

# **Regional integration and market entry with costly technology transfer**

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**Abstract:** This paper presents a model of a foreign firm's choice to enter markets by exporting, greenfield FDI or acquiring a domestic firm, and considered the effects of regional integration on that decision. The factors affecting the entry decision prior to regional integration are first identified, then the effects of reducing trade costs between partner countries are analysed. These results first suggest that regional integration will promote production by foreign firms in the region rather than supplying the markets by exporting. It is further shown that the effect of regional integration on the choice between greenfield FDI and takeovers of domestic firms depends crucially on the cost of technology transfer.

**Keywords:** regional integration, FDI, acquisition

**JEL classification:** F12, F15, F23, L13

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## 1. Introduction

In recent years there has been a proliferation of regional trade agreements. 250 such agreements had been notified to the GATT/WTO up to December 2002, of which 130 were notified after January 1995.<sup>1</sup> Over 170 regional trade agreements are currently in force, with every WTO member except Japan, Korea and Hong Kong belonging to at least one. At the same time, there have also been significant increases in FDI flows into both developed and developing countries. One characteristic of these increased flows is the increasing importance of mergers and acquisitions relative to greenfield investment, as discussed below. This paper examines the relationship between regional integration and FDI and considers how regional integration affects firms' choice between exporting, greenfield FDI and acquisitions of foreign firms.

Regional integration agreements have tended to be accompanied by increased production by foreign firms in the integrating region (see Dunning 1993 for a survey). However, what is less widely understood is whether the nature of that FDI has changed as a result of regional integration. This paper suggests that increased regional integration will increase the profitability of both greenfield FDI and acquisition of existing plants by foreign firms relative to exporting. The choice between these modes of entry will depend crucially on the cost of transferring technology to an acquired plant: when such costs are low, regional integration will tend to promote takeovers, whereas with higher costs of technology transfer, regional integration will instead tend to promote greenfield FDI.

The figures in Table 1 illustrate that FDI inflows by mergers and acquisitions in industrial countries were almost five times as high as inflows by greenfield investment between 1995 and 1999, with merger and acquisition activity almost doubling as a percentage of GDP between the late 1980s and the late 1990s. Meanwhile in developing countries greenfield investment still accounted for a majority of FDI in the latter period, but was more than nine times as high as a share of GDP compared to the earlier period, whereas the increase in total FDI inflows into these countries was approximately threefold.

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<sup>1</sup> Figures taken from WTO website: [www.wto.org](http://www.wto.org).

**Table 1: FDI inflows**

(percent of GDP, weighted averages)

	Gross FDI Inflows		
	Total	Greenfield	Mergers & Acquisition
Industrial countries			
1987-89	1.07%	0.25%	0.82%
1990-94	0.82%	0.29%	0.53%
1995-99	1.88%	0.33%	1.55%
Developing countries			
1987-89	0.97%	0.87%	0.10%
1990-94	1.59%	1.28%	0.32%
1995-99	2.95%	2.01%	0.94%

Source: Calderón et al. (2002)

Within figures for developed countries, notable differences appear. Table 2 reports ratios of mergers and acquisitions to FDI inflows for the OECD as a whole, European OECD members in aggregate (together with some individual members) and the United States. This ratio increased greatly in Europe, rising from 56.2% in the period 1988-93 to 89.6% in the period 1994-99.<sup>2</sup> However the ratios for the United States, while higher than those for Europe, showed a very small increase, from 93.9% to 97.0%.

One possible explanation for these differing trends is provided by considering regional integration agreements. The period covered by Table 2 included the completion of the European Single Market and a significant deepening of integration, as well as a broadening of the EU: the period includes the expansion of 1995 and also is likely to pick up many of the effects of the previous expansion of 1986.<sup>3</sup> While the United States was also becoming more involved in regional trade agreements with the formation of NAFTA in 1994, the effect of deepening European integration on FDI into member countries is likely to be more significant than the effects of NAFTA on FDI into the United States due to market size effects (as identified by Rowthorn 1992 among others). A larger domestic (or regional) market is

<sup>2</sup> It would be desirable to look at these figures over a longer period to identify changes earlier in the history of the EU. Unfortunately the data on mergers and acquisitions are not available for earlier years.

<sup>3</sup> Spain and Portugal became EU members in 1986; Austria, Finland and Sweden joined in 1995.

important in attracting additional FDI; the European market is large compared to that of any individual member, whereas the United States dominates NAFTA.

