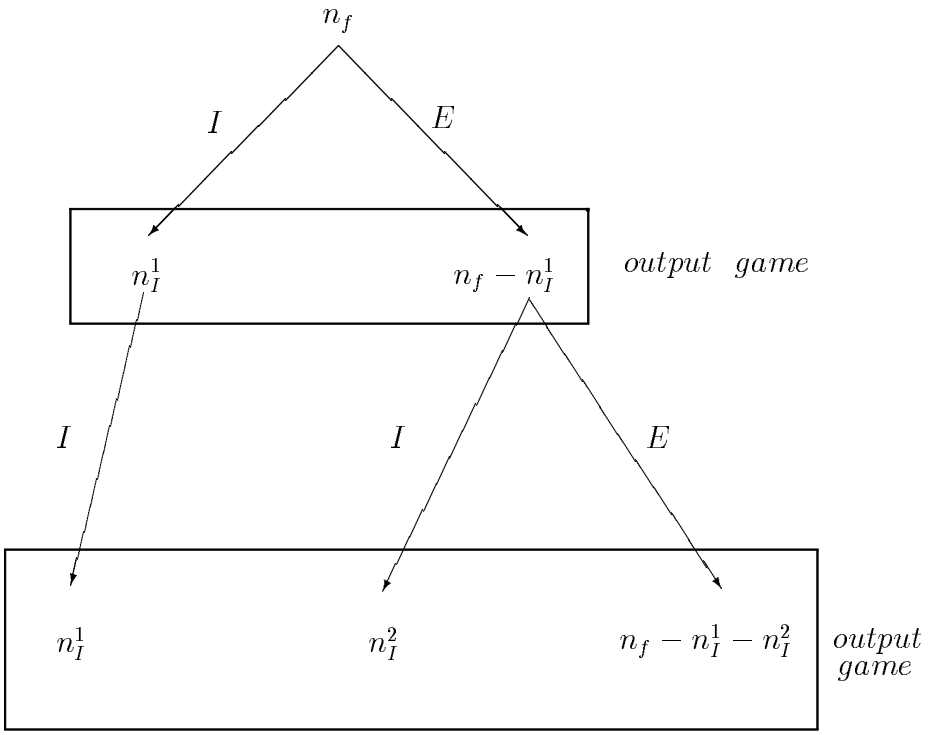

Figure 1 : *structure of the foreign firms' I/E decisions.*

In the second period, the system of equations (10) determines the equilibrium n_I^{2*}, given the n_I^1 inherited from the first period.

$$(i)\pi_I^2(n_I^2; n_I^1) \geq \pi_E^2(n_I^2 - 1; n_I^1) \quad (ii)\pi_I^2(n_I^2 + 1; n_I^1) < \pi_E^2(n_I^2; n_I^1) \qquad (10)$$

These two conditions have the same interpretation as in the previous section. We may then get an equation similar to (8) by using (4)-(5) and appropriately taking the number of investing firms. Thus,

$$\begin{array}{l} \frac{\left(2(a-c)-(n_h-n_f+2(n_I^1+n_I^2))\tau\right)N\tau}{(N+1)^2} \geq \frac{F+G}{\gamma} \\ > \frac{\left(2(a-c)-(n_h-n_f+2(n_I^1+n_I^2+1))\tau\right)N\tau}{(N+1)^2} \end{array} \tag{11}$$

Equation (11) is telling that, given that $(n_f - n_I^1)$ firms exported in the first period, some of them (n_I^2) find it more profitable to invest in the second period. To show that switching is a subgame perfect equilibrium for at least one firm amounts to specifying the conditions for it not to deviate neither in the first period nor in the second. That is, equation (11) tells us when deviation does not occur in the second period. Going backwards we now express the non-deviation conditions in the first period,

$$\begin{array}{l} (i)\pi_E^1(n_I^1) + \pi_I^2(n_I^2; n_I^1) \geq \pi_I^1(n_I^1+1) + \pi_I^2(n_I^2; n_I^1+1) \\ (ii)\pi_E^1(n_I^1+1) + \pi_I^2(n_I^2; n_I^1+1) < \pi_I^1(n_I^1) + \pi_I^2(n_I^2; n_I^1) \end{array} \tag{12}$$

which can be summarised as,[11]

$$\begin{array}{l} \frac{\left(2(a-c)-(n_h-n_f+2(n_I^1+1))\tau\right)N\tau-\left(2(a-c)+\tau(2n_f-2(n_I^1+n_I^2)-1)\right)\tau}{(N+1)^2} \leq \frac{F}{\gamma} \\ < \frac{\left(2(a-c)-(n_h-n_f+2(n_I^1+1))\tau\right)(N+2)\tau+\left(2(a-c)+\tau(2n_f-2(n_I^1+n_I^2)-1)\right)\tau}{(N+1)^2} \end{array} \tag{13}$$

Equations (13) and (11), using the equality side, define the equilibrium number of investing firms in the first and second periods, respectively. It is interesting to note that (11) defines a direct relationship between the number of exporting firms in the first period and the number of investors in the second. This analytical result supports the consideration of lags of exports in regression models explaining the current levels of FDI. The equilibrium n_I^{1*} and n_I^{2*} are,

$$n_I^{1*} = \frac{a-c}{\tau} - \frac{3N-1}{2N} + \frac{n_f - n_h}{2} - \frac{(N+1)^2[(N+1)F+G]}{2\gamma\tau^2N^2} \tag{14}$$

$$n_I^{2*} = \frac{3N-1}{2N} - \frac{(N+1)^2[(N-1)G-F]}{2\gamma\tau^2N^2} \tag{15}$$

[11] Equation (13) is capturing the dynamic aspect of the decision FDI vs. Export, therefore only the recurrent fixed cost appears.

