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## Endogenous market structure and the gains from foreign direct investment

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# Kieler Arbeitspapiere

# Kiel Working Papers

Kiel Working Paper No. 958

**ENDOGENOUS MARKET STRUCTURE AND  
THE GAINS FROM FOREIGN DIRECT INVESTMENT**

by

**Roberto A. De Santis and Frank Stähler**



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## ABSTRACT

This paper discusses the gains from foreign direct investment (FDI) in a two country setting with endogenous markets structures under two alternative locations for the oligopolistic industry. If the oligopolistic industry is located in the domestic country only, we show that market concentration occurs if national and multinational firms coexist. In this case, FDI is welfare improving for the foreign country, but welfare declining for the domestic country. If only multinational firms are competitive, the impact on market structure and the welfare of the domestic country is indeterminate, whereas the welfare of the foreign country improves. By contrast, if the oligopolistic industry is located in both countries, then FDI compared to intraindustry trade leads to mutual welfare gains.

**KEYWORDS:** Foreign direct investment, Multinational enterprises, Imperfect competition, Welfare.

**JEL classification:** F12, F15.

## TABLE OF CONTENTS

1. Introduction.....	1
2. The model .....	3
2.1. A basic model with intersectoral trade.....	5
2.2. A basic model with intraindustry trade .....	5
2.3. A basic model with FDI .....	6
3. FDI versus intersectoral trade .....	6
3.1. The impact of FDI on market structure.....	10
3.2. The impact of FDI on welfare .....	11
4. FDI versus intraindustry trade.....	14
5. Concluding remarks.....	17
References.....	18

# 1 Introduction

The stylized facts of the recent years suggest that economic integration among countries does not only take place via trade but also, and now predominantly, via FDI, even though trade barriers have fallen dramatically. In fact, the World Investment Report of the United Nations (1998) gives a projection of foreign affiliates' sales of 8851 and 9500 billions of US Dollars respectively for the years 1996 and 1997; whereas, in the same period, exports of goods and non-factor services amount to 6245 and 6432 billions of US Dollars. In other words, the value of aggregate production of multinational enterprises (MNEs) in the host country outweighs nowadays aggregate exports. These new facts have motivated the study of the theory of the multinational firm, which started in the middle eighties and developed in the nineties. The literature distinguishes between horizontal FDI (Markusen, 1984; Horstmann and Markusen, 1992; Brainard, 1993; Markusen and Venables 1996a, b, 1998), which is undertaken to place production closer to foreign markets; and vertical FDI (Helpman, 1984; Helpman and Krugman, 1985), which is undertaken to exploit lower production costs in order to serve both the domestic and the foreign markets. Thus, FDI can substitute trade, when production in the host country replaces exports (horizontal FDI); but it can be complementary to trade, when a part of the production in the host country is shipped back to the home country (vertical FDI).

In this study, we focus our analysis on the welfare effect of FDI, when FDI and exports are perfect substitutes.<sup>1</sup> It must be stressed that, although the classical and the 'new trade' theory have discussed welfare effects in detail, the welfare impact of FDI has received little attention. The simultaneous treatment of trade and FDI has already been discussed in the literature, in

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<sup>1</sup>The underlying assumption is that FDI is undertaken by MNEs to be closer to the foreign market. This argument is often used to explain the large intra-flow of FDI among developed countries (see, for example, Markusen and Venables, 1998). Also Markusen (1998), in summarizing the results of the empirical literature, points out that MNEs engage their activities with countries which are more similar in size, relative endowments and per capita incomes, and that most FDI seems to be horizontal. For recent contributions which discuss the econometric evidence in support of an horizontal relationship between trade and FDI, see Brainard (1997), Blonigen (1999) and Markusen and Maskus (1999).

particular by two papers, one by Horstmann and Markusen (1992) and the other by Markusen and Venables (1998). Horstmann and Markusen (1992) deal analytically with the different type of firms, that is national firms and MNEs. However, they do not allow for market entry and assume at most the existence of one firm in each country. A more recent contribution by Markusen and Venables (1998) employs a model, which explains simultaneously and endogenously the type and the number of active firms in each country. However, given the complexity of this model, they are not able to study analytically 'what are the effect of multinationals'. These models are solved by means of numerical simulations. Horstmann and Markusen (1992) claim that small tax changes have a large impact on profits and welfare, as a result of changing equilibrium market structure. In particular, they point out that the domestic country can suffer welfare losses with an introduction of a tariff, as the foreign firm would serve the domestic market with a branch plant, and the domestic firm would suffer a large loss in profits. Markusen and Venables (1998) claim that the effect of multinational entry on the welfare of the domestic country is never negative, if countries differ in relative endowments, as economies of scale are more efficiently exploited. However, the welfare impact on the domestic country can be slightly negative, if it is a large country, due to the loss of the so called 'home market advantage', which keeps the average cost, and therefore the price index, at a lower level in the absence of MNEs.