**Table 2: Ratio of Inward Mergers and Acquisitions to FDI Inflows**

(percent)<sup>4</sup>

	1988-93	1994	1995	1996	1997	1998	1999	1994-99
OECD total	68.8	73.3	76.7	82.7	85.4	97.9	106.1	92.9
Europe	56.2	67.7	65.0	75.0	88.0	83.2	116.6	89.6
UK	85.9	135.5	178.4	127.2	139.0	150.9	161.9	152.3
France	42.0	104.7	32.7	67.1	87.7	80.1	64.4	70.5
Germany	120.7	62.6	62.3	181.9	107.1	95.0	175.8	121.5
United States	93.9	105.9	93.9	83.4	81.6	118.3	91.8	97.0

Source: OECD (2001), p.47.

While the trend towards mergers and acquisitions is clear in aggregate, some industries appear to go against the trend. An example is provided by investment in the car industry in Britain. Much of the early production in Britain by American car manufacturers such as Ford and General Motors took place in plants acquired from British car manufacturers, whereas later investment, notably that in the last two decades by Japanese and other Asian producers, has taken the form of greenfield FDI. While other factors including government policy have influenced the actions of foreign firms, the results in this paper suggest that, when technology transfer from the parent company to an acquired plant is sufficiently costly, regional integration is likely to increase the profitability of entry through greenfield FDI relative to that of entry through a takeover, in contrast to those industries with less costly technology transfer. Hence the existence of industries whose pattern of investment has changed in the opposite way to the general trend is consistent with the model in this paper if technology transfer is relatively costly in those industries.

Recent theoretical papers by Motta and Norman (1996) and Norman and Motta (1993) have explained the increase in FDI which has accompanied many regional integration agreements by

<sup>4</sup> Due to differences in the way the series are calculated, the values for mergers and acquisitions are often more than 100% of the corresponding values for FDI inflows. Details of how these series are calculated can be found in OECD (2001, p.19).

showing that regional integration offers a large tariff-free market to firms located in the region, hence increasing the relative profitability of FDI compared to exporting. Kendall and Ryan (2001) show that both greenfield FDI and foreign acquisitions of domestic firms are likely to be promoted by regional integration. This paper shows similar results, while additionally showing under what circumstances increased regional integration is likely to promote greenfield FDI at the expense of takeovers of domestic firms or *vice versa*.

Formally, this paper analyses a two-stage game. In the first stage, a foreign firm decides whether to sell in the markets of the domestic and (potential) union-partner countries by one of three means: exporting, greenfield FDI or acquiring a domestic firm. In the second stage, firms, which sell differentiated products and have differing costs, compete as Cournot competitors.

One innovation in this paper is the modelling of merger costs. Recent papers on mergers (for example Long and Vousden 1995, Falvey 1998, Horn and Levinsohn 2001, Ryan 2001) have assumed that the costs to the acquiring firm of a merger are the sum of the profits which would be earned by the acquired firm if it were not taken over and a fixed merger cost. On paying these costs, it is assumed that the technologically superior acquiring firm can use its technological advantage to produce in the acquired plant at the same marginal cost as it produces in its original home plant.

This paper proposes an alternative view that a technologically superior acquiring firm will only be able to transfer some of its technological advantage to the acquired firm. Hence it is assumed that the marginal cost of the acquired firm will generally lie between the marginal cost of the acquiring firm's original plant and the pre-takeover marginal cost of the acquired plant. The reasons for this are as follows. Firstly, the plant which is acquired will typically have been used to produce a product which is not identical to that produced by the acquiring firm. Hence the cost of producing the acquiring firm's product in that plant is likely to be higher than the cost of producing it at a plant built specifically for producing the product. This suggests that the degree of product differentiation should be important in determining the post-takeover marginal cost of the plant. Secondly, while the acquiring firm will be able to introduce improved technology and managerial skills to the acquired plant, this transfer will not generally be perfect and some of those factors which gave the acquired plant its initial cost

disadvantage are likely to persist. For these reasons, the post-takeover marginal cost of the acquired plant is assumed to exceed the costs in the acquiring firm's original plant by an amount increasing in both the degree of product differentiation and the pre-acquisition cost difference between the plants.

The rest of this paper is set out as follows. Section 2 presents a general multi-country, multi-firm model of trade in a differentiated good, where firms have different costs and compete as Cournot competitors. Section 3 uses this framework to consider a foreign firm's decision on how to enter the markets of two countries, faced with a choice between exporting, FDI or taking over a local firm. Section 4 looks at how this decision is affected by regional integration. Finally, Section 5 concludes.

