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## Playing away to win at home

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**Playing away to win at home**

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# Playing away to win at home

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# Playing away to win at home

## **Abstract**

This paper presents a model of the interaction between two rival firms based in the same country. Each firm must decide how to serve a foreign market (export or foreign production) and how much to invest in a corporate-wide asset that reduces production costs and/or augments the willingness-to-pay for their product. In this scenario, the firms' foreign direct investment decisions are interdependent. Furthermore, strategic motives for FDI relate not to a firm's domestic, as well as foreign, market profits. One possibility is that a firm sets up overseas production even though its foreign market profits would be higher by exporting.

**JEL classification:** F23; L13; O30

**Keywords:** Foreign direct investment; Multinational firm; R&D; Oligopoly

## **1. Introduction**

Standard explanations of foreign direct investment (FDI) focus upon two motives: to lower the cost of supplying a market; and/or to improve access to some foreign market(s) (see Caves, 1996 for an overview). However, the theory of the multinational firm also accommodates other, complementary motives for FDI that derive from the strategic imperative for a firm to influence the behaviour of its rivals insofar as it is possible and that influence can be exerted to achieve a more beneficial outcome for the firm. In this paper, we highlight a possible strategic motive for FDI, such that: a firm may be motivated to set-up foreign production because by doing so they reduce a rival firm's commitment of resources to a corporate-wide investment that has a cost-reducing, and/or demand augmenting, effect. As the investment deterred has a corporate-wide impact on the rival, this effect of FDI serves to augment the firm's performance in the home, as well and the foreign, market. Indeed, even if the fixed cost of FDI is large enough to ensure that the firm's profits from serving the foreign market would be higher by exporting, the firm may nevertheless set-up a foreign plant. They do so because FDI is associated with an improvement in their home market profits – this is the scenario alluded to in the title.<sup>1</sup>

The international expansion of production activities is overwhelmingly associated with relatively large firms that tend to serve relatively large shares of the national markets in which they operate. After all, such a strategy is accompanied by substantial resource requirements in capital, managerial expertise and time, and so on. Also, a firm must overcome any disadvantage associated with its (at least initial) relative unfamiliarity and/or incompatibility with the foreign production environment, as compared to the indigenous industry. Therefore, firms that sustain multinational production are those that hold the firm-specific assets (of whatever kind) that secure a strong, perhaps dominant, presence in the market (Teece, 1986; Dunning, 1988). As a result, it is unsurprising that, in recent years, a

notable academic literature has developed to explore the influence of market power on the evolution of multinational firms. Specifically, it has become more widely acknowledged that companies' foreign direct investment (FDI) decisions can be importantly interdependent, i.e. that one firm's FDI decision can be importantly influenced by the corresponding choice of a rival firm.

One mechanism through which such interdependence can arise is proposed by Knickerbocker (1973), who sought to explain the apparent clustering of FDI observed among US firms. He proposed that if one of a group of rival oligopolists sets-up production facilities overseas, uncertain foreign cost economies will threaten the status-quo in all markets (at home and abroad, if the firms initially export). Risk-averse rival firms would then seek to minimise the prospect of upsetting the balance of competition by replicating an initial FDI by one of their number, i.e. there is an incentive for follow-my-leader behaviour. This mechanism, which requires the presence of oligopoly, uncertainty and risk aversion, has since been formalised by Head et al. (2002). Also, Leahy and Pavelin (2003) formally illustrate an alternative mechanism for positive interdependence between firms' FDI, i.e. that one firm undertaking FDI increases the incentive for rival firms to follow suit. They show that, without uncertainty about the foreign production environment or risk aversion, firms may engage in follow-my-leader FDI because of foreign cost advantages that would threaten tacit, oligopolistic collusion if FDI was not replicated across firms.