	$a-c$	γ	F	G	τ	n_h	n_f
n_I^{1*}	$+$	$+$	$-$	$-$	$\gtreqless$	$-$	$\gtreqless$
n_I^{2*}	0	$+$	$+$	$-$	$+$	$\gtreqless$	$\gtreqless$
$n_I^{1*}+n_I^{2*}$	$+$	$+$	$-$	$-$	$\gtreqless$	$-$	$\gtreqless$

Table 2: Comparative statics.

Observe that $n_I^{1*}+n_I^{2*}$ coincides with the expression (9). Conditions for the existence of at least one switching firm are $n_I^{1*} < n_f$ (C.3) and $n_I^{2*} > 0$ (C.4). That is,

$$\text{(C.3)} \quad \tau^2\left(\tfrac{N^2+3N-1}{2N}\right) - \tau(a-c) + \tfrac{(N+1)^2[(N+1)F+G]}{2\gamma N^2} > 0$$

$$\text{(C.4)} \qquad \sqrt{\tfrac{(N+1)^2[(N-1)G-F]}{(3N-1)N\gamma}} < \tau$$

Condition (C.3) tells us whether or not all of the foreign firms invest in the first period. It is a second degree expression in τ. For the τ values belonging to the interval (τ^-, τ^+), where τ^- and τ^+ denote the smallest and the biggest roots when they exist, the condition is not satisfied, and this means that all firms become investors in the first period. This is more likely to happen the bigger the oligopoly profitability and the smaller the market size and both the plant-specific and country-specific fixed costs. The effect of the total size of the oligopoly is ambiguous. Therefore, we find a non-monotonic relation in the exports and investment decisions as τ varies. This result resembles a finding in Motta (1992).

Condition (C.4) establishes a minimum level of τ such that at least one exporter in the first period moves to the investing activity in the second. That minimum level is increasing with both the plant-specific cost and the size of the oligopoly and decreasing with the market size and the country-specific fixed cost. Putting the two conditions together, a switching firm is more likely to be found the bigger the country-specific fixed cost and the smaller the oligopoly profitability, whereas the effects of the other parameters are ambiguous. It has to be noted that the two conditions for the existence of interior output solutions must be added to (C.3) and (C.4) in the foregoing analysis.

Table two displays the comparative statics corresponding to (14) and (15). A few comments are in order. The signs for the total number of

investors coincide with the ones for n_I^{1*}. However, for n_I^{2*} the effects are rather different. There is an absolute saving cost argument associated to the delay of the investment that explains the sign of F. Also, there seems to appear a kind of tariff jumping argument only confined to the second period, presumably because the strategic effect vanishes. The oligopoly profitability plays a role in determining the total number of investors but it does not affect the number of investors in the second period.

4 CONCLUDING REMARKS

The previous analyses on the strategic role of FDI have investigated, in one way or another, the interactions between rival firms, understanding as such the host and the multinational firms. Despite this important feature, compared to early qualitative works, they disregard the interactions among multinationals themselves.

The present paper has shown, in a simple model, how foreign investment versus export decisions interplay in a homogeneous oligopoly setup. There is a host oligopoly facing competition from the potential multinationals and market structure is partially endogenised. Compared to recent papers stressing the strategic role of FDI, we amplify the analysis by considering the interaction among foreign rivals' decisions. In the context of a multi-stage game we have described the conditions under which a multinational would switch from an exporting strategy to an investing one.

Put differently, the first part of the article has looked at when, in a given moment of time, we observe that symmetrical firms in all respects choose a different way to be present in a host market. The second part highlights when a given firm takes a different strategic decision across time. Our formalisation is in support of the empirical analyses of the determinants of FDI that include, among others, the relative sizes of the oligopolies and the lags of exports as explanatory variables.

Some limitations of the model should be noted. i) The possibility of a host firm establishing itself in a foreign market is not contemplated. ii) There are other forms of entry, such as licensing or joint ventures, which have not

been considered. iii) Once a multinational has established it becomes an irrevocable decision in the sense that it cannot switch to export later in the game. iv) Host firms are already settled, and allowing them to decide whether to enter would very much complicate the game played by N agents. v) Strategic trade policy effects on welfare have been omitted.

A few words comment on extensions are in order. The first one is the introduction of product differentiation. The nature of the results in our model depends on the oligopoly profits of a firm being decreasing in n_I, the number of investing firms. Presumably, any product differentiation model displaying this property would yield the same qualitative results.[12] Secondly, it is usual in the literature on FDI to assume that host firms know the market better than firms coming from abroad. Very recently, and from a contract theory perspective, Horstmann and Markusen (1996) have considered informational asymmetries between the export and investment decisions.[13] It is possible to introduce an uncertainty structure in our model taking into account that an established firm knows the market better.

[12]Recently, Ellingsen and Wärneryd (1992) study strategic trade policy when foreign direct investment is an option. They show that the limit tariff, that is, the tariff making the multinational indifferent between investing and exporting, varies countercyclically regardless of the mode of market interaction.

[13]De Meza and van der Ploeg (1987) introduce uncertainty in the marginal cost of the potential multinational. Risk spreading gives an alternative incentive to diversify production location. Then, allowing for production flexibility because of inter-plant substitution provides a motive for multinationality.

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