The aim of this study is to explain analytically both the type and the number of firms, and the impact on welfare in the home and the host country. The model is similar to the setting employed in Horstmann and Markusen (1992), but with free entry/exit, as assumed in Markusen and Venables (1998). The analysis is carried out by comparing two different regimes. In the first instance, FDI is assumed to be not profitable, and the foreign market is served with exports (i.e. trade regime). Then, FDI is made profitable, and domestic firms can choose between exporting or locating production in the host country (i.e. FDI regime). This regime switch has an impact on market structure and welfare, whose analysis is the purpose of this paper. It is important to stress that we examine two different trade regimes (i.e. intersectoral and



intra-industry trade), where trade *per se* is beneficial compared to autarky.

We assume that the oligopolistic industry needs specific skills to produce specific goods. Thus, its location depends upon the place where the specific skills of the workforce are concentrated. This is the reason why we explore the economic implications of FDI by using as a reference point two alternative trade regimes: the intersectoral trade regime and the intraindustry trade regime. If the specific skills are concentrated in one country, the oligopolistic industry can exist only in this country (say the domestic country). In this case, the FDI regime is compared with the intersectoral trade regime. We show that there are gains for the foreign country, but losses for the domestic country, if both national and multinational firms are active in the market. Conversely, the impact on the welfare of the domestic country is ambiguous if FDI is dominant, in the sense that only multinational firms are profitable. We also show that market concentration occurs when both national and multinational firms coexist, but the impact on market structure is indeterminate if FDI is more profitable. If skills are located in both countries, then the oligopolistic industry is present in both of them. In this case, the FDI regime is compared with the intraindustry trade regime. We show that FDI compared to intraindustry trade leads to mutual welfare gains.

The plan of the paper is as follows. Section 2 presents the framework of the model. Section 3 explores the effects on market structure and welfare of FDI replacing intersectoral trade. Section 4 discusses the implications of FDI replacing intraindustry trade. Section 5 concludes.

## 2 The model

The model used in this paper is similar to the model employed by Horstmann and Markusen (1992). The world consists of two countries, a domestic country  $d$  and a foreign country  $f$ . Each country is endowed with a certain amount of a production factor, such as labor  $L$ . In both countries, a homogeneous good  $Y$  is produced by using the labor input, such that  $L^Y = Y$ , where the superscript denotes the sector in which labor is used. The price of  $Y$  or the return on  $L$  is the numeraire of the model. Exporting  $Y$  is assumed to

raise no transport costs. In order to keep the structure of the model simple, the consumer behavior in each country is determined by the linear quadratic utility function  $U_i(X_i, Y_i) = \alpha X_i - 0.5\beta X_i^2 + Y_i$ . Given the aggregate budget resource constraint  $L_i + \sum \pi_i = p_i X_i + Y_i, i \in \{d, f\}$ , where  $\sum \pi_i$  denotes the aggregate profits of the oligopolistic industry and  $p_i$  the price of  $X_i$  in terms of the numeraire, maximization of  $U_i$  subject to the resource constraint yields the inverse income inelastic demand function

$$p_i = \alpha - \beta X_i, i \in \{d, f\}. \quad (1)$$

The oligopolistic industry is characterized by imperfect competition and Cournot behavior. Each firm faces a fixed set-up cost and produces two goods, one traded within the home market and the other exported or produced abroad. Exports and FDI are assumed to be perfect substitutes, which implies that we focus our analysis upon horizontal FDI. Firms' production decisions depend on the fixed costs, the marginal cost  $c$  and the trade costs  $t$ . Markets are segmented so that each firm is able to regard each country as a separate market. Thus, each firm maximizes its profit function with respect to both the sales in the foreign market and the production for the domestic market, and chooses the profit-maximizing quantity for each country separately. The profit of a national firm are

$$\pi^n = (p_d - c)x_d^n + [p_f - (c + t)]x_f^n - F_d, \quad (2)$$

where  $x_d^n$  and  $x_f^n$  represent the production of a national firm for the domestic and the foreign market, respectively; and  $F_d$  the fixed set-up cost for home and export production (i.e. firm-specific costs). This fixed cost comprises the investment costs for headquarters and one production plant in the domestic country. The superscript  $n$  denotes the case of national firms.