An alternative approach employs an analysis of oligopoly that disregards risk-aversion and presumes complete information and non-cooperative behaviour. Seminal contributions in this area include those made by Smith (1987), Horstmann and Markusen (1992) and Motta (1992). That literature, upon which this paper builds and to which it contributes, reveals the tendency in FDI for negative interdependence between firms, i.e. the firms' actions are strategic substitutes. The underlying mechanism derives from the characterisation of FDI as a

fixed cost (of building a foreign plant) in exchange for per-unit saving (on a transport cost and/or tariff associated with exporting), and the fact that if a firm undertakes FDI, the foreign-dedicated output of that firm is larger and that of its rival is smaller, *ceteris paribus*. Therefore, by undertaking FDI, a firm decreases its rival's incentive to follow suit by reducing that firm's optimal foreign-dedicated output and so decreasing the number of units across which it must recover the fixed cost of overseas operations. This interdependence gives rise to a potential strategic motive for FDI: when FDI by one firm deters FDI by a rival, this makes FDI more attractive for the former as it increases the profitability of its serving of the foreign market through local production.

As outlined previously, we will show that the range of strategic motives for FDI available to a firm is expanded by the addition of investment in some corporate-wide asset. In this connection, there is an extensive literature that discusses the complementary relationship between FDI and research and development (R&D) activities. Some have focussed upon the role of innovatory leadership in providing the firm-specific advantages necessary for the internationalisation of the firm (Caves, 1996; Dunning, 1977 and 1981; Petit and Sanna-Randaccio, 1998); others have focussed upon the within-firm internationalisation of the innovation process (Archibugi and Michie, 1995; Cantwell, 1992 and 1995; Cantwell and Piscitello, 1999 and 2000; Granstrand and Sjolander, 1992; Kuemmerle, 1999; Zander, 1997). Most pertinently, Petit and Sanna-Randaccio (2000) and Sanna-Randaccio (2002) propose a formal theoretical model of the interaction between these two corporate behaviours in an oligopoly setting. Indeed, this model is similar to that which we present below. However, in the exposition of their model, they choose to focus upon the within-firm complementarity between FDI and R&D, the effect of technological spillovers and government policy on FDI, and the welfare implications of corporate behaviour. They choose not to extract, describe and

discuss the distinctive motives for FDI present in such a framework, and upon which we will focus here.

The remainder of the paper is organised as follows: the next section describes the model; section 3 presents results; a final section offers concluding remarks.

## 2. The model

Consider the following model. There are two firms – Firm 1 and Firm 2 – that produce substitute goods. The firms compete in two markets: one in country A (the home market); and one in country B (the foreign market). Both firms have a production plant in country A but must decide whether to serve B with exports or, following FDI, from a new local plant. In addition to deciding whether or not to carry out this market-specific investment, each firm engages in corporate-wide investment, which lowers its production costs everywhere and/or raises demand for the firm's product everywhere. This corporate-wide investment expenditure is:  $k_j$  for Firm  $j=1,2$ . There is a three-stage game as follows: in the first stage, the firms decide whether or not to carry out FDI; in the second stage, they set their R&D levels; and in the third stage, they choose their outputs to be dedicated to each of the two markets. At each stage, the firms move simultaneously.

The home market demand for Firm  $j$  is:

$$p_j^A = a + \lambda x_j - q_j^A - e q_i^A \quad j=1,2 \text{ and } i \neq j \quad (1)$$

where  $q_j^A$  represents the home market sales of Firm  $j$ . The parameter  $e$  is an inverse measure of product differentiation that takes a value of unity when goods are identical and zero when they are unrelated. Investment affects demand through  $x_j = \sqrt{2k_j/\gamma}$  (inverting we have  $k_j = \gamma x_j^2/2$  with the cost of investment determined by  $\gamma$ ). The parameter  $\lambda$  is greater than



zero if a firm's investment increases consumers' willingness to pay for the variety produced by that firm. The corresponding foreign market demand for Firm  $j$  is:

$$p_j^B = a + \lambda x_j - q_j^B - e q_i^B \quad j=1,2 \text{ and } i \neq j \quad (2)$$

where  $q_j^B$  represents the foreign market sales of Firm  $j$ .