## 2. The general framework

This section presents a general  $n$ -firm Cournot model of trade in an industry, where firms sell different varieties of a differentiated good and have differing constant marginal costs.<sup>5</sup>

The representative consumer of the good in country  $i$  has a utility function of the form:

$$u_i(\mathbf{q}_i) = \alpha Q_i - \frac{\gamma}{2} Q_i^2 - \frac{1-\gamma}{2} \sum_{j=1}^n q_{ij}^2 \quad (1)$$

where  $q_{ij}$  is country  $i$ 's consumption of firm  $j$ 's variety of the good,  $\mathbf{q}_i \equiv (q_{i1}, q_{i2}, \dots, q_{in})$  is country  $i$ 's consumption profile,  $Q_i \equiv \sum_{j=1}^n q_{ij}$  and  $\gamma$  is a substitution index between varieties of the good, ranging from 0 (independent goods) to 1 (homogeneous goods).

The utility function above means that country  $i$ 's inverse demand curve for firm  $j$ 's good is:

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<sup>5</sup> The model is similar to that of Yi (1996), except that his model assumes common costs.

$$p_{ij} = \alpha - q_{ij} - \gamma \sum_{k \neq j} q_{ik} \quad (2)$$

Firm  $j$ 's effective marginal cost of selling in country  $i$  is the sum of the marginal cost of producing the good and any trade costs faced by the firm in country  $i$ :<sup>6</sup>

$$c_{ij} = c_j + t_{ij} \quad (3)$$

where  $c_j$  is firm  $j$ 's constant marginal cost of production and  $t_{ij}$  is the trade cost associated with country  $i$  buying goods produced by firm  $j$ .

Markets are assumed to be segmented and firms act as Cournot competitors, so firm  $j$  selling in country  $i$  faces the following profit maximisation problem:

$$\text{Max}_{q_{ij}} \pi_{ij} = (p_{ij} - c_{ij})q_{ij} \quad (4)$$

Substituting (2) and (3) into (4) and differentiating yields the following first-order condition:

$$\frac{d\pi_{ij}}{dq_{ij}} = \alpha - 2q_{ij} - \gamma \sum_{k \neq j} q_{ik} - c_j - t_{ij} = 0 \quad (5)$$

which leads to the following best-reply function for firm  $j$ :

$$q_{ij} = \frac{\alpha - \gamma(Q_i - q_{ij}) - c_j - t_{ij}}{2} \quad (6)$$

Summing across firms gives the following expression for total output sold in country  $i$ :

$$Q_i = \frac{n\alpha - \sum_{k=1}^n c_{ik}}{2 + (n-1)\gamma} \quad (7)$$

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<sup>6</sup>  $t_{ij}$  could incorporate tariffs, non-tariff barriers, transport costs and other costs of trade between countries.

and substituting this back into (6) gives firm  $j$ 's sales in market  $i$ :

$$q_{ij} = \frac{(2-\gamma)\alpha + \gamma \sum_{k=1}^n (c_k + t_{ik}) - [2 + (n-1)\gamma](c_j + t_{ij})}{[2 + (n-1)\gamma](2-\gamma)} \quad (8)$$

Note that with  $\gamma = 0$  the expression above simply becomes the standard monopoly output, while with  $\gamma = 1$  the expression becomes the output of a firm in an  $n$ -firm homogeneous product Cournot model.

Substituting back into (2), the following expression can be obtained for the price facing firm  $j$ :

$$p_{ij} = \frac{(2-\gamma)\alpha + \gamma \sum_{k=1}^n (c_k + t_{ik}) + (1-\gamma)[2 + (n-1)\gamma](c_j + t_{ij})}{[2 + (n-1)\gamma](2-\gamma)} \quad (9)$$

and profits earned by firm  $j$  in country  $i$  are

$$\pi_{ij} = (p_{ij} - c_{ij})q_{ij} = \left\{ \frac{(2-\gamma)\alpha + \gamma \sum_{k=1}^n (c_k + t_{ik}) - [2 + (n-1)\gamma](c_j + t_{ij})}{[2 + (n-1)\gamma](2-\gamma)} \right\}^2 \quad (10)$$

### 3. The entry decision

This section uses the analysis of Section 2 to consider the entry decision of a firm located in country 3 which wishes to supply consumers in countries 1 and 2 under the following assumptions. There is a single firm in each of countries 1 and 2 and a single potential entrant in country 3, which will supply countries 1 and 2 from at most one location. Due to the assumption of segmented markets, the firm's entry decision has no effect on the market in country 3. First the costs associated with different location decisions are set out and the



potential entrant's profits are compared under three scenarios: exporting, greenfield FDI and acquiring the firm located in country 1. Later, in Section 4, the effects of regional integration (reducing the tariffs or other costs of trade associated with selling between countries 1 and 2) are examined.