The profits of an MNE are

$$\pi^m = (p_d - c)x_d^m + (p_f - c)x_f^m - F_d - F_f, \quad (3)$$

where  $x_d^m$  and  $x_f^m$  represent the production of an MNE for the domestic and the foreign market, respectively; and  $F_f$  the fixed cost needed to start the production process abroad (i.e. plant-specific costs). The superscript  $m$  denotes the case of MNEs.

## 2.1 A basic model with intersectoral trade

If only national firms exist in the domestic country, that is, if the oligopolistic industry is concentrated in the domestic country, the equilibrium in the goods market implies that  $X_d = Nx_d^n$  and  $X_f = Nx_f^n$ , where  $N$  denotes the number of national firms. In equilibrium, each firm maximizes (2) given the equilibrium output of its rivals, and entry occurs until the excess profits of the marginal firm are driven to zero. Since firms are symmetric, all firms earn zero profits in equilibrium. This condition allows us to determine the equilibrium number of national firms, the individual output levels in equilibrium and the equilibrium prices in both countries:

$$N^* = \sqrt{\frac{(\alpha - c)^2 + (\alpha - c - t)^2}{\beta F_d}} - 1, \quad (4)$$

$$x_d^* = \frac{\alpha - c}{\beta(N^* + 1)}, \quad x_f^* = \frac{\alpha - (c + t)}{\beta(N^* + 1)}, \quad (5)$$

$$p_d^* = \frac{\alpha + cN^*}{N^* + 1}, \quad p_f^* = \frac{\alpha + (c + t)N^*}{N^* + 1}. \quad (6)$$

## 2.2 A basic model with intraindustry trade

If the oligopolistic industry exist in both countries, but FDI is not profitable, the model coincides with the reciprocal dumping model of Brander (1981), and Brander and Krugman (1983).<sup>2</sup> By symmetry we need to consider only the domestic country. The equilibrium in the commodity market is then  $X_d = X_f = 0.5N(x_d + x_f)$ , where  $N$  denotes now the total number of active firms in both countries. The equilibrium values for the number of firms, for individual output levels and prices are:

$$\tilde{N} = \frac{(\alpha - c) + (\alpha - c - t)}{\sqrt{2\beta F} - t^2} - 1, \quad (7)$$

---

<sup>2</sup>Brander and Krugman (1983) demonstrate that the gains from trade above the autarky levels are not guaranteed in a Cournot competition setting with a given number of firms. But, they show that the gains from trade are mutual, if market entry is allowed.

$$\bar{x}_d = \frac{\alpha - c + 0.5\tilde{N}t}{\beta(\tilde{N} + 1)}, \bar{x}_f = \frac{\alpha - c - (0.5\tilde{N} + 1)t}{\beta(\tilde{N} + 1)}, \quad (8)$$

$$\tilde{p} = \frac{\alpha + \tilde{N}c + 0.5\tilde{N}t}{\tilde{N} + 1}. \quad (9)$$

### 2.3 A basic model with FDI

If FDI is profitable and dominant, only MNEs would be active in the market. They serve the foreign market by means of a production site erected in the foreign country. This implies that they are able to produce for the foreign market without incurring trade costs, but they have to carry the additional fixed cost burden needed to set up the production process abroad. The f.o.c.'s, the zero profit condition (3) and the inverse demand functions (1) allow us to determine the respective equilibrium number of MNEs, output levels and prices:

$$M^{**} = (\alpha - c) \sqrt{\frac{2}{\beta(F_d + F_f)}} - 1 \quad (10)$$

$$x_d^{**} = x_f^{**} = \frac{\alpha - c}{\beta(M^{**} + 1)}, \quad (11)$$

$$p_d^{**} = p_f^{**} = \frac{\alpha + cM^{**}}{M^{**} + 1} \quad (12)$$

## 3 FDI versus intersectoral trade

Following the eclectic paradigm of Dunning (1977), MNEs are induced to invest abroad if, in addition to location advantages (i.e. lower factor costs), they have ownership advantages and internalization advantages (i.e. no interest in selling licenses to foreign firms). For this reason, this section assumes that the oligopolistic industry owns specific skills to produce specific goods, and is located in the domestic country only, so that national firms serve the foreign country via exports and MNEs via FDI. The economy is therefore characterized by intersectoral trade and FDI.