Marginal production costs are:

$$c_j = c_0 - \theta x_j \quad j=1,2 \quad (3)$$

where  $\theta > 0$  if the investment is cost reducing, and the higher is  $x_j$  the lower is marginal cost. The transport costs are  $t$  and the total production costs when a firm exports is:  $c_j q_j^A + (c_j + t) q_j^B$ . If the firm undertakes FDI, it pays a fixed cost,  $G$ , and avoids the transport costs. It is convenient to use a more compact notation and to define  $c_j^i$  as marginal cost for Firm  $j=1,2$ , inclusive of any transport costs, of serving market  $i=A,B$ . Now the profits of Firm  $j$  can be written as:

$$\pi_j = (p^A - c_j^A) q_j^A + (p^B - c_j^B) q_j^B - (\chi_j^2 / 2) - IG \quad (4)$$

where  $I$  is an indicator variable which is unity when FDI occurs and zero otherwise. The price-cost margin for Firm  $j$  in the home market is:

$$p_j^A - c_j = a - c_0 - q_j^A - e q_i^A + (\lambda + \theta) x_j \quad (5)$$

Thus, regardless of whether it is cost-reducing or demand enhancing more investment involves higher fixed costs in exchange for a larger price-cost margin in both markets. Thus, it makes no qualitative difference whether we model investment as willingness-to-pay augmenting or as cost reducing. Without loss of generality we will set  $\theta + \lambda = 1$ .

For concreteness in the remainder of the exposition of the model, we will assume that investment is cost reducing, rather than quality-enhancing, R&D, and reserve comment on the demand-augmenting investment case to subsequent discussions (section 3.4 and

thereafter). Then, since investment does not affect demand, the size of  $e > 0$  (the degree of product differentiation) has no qualitative impact on results and it will save on notation to set  $e = 1$ .

### 3. Results

In solving the game, we adopt the sub-game perfect equilibrium concept and proceed by solving the game backwards, beginning with the third stage decision, that regarding outputs.

#### 3.1 The output choices

In each market, outputs are set to satisfy the following first-order conditions:

$$\frac{\partial \pi_j}{\partial q_j^i} = (p^i - c_j^i) - q_j^i = 0 \quad i=A,B \quad (6)$$

The resulting equilibrium outputs are:

$$q_j^i = \frac{\alpha_j^i + 2x_j - x_k}{3} \quad i=A,B \text{ and } k \neq j \quad (7)$$

where  $\alpha_j^A = a - c_0$  and  $\alpha_j^B$  depends on the FDI choice of Firm  $j$  and its rival (see Table 1).

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 INSERT TABLE 1 ABOUT HERE  
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#### 3.2 The R&D choices

In the second stage of the game, each firm chooses its R&D expenditure taking the FDI regimes as given. Since there is a one-to-one relationship between R&D expenditure  $k_j$  and cost reduction  $x_j$ , we can model the firm as choosing  $x$  directly. This turns out to be algebraically simpler. Substituting (6) and (7) into (4), profits net of FDI costs are:

$$\pi_j = \left( \frac{\alpha_j^A + 2x_j - x_k}{3} \right)^2 + \left( \frac{\alpha_j^B + 2x_j - x_k}{3} \right)^2 - (\gamma x_j^2 / 2) \quad (8)$$

Firm  $j$ 's first-order condition for R&D is:

$$\frac{\partial \pi_j}{\partial x_j} = \frac{4}{3} \left( \frac{\alpha_j^A + 2x_j - x_k}{3} \right) + \frac{4}{3} \left( \frac{\alpha_j^B + 2x_j - x_k}{3} \right) - \gamma x_j = 0 \quad (9)$$