Below the profits earned by firm 3 in countries 1 and 2 are calculated for three different scenarios:

Case 1: Firm 3 exports to countries 1 and 2 (EX);

Case 2: Firm 3 establishes a new plant in country 1 (FDI);

Case 3: Firm 3 takes over the firm in country 1 (TO).

Each of these cases presents a special case of the model outlined in Section 2; the exact modelling implications are explained below. The following assumptions are made about trade costs: any good produced within the consuming country, whether by a domestic or foreign firm, faces a zero trade cost; otherwise goods imported to country  $i$  from firm  $j$  face a trade cost of  $t_{ij}$ .

By comparing profits earned in these three cases, factors can be identified which affect firm 3's decision in the first stage on how to sell in markets 1 and 2.

#### *Case 1 (EX)*

There are three firms selling in each market, two of which face positive trade costs. Firm 3 faces trade costs of  $t_{13}$  and  $t_{23}$  in countries 2 and 3 respectively. Total profits earned by firm 3 are:

$$\pi_3^{EX} = \left[ \frac{(2-\gamma)\alpha - (2+\gamma)(c_3 + t_{13}) + \gamma(c_1 + c_2 + t_{12})}{2(2-\gamma)(1+\gamma)} \right]^2 + \left[ \frac{(2-\gamma)\alpha - (2+\gamma)(c_3 + t_{23}) + \gamma(c_1 + c_2 + t_{21})}{2(2-\gamma)(1+\gamma)} \right]^2 \quad (11)$$

*Case 2 (FDI)*

Firm 3 establishes a plant in country 1 from which to supply countries 1 and 2.<sup>7</sup> This enables the firm to avoid paying any trade costs in supplying country 1, but it still faces trade costs of  $t_{21}$  when selling in country 2. The establishment of the plant in country 1 means that the firm must pay a fixed cost of  $F$ . Hence the firm's profits are:

$$\begin{aligned} \pi_3^{FDI} = & \left[ \frac{(2-\gamma)\alpha - (2+\gamma)c_3 + \gamma(c_1 + c_2 + t_{12})}{2(2-\gamma)(1+\gamma)} \right]^2 \\ & + \left[ \frac{(2-\gamma)\alpha - (2+\gamma)c_3 + \gamma(c_1 + c_2) - 2t_{21}}{2(2-\gamma)(1+\gamma)} \right]^2 - F \end{aligned} \quad (12)$$

*Exporting vs. FDI*

Comparing the profits given by (11) and (12), the following condition can be obtained for FDI to be more profitable than exporting:

$$\begin{aligned} & 2(2+\gamma)(t_{13} + t_{23} - t_{21})[(2-\gamma)\alpha - (2+\gamma)c_3 + \gamma(c_1 + c_2 + t_{12})] \\ & - (2+\gamma)^2(t_{13}^2 + t_{23}^2 - t_{21}^2) - [2(2-\gamma)(1+\gamma)]^2 F > 0 \end{aligned} \quad (13)$$

For tariff levels which lead to positive outputs, the first (positive) term dominates the second (negative) term and the following comparative static results can be obtained: FDI is more likely to dominate exporting the higher the trade costs facing a firm located in country 3 ( $t_{13}$  and  $t_{23}$ ); the lower the trade costs firms located in country 1 pay when exporting to country 2 ( $t_{21}$ ); the lower the fixed cost of establishing a new plant; the lower firm 3's costs; and the higher the costs (including trade costs) faced by firms 1 and 2.

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<sup>7</sup> Implicitly this assumes that the cost of supplying country 2 from country 1 ( $t_{21}$ ) is no higher than the cost of supplying country 2 from country 3 ( $t_{23}$ ).

The effects of the trade costs and fixed costs paid by firm 3 are intuitively obvious: an increase in the costs associated with exporting from country 3 or a reduction in the costs associated with locating in country 1 will make FDI relatively more profitable. The effects relating to the marginal costs arise because firm 3 gains a larger market share, and can thus exploit any cost advantage more, when it chooses FDI.

### *Case 3 (TO)*

Firm 3 enters the market by acquiring firm 1. Hence the markets in countries 1 and 2 contain only two firms, as opposed to three in the other two cases. The direct cost of the merger is that firm 3 must pay the owners of firm 1 the profits the latter would have earned had it not been taken over.