The equilibrium number of national and multinational firms can be determined by solving the optimizing behavior of firms under the zero profit conditions. Express  $N$  as the number of national firms and  $M$  as the number of MNEs. In this case, aggregate outputs are determined by  $X_d = Nx_d^n + Mx_d^m$  and  $X_f = Nx_f^n + Mx_f^m$ . The optimizing solution under the zero profit conditions (2) and (3) results in two non-linear equations in  $N$  and  $M$ ,

$$f(N, M) := (\alpha - c)^2 + [\alpha - c - (M + 1)t]^2 - \beta F_d(N + M + 1)^2 = 0, \quad (13)$$

$$g(N, M) := (\alpha - c)^2 + (\alpha - c + Nt)^2 - \beta(F_d + F_f)(N + M + 1)^2 = 0. \quad (14)$$

$f$  denotes the zero profit condition for national firms, and  $g$  denotes the zero profit condition for MNEs. Given that both types of firms are active in the market, (13) and (14) can be solved explicitly for the equilibrium values of  $N$  and  $M$ :

$$N^e = \frac{\alpha - c}{t} \left( \frac{\beta F_f + t^2}{\sqrt{\eta}} - 1 \right), \quad (15)$$

$$M^e = \frac{\alpha - c}{t} \left( 1 - \frac{\beta F_f - t^2}{\sqrt{\eta}} \right) - 1, \quad (16)$$

where  $\eta := 4\beta F_d t^2 - (\beta F_f - t^2)^2$ . The superscript  $e$  denotes the equilibrium values in the case of coexistence of national and multinational firms. The four f.o.c.'s and the two inverse demand functions (1) determine the optimal output and prices for both the domestic and the foreign market:

$$p_d^e = \frac{\alpha + c(N^e + M^e)}{N^e + M^e + 1}, p_f^e = \frac{\alpha + (c + t)N^e + cM^e}{N^e + M^e + 1}, \quad (17)$$

$$x_d^{ne} = x_d^{me} = \frac{\alpha - c}{\beta(N^e + M^e + 1)},$$

$$x_f^{ne} = \frac{\alpha - c - t(M^e + 1)}{\beta(N^e + M^e + 1)}, x_f^{me} = \frac{\alpha - c + tN^e}{\beta(N^e + M^e + 1)}. \quad (18)$$

The properties of this equilibrium can be analyzed by computing the Jacobian for the system of implicit functions  $f$  and  $g$ . It can be shown that

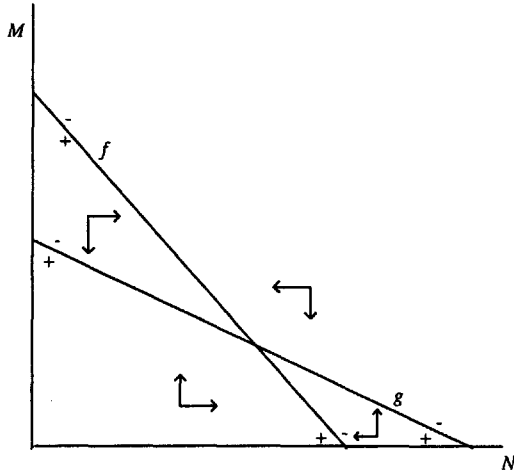


Figure 1: Coexistence of national and multinational firms

the Jacobian determinant of (13) and (14) with respect to the endogenous variables  $N$  and  $M$  is positive. This implies that (15) and (16) intersect in the  $M - N$  - space as it is shown in Figure 1.<sup>3</sup> If  $f$  and  $g$  intersect, then both national and multinational firms coexist. The profit of each national firm or MNE is positive (negative), if the  $M - N$  - combination lies respectively above (below)  $f$  or  $g$ . The positive Jacobian guarantees that the equilibrium point is also internally stable in the sense that no national (multinational) firm can improve on its profits by becoming a multinational (national) firm.

It might happen that, due to low production costs, only one type of firm, either national firms or MNEs, is active in the market. In this case,  $f$  or  $g$  do not intersect. Figure 2 depicts the case of MNEs dominating the market, since the  $g$ -curve lies to the right of the  $f$ -curve. In this case,  $F_f(t)$  is so low (high) that all national firms exit the market. In this case, the respective equilibrium number of MNEs, output levels and prices can be derived from (14), (17) and (18) by setting  $N = 0$ . This leads to (10), (11) and (12).

<sup>3</sup>The detailed proof is available upon request. Note that the slopes in all figures are linear only for ease of exposition.