From this we can obtain the linearised R&D reaction functions in explicit form:

$$x_j = \frac{R[\alpha_j^A + \alpha_j^B - 2x_k]}{1 - 4R} \quad k \neq j \quad \text{where } R \equiv \frac{4}{9\gamma} \quad (10)$$

$R$  is inversely related to the cost of investment, and is a measure of the *effective return* on R&D. The denominator in (10) is positive from the second-order condition for R&D. Clearly, these reaction functions are negatively sloped implying that R&D levels are strategic substitutes. Firm  $j$ 's Nash equilibrium level of cost reduction is:

$$x_j = \frac{R}{\Delta} [(1 - 4R)(\alpha_j^A + \alpha_j^B) - 2R(\alpha_k^A + \alpha_k^B)] \quad k \neq j \quad (11)$$

where  $\Delta = (1 - 2R)(1 - 6R) > 0$ . Stability considerations require this to be positive, i.e. we require that  $R < 1/6$ . (The cost parameter  $\gamma$  never appears independently of  $R$ . It is possible to see  $R$  as inversely related to cost of R&D and to place restrictions on it directly.) When a firm decides to do FDI rather than export the value of  $\alpha_j^B$  rises by  $2t$  (see Table 1) and the value of  $\alpha_k^B$  falls by  $t$ . From (10) we can see that this leads to a parallel outward shift of its own, and a parallel inward shift of its rival's, R&D reaction function. From (11) we can see how this results in an increase in the R&D investment of the firm that does FDI and a fall in the other firm's R&D.

The use of (11) in (7) gives the following reduced form expressions for home market outputs ( $q_j^A$ ) and foreign market outputs ( $q_j^B$ ):

$$q_j^i = \frac{1}{3} \left( \alpha_j^i + \frac{R}{\Delta} \left[ (2 - 6R)(\alpha_j^A + \alpha_j^B) - (\alpha_k^A + \alpha_k^B) \right] \right) \quad i=A,B \text{ and } k \neq j \quad (12)$$

Thus, there is an increase in both the foreign and domestic outputs of a firm that follows from a choice to do FDI.

### 3.3 The FDI choices

We will now examine the first stage, that in which the firms choose whether or not to engage in FDI. Making use of first-order conditions for output, (6), and the first-order conditions for investment, (9) which can be rewritten as  $x_j = 3R(q_j^A + q_j^B)$ , allows us to write profits in terms of each firm's own outputs:

$$\pi_j = (q_j^A)^2 + (q_j^B)^2 - 2R(q_j^A + q_j^B)^2 - IG \quad (13)$$

From (12) it is clear that the outputs depend on the levels of  $R$  and  $\alpha$ . Without loss of generality we can normalise the home market  $\alpha_j^A = a - c_0$  as unity. The difference between regimes in outputs, and thus also in profits exclusive of FDI costs, is explained by differences in the regime specific  $\alpha_j^B$  levels which in turn depend on transport costs (see Table 1). There are three exogenous parameters in the model  $G$ ,  $t$  and  $R$  – we replace  $\gamma$  with  $R$  for convenience – that will jointly determine the first stage equilibrium outcomes.

We will use  $E$  to represent the strategy choice export and  $M$  is used to represent strategy choice of a firm that does FDI and thus becomes a multinational. Let  $\Pi_{ij}^i$  be the profits for Firm  $i$  exclusive of FDI costs when Firm  $i$  chooses mode of serving the foreign market  $i=E,M$  and Firm  $j$  chooses mode  $j=E,M$ . Given that Firm  $j$  chooses  $j=E,M$ , Firm  $i$  compares  $\Pi_{Ej}^i$  and  $\Pi_{Mj}^i - G$   $j=E,M$  and chooses the one that yields higher profits. Setting these equal gives us the two thresholds for Firm  $i$ :  $G_j^i = \Pi_{Mj}^i - \Pi_{Ej}^i$   $j=E,M$ .