In addition to this direct cost of the acquisition, technology transfer is assumed to be costly. If firm 3 has superior technology, represented by a lower marginal cost, it cannot simply produce in the plant in country 1 at this lower marginal cost. Instead it produces at a marginal cost bounded by the original marginal cost of firm 1 and its own cost when producing in country 3.

The marginal cost of the acquired firm is given by  $c_{3m} = c_3 + \frac{\delta(c_1 - c_3)}{\gamma}$  if  $c_3 < c_1$  and  $c_{3m} = c_1$

otherwise, where  $\delta$  is a parameter representing the difficulty of transferring technology,  $0 \leq \delta \leq \gamma$ . The inclusion of  $\gamma$ , the parameter representing the degree of product differentiation, in the cost function represents the fact that technology transfer is more costly when products are more differentiated; for a given value of  $\delta$ , an increase in  $\gamma$  (meaning the two varieties are more similar) reduces the marginal cost of producing in the acquired plant.

$$\pi_3^{TO} = \left[ \frac{(2-\gamma)\alpha - 2c_{3m} + \gamma(c_2 + t_{12})}{(2+\gamma)(2-\gamma)} \right]^2 + \left[ \frac{(2-\gamma)\alpha - 2(c_{3m} + t_{21}) + \gamma c_2}{(2+\gamma)(2-\gamma)} \right]^2 - \left[ \frac{(2-\gamma)\alpha - 2c_1 + \gamma(c_2 + t_{12})}{(2+\gamma)(2-\gamma)} \right]^2 - \left[ \frac{(2-\gamma)\alpha - 2(c_1 + t_{21}) + \gamma c_2}{(2+\gamma)(2-\gamma)} \right]^2 \quad (14)$$

Note that given the assumption about post-acquisition costs, a takeover is profitable to the acquiring firm if and only if  $c_3 < c_1$  and  $\delta < \gamma$ .<sup>8</sup>

### *Takeover vs Exporting*

Comparing the profits given by (11) and (14), the following condition can be obtained for taking over the firm in country 1 to be more profitable than exporting:

$$\begin{aligned}
& 16(1+\gamma)^2 \left\{ \frac{\gamma-\delta}{\gamma}(c_1-c_3) \left[ 2(2-\gamma)\alpha + \gamma(2c_2+t_{12}+t_{21}) \right] + \left[ c_3 + \frac{\delta(c_1-c_3)}{\gamma} \right]^2 - c_1^2 - \frac{\gamma-\delta}{\gamma}(c_1-c_3)t_{21} \right\} \\
& - (2+\gamma)^2 \left[ (2-\gamma)\alpha - (2+\gamma)(c_3+t_{13}) + \gamma(c_1+c_2+t_{12}) \right]^2 \\
& - (2+\gamma)^2 \left[ (2-\gamma)\alpha - (2+\gamma)(c_3+t_{23}) + \gamma(c_1+c_2+t_{21}) \right]^2 > 0 \tag{15}
\end{aligned}$$

The effects of the trade costs paid by firm 3 are again straightforward: an increase in the costs associated with exporting from country 3 will make a takeover relatively more profitable. The effect of increasing the cost of technology transfer (raising  $\delta$  relative to  $\gamma$ ) is to reduce the relative profitability of a takeover, while increasing the acquiring firm's cost advantage (reducing  $c_3$  relative to  $c_1$ ) will make a takeover relatively more profitable unless  $\delta/\gamma$  is close to 1: it reduces the pre-acquisition profits of the target relative to the post-acquisition profits of the predator and this effect dominates the gain to firm 3 when exporting from a bigger market share in countries 1 and 2.

### *Takeover vs. FDI*

Comparing the profits given by (12) and (14), the following condition can be obtained for taking over the firm in country 1 to be more profitable than greenfield FDI:

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<sup>8</sup> These two conditions together imply  $c_{3m} < c_1$ .

$$\begin{aligned}
& 16(1+\gamma)^2 \left\{ \frac{\gamma-\delta}{\gamma}(c_1-c_3)[2(2-\gamma)\alpha + \gamma(2c_2+t_{12}+t_{21})] + \left[ c_3 + \frac{\delta(c_1-c_3)}{\gamma} \right]^2 - c_1^2 - \frac{\gamma-\delta}{\gamma}(c_1-c_3)t_{21} \right\} \\
& - (2+\gamma)^2 [(2-\gamma)\alpha - (2+\gamma)c_3 + \gamma(c_1+c_2+t_{12})]^2 \\
& - (2+\gamma)^2 [(2-\gamma)\alpha - (2+\gamma)(c_3+t_{21}) + \gamma(c_1+c_2+t_{21})]^2 + [2(2-\gamma)(1+\gamma)(2+\gamma)]^2 F > 0 \quad (16)
\end{aligned}$$