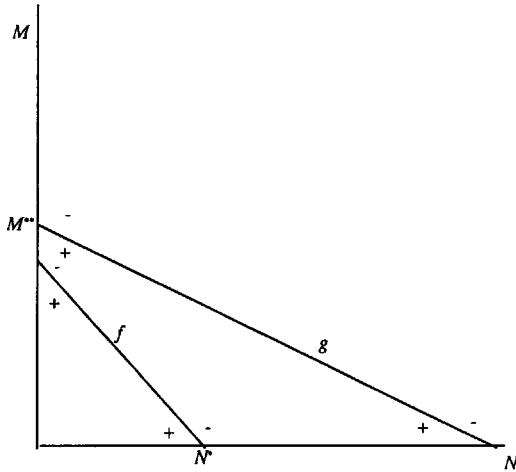


Figure 2: Dominance of multinational firms

We can determine what we define as the 'dominance condition' for FDI. Once this occurs, firms are forced to invest abroad to remain active in both the domestic and the foreign market. It is clear from Figure 2 that the 'dominance condition' occurs if, and only if,  $f(0, M^{**}) \leq 0$ . In this case, market entry is not profitable even for a single national firm. By using (13), we derive the following 'dominance condition' for FDI:

$$f(0, M^{**}) \leq 0 \Leftrightarrow \beta F_f \leq t\sqrt{2\beta F_d - t^2}. \quad (19)$$

In summary, the lower the fixed costs to undertake FDI, and/or the larger the trade costs, the greater the possibility that that only multinationals are active in the market.

If  $F_f(t)$  is sufficiently high (low), then national firms dominate the market. Figure 3 depicts this case, which occurs if  $g(N^*, 0) \leq 0$ . By using (14), we derive the following 'dominance condition' for national firms:

$$g(N^*, 0) \leq 0 \Leftrightarrow \beta F_f \geq 2t(\alpha - c - t)\sqrt{\frac{\beta F_d}{(\alpha - c)^2 + (\alpha - c - t)^2} + t^2}. \quad (20)$$

Namely, the greater the fixed costs to undertake FDI, and/or the lower the

trade costs, the greater the possibility that only national firms are active in the market.

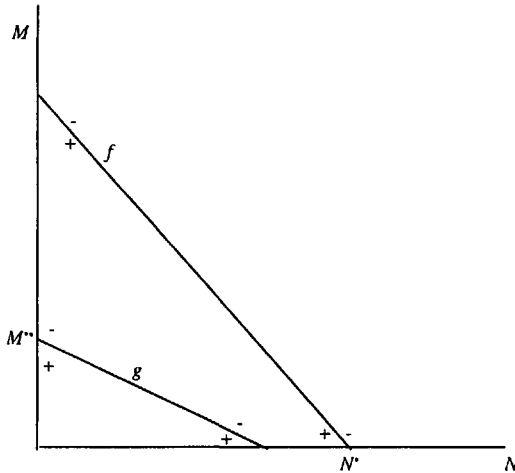


Figure 3: Dominance of national firms

### 3.1 The impact of FDI on market structure

If FDI is profitable and MNEs are competitive, the market structure of active firms will change. This subsection will prove the following Lemma 1 which summarizes the impact of FDI on market structure.

**Lemma 1:** *If national and multinational firms coexist, the total number of active firms under the FDI regime is lower than that under the intersectoral trade regime. However, if FDI is dominant, the impact on the market structure is ambiguous.*

Proof: Consider first the case of both national and multinational firms serving the market. Then, the total number of active firms is given by  $N^e + M^e$ . The impact of FDI on market structure can be easily examined



by using (4), (15), and (16). In fact,  $M^e + N^e < N^*$  if, and only if,

$$[(\alpha - c)^2 + (\alpha - c - t)^2](\beta F_f - t^2)^2 < 4(\alpha - c - t)^2 t^2 \beta F_d. \quad (21)$$

This expression is fulfilled if, and only if, the 'dominance condition' for national firms (20) is violated. Since this is the case, we can argue that the coexistence of both national and multinational firms leads to the concentration of the industry.

If FDI is dominant, the 'dominance condition' (19) can be re-arranged as follows:

$$\frac{F_d}{F_d + F_f} \geq \frac{(\alpha - c)^2 + (\alpha - c - t - tM^{**})^2}{2(\alpha - c)^2}. \quad (22)$$

Expression (22) does not contradict  $M^{**} < N^*$ . In fact, from (4) and (10), we observe that the relation  $M^{**} < N^*$  holds if

$$\frac{F_d}{F_d + F_f} < \frac{(\alpha - c)^2 + (\alpha - c - t)^2}{2(\alpha - c)^2}. \quad (23)$$

By comparing (22) and (23), we can maintain that there is scope for a negative market structure effect even if FDI is dominant. In particular, we observe that the number of active firms under the FDI regime is lower, if FDI is profitable at the margin. However, we also cannot rule out the possibility that  $M^{**} > N^*$ . Indeed, Figure 2 depicts this case: the distance of the intercept of the  $g$ -curve with the  $M$ -axis is larger than that of the intercept of the  $f$ -curve with the  $N$ -axis. ■

### 3.2 The impact of FDI on welfare

The impact of FDI on market structure has an effect on the welfare of both the domestic and the foreign country, because equilibrium prices and quantities depend upon the equilibrium number of firms and the costs of production. Based on Lemma 1, we prove the following Proposition 1.