The results are presented graphically in  $G, t$  space in Figure 1. The two thresholds divide the space into three regions. In the figure,  $G$  and  $t$  are given as a proportion of  $a - c_0 = 1$ . Clearly therefore,  $t$  must lie below 0.5 to ensure that all  $\alpha_j^B$  are positive, and so that both firms can profitably serve the foreign market in all circumstances (see Table 1). In the figure, we hold the value of  $R$  constant at 0.03. Increases in the level of  $R$  will shift the threshold loci demarcating the different regions upwards increasing the size of the regions in which firms become multinational, but it will not qualitatively affect the diagram.

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 INSERT FIGURES 1 AND 2 ABOUT HERE  
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### 3.4 Discussion: Playing away to win at home

In this model, there is potential for FDI to be critically motivated by its ability to increase home market profits. To reveal the extent to which the FDI observed in Figure 1 is thus motivated, we must find those combinations of  $R, G$  and  $t$  for which a firm chooses FDI when its foreign market profits would be higher as an exporter. We isolate such combinations in  $G, t$  space by recalculating the thresholds  $G_j^i$  disregarding home market profits; the relevant parameterisations lie in-between the original and recalculated thresholds (the latter of which lie below the former in both cases) and are shaded in Figure 2 – regions (i) and (ii).

In region (i), if the firms were to ignore the effect of FDI on home profits, the outcome would be M,E (or E,M) rather than M,M. This is because, given that its rival chooses FDI, the foreign market profits of a firm (taking account of FDI costs) would be higher if it exported rather than undertook FDI. The firm chooses FDI because, were it to export, its home market profits would be lower due to the accompanying differences in investment behaviour – rather than the symmetrical R&D of the M,M outcome, a sole multinational out-invests its rival in R&D.

In region (ii), if the firms were to ignore the effect of FDI on home profits, the outcome would be E,E rather than M,E (or E,M). This is because, given that its rival chooses to export, the foreign market profits of a firm (taking account of FDI costs) would be higher if it exported rather than undertook FDI. The firm chooses FDI because, were it to export, its home market profits would be lower due to the accompanying differences in investment behaviour – rather than the multinational out-investing its rival in R&D as in the M,E/E,M outcome, there is symmetrical R&D in exporting duopoly (E,E).

The ‘playing away to win at home’ scenario arises because of the effect of a firm’s FDI on the investment behaviour of both firms. Thus, there are two mechanisms at work: one is the within-firm complementarity between FDI and R&D; the other is the strategic effect of FDI across firms which depresses the R&D of the rival. The former derives from the increased incentive to invest in R&D that accompanies FDI due to a rise in the firm’s total output (owing to a lower variable cost of serving the foreign market); the latter derives from the decreased incentive to invest in R&D that accompanies a rival’s FDI due to a fall in the firm’s total output (owing to an improvement in the relative position of the rival in the foreign market). The effect of each is to improve the home (as well as foreign) market position associated with the FDI option. Thus, with the inclusion of a corporate-wide investment, the strategic motives for FDI extend to a firm’s home market, where one effect of FDI is to reduce the rival’s price-cost margin.

### **3.5 Discussion: Playing away to win at home and consumer surplus**

It is worth noting the effect on consumer surplus in the home market of the FDI we observe that is critically motivated by its positive effect on home market profits. From Figure 1, we can see such promotion of FDI: M,M rather than M,E or E,M (region (i) of Figure 2); M,E or E,M rather than E,E (region (ii) of Figure 2). These shifts in regime act to augment per-unit

consumer willingness-to-pay and/or depress the variable costs at which the market is served in two ways. Firstly, one firm need not incur the per-unit transport cost,  $t$ . Secondly, and as a result of the first, FDI is associated with greater investment in the corporate-wide asset. This is because, as an exporter, a firm invests less than it would as a multinational, *ceteris paribus*, owing to the increased marginal return to investment associated with larger outputs.