**Proposition 1:** *If FDI is profitable, and national and multinational firms coexist, the welfare of the domestic country under the FDI regime is lower than that under the intersectoral trade regime. If FDI is dominant, the*

*welfare of the domestic country can either increase or decrease. The welfare of the foreign country rises in both cases.*

Proof: Given the zero profit condition and the assumption that marginal costs are constant, the welfare analysis can be carried out by examining the impact of FDI on prices. If the foreign market is served via exports, prices are given by (6). If FDI is dominant, the domestic price and the foreign price coincide and are given by (12). If instead national and multinational firms coexist, prices are given by (17). By comparing (6), (12) and (17), it is evident that the domestic consumer is worse off if, and only if, the total number of active firms under the FDI regime is smaller than the number of national firms under the intersectoral trade regime. If both national and multinational firms are competitive, the domestic consumer is worse off, because market concentration occurs (see Lemma 1). If FDI is dominant, Lemma 1 claims that the impact on market structure is indeterminate. Thus, the impact on domestic welfare is ambiguous. Hence, the welfare effects for the domestic country stated by Proposition 1 are proven.

Conversely, we can show that the representative consumer in the foreign country is always better off, if FDI is profitable. In this case, two effects have to be considered: firstly, due to higher total fixed costs, the exit of firms can occur, bringing about a rise in foreign prices, which decreases foreign welfare; secondly, the foreign consumer benefits from lower production costs unambiguously, as foreign prices can be set at a lower level. The proof of the foreign country's welfare improvement can be given by contradiction. Suppose that  $p_f$  given by (17) is larger than  $p_f$  given by (6). Under the use of (4), (15) and (16), we find that an increase in the foreign price occurs if, and only if,

$$\beta F_f > 2t(\alpha - c - t) \sqrt{\frac{\beta F_d}{(\alpha - c)^2 + (\alpha - c - t)^2} + t^2}. \quad (24)$$

However, if this inequality occurs, then MNEs would not be profitable and national firms would dominate the market [see (20)]. Hence, if coexistence occurs, the foreign price under the FDI regime ought to be lower than that

under the intersectoral trade regime. This finding holds also for the case when FDI is dominant. In fact, (24) tells us that  $p_f$  is lower under coexistence, including the border case where  $N^e = 0$  and FDI becomes dominant. When FDI becomes more dominant, the number of active firms increases. Additionally, dominant FDI implies that no trade costs have to be carried by foreign consumers. Hence, the welfare of the foreign country is larger under the dominant FDI regime compared to the intersectoral trade regime.<sup>4</sup> ■

Another interesting question is how small  $F_f$  should be such that the domestic country is not worse off. Since we have already proven that the domestic country is worse off in the case of coexistence, it is obvious that the domestic country can become better off only if FDI is dominant, and if  $p_d^{**} < p_d^*$ . Thus, the critical amount of plant-specific fixed costs can be computed by setting (10) larger than or equal to (4). The domestic country is therefore not worse off if

$$F_f \leq \psi F_d, \psi = \frac{(\alpha - c)^2 - (\alpha - c - t)^2}{(\alpha - c)^2 + (\alpha - c - t)^2}. \quad (25)$$

If  $F_f$  is larger (lower) than  $\psi F_d$ , the domestic country is worse (better) off with FDI, because the latter would imply a higher (lower) degree of industry concentration. Only if  $F_f$  is small enough, the domestic country gains from FDI, because the equilibrium number of MNEs would be larger than the equilibrium number of national firms. However, this case seems to be rather the exception than the rule. In fact, consider a possible case where marginal costs are 10 % of the reservation price and trade costs are 30 % of the marginal costs:  $\alpha = 10$ ,  $c = 1$  and  $t = 0.3$ . In this case, the critical parameter  $\psi$  would be equal to 0.0339. In other words, the plant-specific fixed costs should be lower than 3.39 % of the firm-specific fixed costs for the domestic consumer to be better off.

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<sup>4</sup>To clarify this argument, consider the case of dominant national firms as depicted in Figure 3. A decrease in  $F_f$  implies a shift of the  $g$ -curve to the right. If  $F_f$  is sufficiently smaller, coexistence of national and multinational firms would occur. We have shown that this leads to welfare gains for the foreign country, including the border case for which  $N^e = 0$ ,  $M^e = M^{**}$ . Given the border case, a further decrease in  $F_f$ , by strengthening the profitability of FDI, leads to a greater number of active MNEs and, as a result, to larger welfare gains.