Figure 3 shows consumer surplus (CS) in the home market in equilibrium (represented by black lines) across the same range of  $t$  shown in Figures 1 and 2. In order to illustrate the manner in which CS varies with  $t$  not only within, but also between, FDI regimes, we draw the figure given a fixed cost of FDI for which we observe all regimes (E,E, M,E/E,M and M,M) across the relevant range of  $t$ , i.e.  $G$  must be sufficiently low for M,M to be observed at the highest levels of  $t$ . In Figure 3, we see that within regimes CS either falls (as in E,E and M,E/E,M) or remains constant (as in M,M) as  $t$  rises. Comparing across FDI regimes for  $t > 0$ , the highest level of CS is found under multinational duopoly, M,M, and shifts in regimes towards ones exhibiting greater FDI (E,E to M,E/E,M to M,M) tend to be associated with a higher level of CS.

From Figure 3, we can also inspect the effect of playing-away-to-win-at-home FDI on CS in the home market. The shaded regions, (i) and (ii), correspond to the identically labelled regions in Figure 2. In region (i), both firms choose to undertake FDI in equilibrium (M,M), but disregarding the effect of FDI on home market profits, the outcome would instead be M,E or E,M. The CS that would be observed in the latter case is indicated by a white line in region (i) of Figure 3. In region (ii), one firm chooses to undertake FDI in equilibrium (M,E or E,M), but disregarding the effect of FDI on home market profits, the outcome would instead be E,E. The CS that would be observed in the latter case is indicated by a white line in region (ii) of Figure 3. By comparing the white lines with the black lines in regions (i) and (ii), we observe that playing-away-to-win-at-home FDI acts to drive up consumer surplus in the home country

market above the level it otherwise would be. Therefore, FDI thus motivated benefits home consumers.

#### **4. Conclusion**

This paper presents a simple model of the interaction between two rival firms based in the same country. Each firm must decide how best to serve a foreign market (export or foreign production) and how much to invest in a corporate-wide asset that acts to reduce production costs and/or augment the willingness-to-pay for their product. We show that in this scenario, the firms' foreign direct investment decisions are interdependent. Furthermore, strategic motives for FDI relate not only to a firm's foreign market profits, but also to those from their domestic market. One possibility is that a firm sets up a plant overseas even though its profits from serving the foreign market would be higher by exporting.

As explained previously, the corporate-wide investment need not be exclusively interpreted as cost-reducing R&D. The results of the model would not be qualitatively different if the investment instead had a positive effect on the demand for the firm's products. For the purposes of our analysis we require the investment to have a corporate-wide effect, require a fixed cost, and exert positive and negative influences on the output levels (and market shares) of the investing firm and its rival, respectively. Therefore, these results are applicable not only to R&D expenditures for cost reduction, but also to R&D that enhances product quality. Hence, there are a variety of mechanisms through which the effects of rivals' FDI can be felt in all markets in which they compete, permitting the motive for foreign production to reside at home.



## Notes

1. The title draws upon the parlance of Association Football in the UK. For readers unfamiliar with such matters, a corresponding title for followers of American sport might be, *Home stand sweep secured on a road trip*, or more obscurely, *Red Sox visit Bronx, win at Fenway*.