## 4 FDI and intraindustry trade

The previous section has shown the effects on market structure and welfare of FDI compared to intersectoral trade, under the assumption that an oligopolistic industry is present only in the domestic country. In this section, we discuss how these results vary, when an oligopolistic industry is assumed to exist in both countries. Under the intraindustry trade regime, the model is identical to that of Brander and Krugman (1983), used to study the welfare effects of intraindustry trade caused by the rivalry of oligopolistic firms under the free-entry zero profit condition. They show that trade with respect to autarky is mutually welfare improving for the Cournot case, as firms move down their average costs curves. If FDI is profitable, aggregate outputs are determined by  $X_d = nx_d^n + mx_d^m + \tilde{n}x_f^{\tilde{n}} + \tilde{m}x_f^{\tilde{m}}$  and  $X_f = nx_d^f + mx_f^m + \tilde{n}x_d^{\tilde{n}} + \tilde{m}x_d^{\tilde{m}}$ , where  $n(\tilde{n})$  and  $m(\tilde{m})$  denote the number of national firms and the number of MNEs having the headquarters in the domestic (foreign) country, respectively. By symmetry, the equilibrium number of national and multinational firms will coincide. Hence, we need to consider only one market. Let  $X$  denote consumption in each country. The profit of each national firm and each MNE is still given by (2) and (3), respectively. Since all types of firms are possibly present in the market, define  $N = 2n$  and  $M = 2m$ . The solution of the standard profit maximization problems faced by the firms yields,

$$p = \frac{\alpha + cN + 0.5tN + cM}{N + M + 1}, \quad (26)$$

$$x_d^n = x_d^m = x_f^m = \frac{\alpha - c - 0.5tN}{\beta(N + M + 1)}, x_f^n = \frac{\alpha - c - t - 0.5tN - tM}{\beta(N + M + 1)}. \quad (27)$$

Given the profit maximizing output and prices, profits (2) and (3) can be re-arranged as follows:

$$f(N, M) := \frac{(\alpha - c + 0.5tN)^2}{\beta(N + M + 1)^2} + \frac{(\alpha - c - t - 0.5tN - tM)^2}{\beta(N + M + 1)^2} - F_d, \quad (28)$$

$$g(N, M) := \frac{2(\alpha - c + 0.5tN)^2}{\beta(N + M + 1)^2} - F_d - F_f. \quad (29)$$

The zero profit conditions would allow us to determine the equilibrium number of both national firms and MNEs. However, the Jacobian determinant of (28) and (29) with respect to  $N$  and  $M$  is zero for any value of  $(N, M)$ , which implies that (28) and (29) are linearly dependent.<sup>5</sup> Consequently, the equilibrium in a symmetric Cournot oligopoly with entry is a corner solution, which leads to the conclusion that either only MNEs or only national firms are in the market.

**Proposition 2:** *If (i) both the domestic and the foreign inverse demand function are linear, (ii) marginal costs are constant, (iii) countries are symmetric, and (iv) the oligopolistic industry is located in both countries, symmetric firms producing homogeneous goods are either all national or multinational.*

Proof: See appendix.

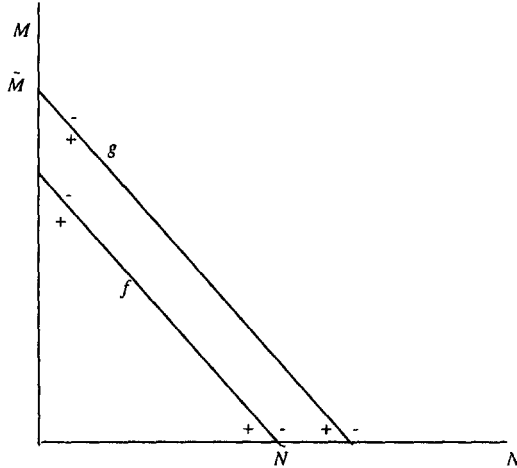


Figure 4: Profitability of FDI

In order to examine which type of firms dominate the market, it is useful

<sup>5</sup>See appendix for a proof.

to compare the implicit functions in the  $M - N$  - space (see Figure 4). As we argued, expressions (28) and (29) not only do not intersect, but are parallel, as it is shown in Figure 4. This implies that the distance between both curves is constant in each point. If FDI is not profitable, the equilibrium  $(\tilde{N}, 0)$  is represented by (7). Conversely, if FDI is profitable, the equilibrium  $(0, M^{**})$  is given by (10).

We can now compute the distance between  $f$  and  $g$ , when for example the equilibrium point is represented by  $(\tilde{N}, 0)$ . Since  $\partial f/\partial N, \partial f/\partial M, \partial g/\partial N, \partial g/\partial M < 0$ , the points under (above) the  $f - (g-)$  curve represent positive (negative) profits for national (multinational) firms. Hence, FDI is profitable if, and only if,  $g(\tilde{N}, 0) \geq 0$ , which means that the entry of a MNE is profitable since national firms make zero profits.<sup>6</sup> Since national firms and MNEs cannot coexist, the conditions for both dominance and profitability of intra-FDI coincide. Thus, by using (10), we derive the following profitability condition:

$$g(\tilde{N}, 0) = \frac{2(\alpha - c + 0.5t\tilde{N})^2}{\beta(\tilde{N} + 1)^2} - F_d - F_f \geq 0. \quad (30)$$

If  $g(\tilde{N}, 0) \geq 0$ , the equilibrium number of firms is given by (10). By inserting (10) into (30), and rearranging, we obtain

$$M^{**} \geq \frac{\alpha - c - 0.5t}{\alpha - c + 0.5t\tilde{N}} \tilde{N}. \quad (31)$$

Inequality (31) shows that industry concentration may also occur in the case of intra-FDI. Most importantly, the dominance condition (31) is very useful for welfare analysis. In fact, (31) is consistent with the price equation (26) under the two alternative regimes if, and only if,  $p(0, M^{**}) \leq p(\tilde{N}, 0)$ . This implies that the negative dumping effect, which occurs if homogeneous goods are traded internationally, plays a key role in welfare analysis, regardless of the impact of a regime switch on market structure. Thus, we can conclude our analysis with the following proposition.

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<sup>6</sup>Conversely, if  $f(0, M^{**}) \geq 0$ , national firms dominate.

*Proposition 3: Although the impact on the market structure of intra-FDI regime compared to intraindustry trade regime is ambiguous, intra-FDI generates mutual welfare gains.*

## 5 Concluding remarks

This paper has examined the impact of FDI on market structure and welfare in both the home and the host country, under the key assumptions that the equilibrium number of symmetric firms is derived by the zero profit condition, and that trade and FDI are perfect substitutes. The model considers two alternative trade regimes (the intersectoral trade regime and the intraindustry trade regime) and two alternative locations for the oligopolistic industry (only in the domestic market and in both the domestic and the foreign markets). Since the oligopolistic industry serves the foreign market via exports or with FDI, we can compare the two FDI regimes with the two trade regimes.

We show that, if the oligopolistic industry is located in the domestic country only, the FDI regime compared to the intersectoral trade regime leads to welfare losses for the domestic country, but to welfare gains for the foreign country, when national and multinational firms are both profitable. However, if FDI is dominant, in the sense that only MNEs are active, then the welfare of the foreign country improves, whereas the impact on the welfare of the domestic country becomes indeterminate. This ambiguity depends upon the impact of FDI on market structure, which we have shown to be negative if both types of firms are profitable, but indeterminate if MNEs dominate the market. Conversely, if the oligopolistic industry is located in both countries, then the FDI regime compared to the intraindustry trade regime leads to mutual welfare gains, although the equilibrium number of MNEs can be lower than that of national firms.

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We are indebted to Horst Herberg, James Markusen and Anthony Venables for valuable comments and suggestions. This paper has been presented at the 1999 annual conference of the European Association for Research in Industrial Economics in Turin, the 1999 annual meeting of the German Economic Association (Verein für Socialpolitik) in Mainz, the workshop on multinational enterprises, economic development and policies of the Kiel Institute of World Economics and the departmental seminar of the Norwegian School of Economics and Business Administration in Bergen. We wish to thank the participants for very useful discussion. All errors are our responsibility.

## Appendix: Proof of Proposition 2

Proposition 2 claims that the determinant of the Jacobian matrix of (28) and (29) is zero. Differentiation of (28) and (29) yields

$$\frac{\partial f}{\partial N} = -\frac{[(\alpha - c) + (\alpha - c - t) - tM]^2}{\beta(N + M + 1)^3} < 0, \quad (32)$$

$$\frac{\partial f}{\partial M} = \frac{\partial g}{\partial N} = -\frac{(\alpha - c + 0.5tN)[(\alpha - c) + (\alpha - c - t) - tM]}{\beta(N + M + 1)^3} < 0, \quad (33)$$

$$\frac{\partial g}{\partial M} = -\frac{4(\alpha - c + 0.5tN)^2}{\beta(N + M + 1)^3} < 0. \quad (34)$$

By using (32), (33) and (34), we find that

$$|J| = \frac{\partial f}{\partial N} \frac{\partial g}{\partial M} - \frac{\partial f}{\partial M} \frac{\partial g}{\partial N} = 0. \quad \blacksquare \quad (35)$$

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