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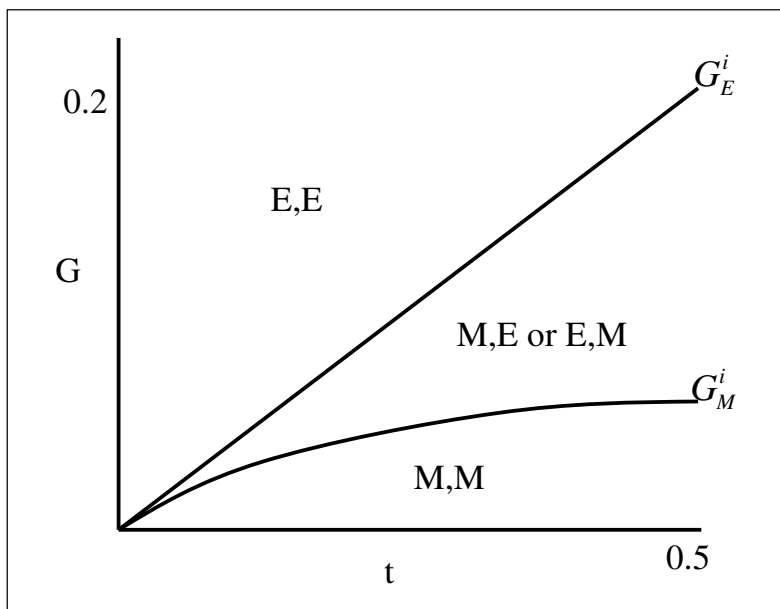
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**Table 1**

	Rival exports	Rival does FDI
Firm j exports	$\alpha_j^B = a - c_0 - t$	$\alpha_j^B = a - c_0 - 2t$
Firm j does FDI	$\alpha_j^B = a - c_0 + t$	$\alpha_j^B = a - c_0$

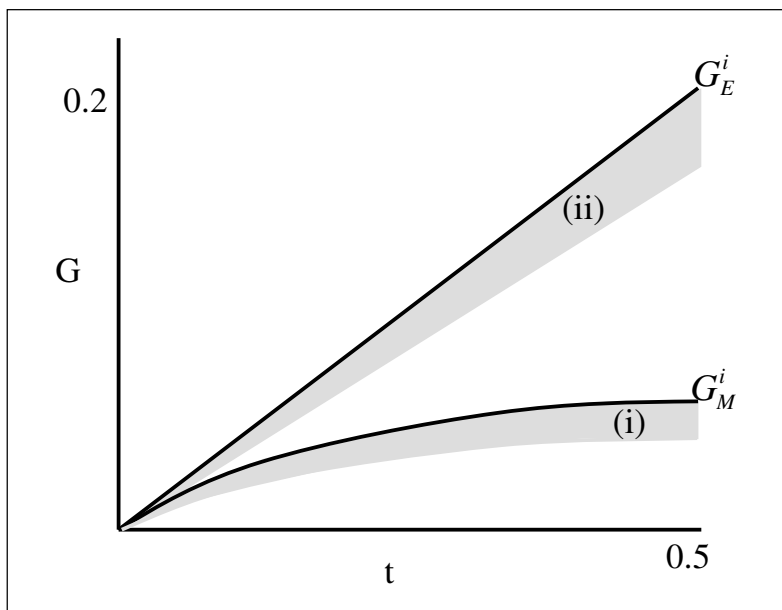
**Figure 1**

The equilibrium outcomes regarding the mode of serving the foreign market: exporting (E) or multinational production following FDI (M) – E,E indicates that both firms export; M,E and E,M indicate that one firm exports and the other undertakes FDI; M,M indicates that both firms undertake FDI. Both  $G$  and  $t$  are measured as fractions of  $a - c_0 = 1$ , and  $R$  is set at 0.03.



**Figure 2**

The combinations of  $G$  and  $t$ , given  $R$ , for which a firm chooses to undertake FDI when its foreign market profits would be higher as an exporter are indicated by shaded regions. In region (i), the equilibrium outcome is M,M; in region (ii), it is M,E or E,M. Both  $G$  and  $t$  are measured as fractions of  $a - c_0 = 1$ , and  $R$  is set at 0.03



**Figure 3**

The effect of trade liberalisation on consumer surplus in the home country market: The figure shows equilibrium consumer surplus (CS; represented by black lines) across the same range of  $t$  (measured as a fraction of  $a - c_0 = 1$ ) shown in Figures 1 and 2. CS given FDI choices disregarding home market profits are represented by a white line (the shaded regions, (i) and (ii), correspond to the identically labelled shaded regions in Figure 2)