The effect of increasing the cost of technology transfer (raising  $\delta$  relative to  $\gamma$ ) is to reduce the relative profitability of a takeover, while increasing the acquiring firm's cost advantage (reducing  $c_3$  relative to  $c_1$ ) will make a takeover relatively more profitable as before. A reduction in the fixed cost of FDI raises the profitability of greenfield FDI relative to acquiring firm 1.

This section concludes by summarising the results above with respect to the likely outcome of stage 1 of the game. Entry by either greenfield FDI or acquisition of a domestic firm is made more likely by higher trade costs faced by the firm in country 3 when selling in country 1 or 2. Hence the tariff-jumping motive for FDI is clear. Reducing the fixed costs of FDI increases the likelihood of greenfield FDI being the most profitable strategy, while a reduction in the cost of technology transfer makes entry by acquiring a domestic firm more likely. The effects of changes in the firms' marginal costs are unclear: a reduction in  $c_3$  relative to  $c_1$  increases the profitability of FDI relative to exporting, but the effect on takeovers relative to the other two entry strategies depends on the costliness of technology transfer. The effects of reducing trade costs between countries 1 and 2 on firm 3's entry decision are considered in the following section.

#### 4. The effects of regional integration

This section considers the effects of regional integration between countries 1 and 2 on firm 3's decision on how to enter those markets. In order to capture the effects of regional integration, it is first assumed that the trade barriers between countries 1 and 2 are symmetric,  $t_{12} = t_{21} = t_u$ . Then the effects on profits, in each of the scenarios above, of a reduction in  $t_u$  is analysed. Hence in each case, the effect of regional integration is given by  $-d\pi_3/dt_u$ .

##### *Case 1 (EX)*

The effect of regional integration on profits earned by firm 3 if it exports is:

$$-\frac{d\pi_3^{EX}}{dt_u} = - \left\{ \frac{2\gamma[(2-\gamma)\alpha - (2+\gamma)(c_3 + t_{13}) + \gamma(c_1 + c_2 + t_u)]}{[2(2-\gamma)(1+\gamma)]^2} + \frac{2\gamma[(2-\gamma)\alpha - (2+\gamma)(c_3 + t_{23}) + \gamma(c_1 + c_2 + t_u)]}{[2(2-\gamma)(1+\gamma)]^2} \right\} \quad (17)$$

The expression above is negative for all costs which lead to positive outputs when  $\gamma > 0$ .<sup>9</sup> Thus integration between countries 1 and 2 reduces the profitability of firm 3 when it exports to those two countries. The intuition behind this is as follows. A reduction in trade costs between countries 1 and 2 reduces the effective marginal cost of each firm based in one of those countries when it sells in the other. Hence regional integration increases the market share of firms 1 and 2 inside the region at the expense of firm 3, which loses market share and profits. Thus entry by exporting becomes less profitable.

##### *Case 2 (FDI)*

The effect of regional integration on profits earned by firm 3 if it establishes a new plant in country 1 is:

$$\begin{aligned}
-\frac{d\pi_3^{FDI}}{dt_u} = & -\frac{2\gamma[(2-\gamma)\alpha - (2+\gamma)c_3 + \gamma(c_1 + c_2 + t_u)]}{[2(2-\gamma)(1+\gamma)]^2} \\
& + \frac{4[(2-\gamma)\alpha - (2+\gamma)c_3 + \gamma(c_1 + c_2) - 2t_u]}{[2(2-\gamma)(1+\gamma)]^2}
\end{aligned} \tag{18}$$

The terms inside the square brackets are all positive, and the second, positive, term clearly dominates the first, negative, one. These two terms represent the effects of regional integration on profits earned by firm 3 in markets 1 and 2 respectively. In the case of FDI, firm 3 now produces in country 1. The reduction of trade costs between countries 1 and 2 results in a fall in firm 3's profits in country 1 (for  $\gamma > 0$ ), as firm 2 can now sell there with a lower effective marginal cost. However, the reduction in trade costs benefits firm 3 in country 2, where it can now sell at a lower effective marginal costs. The increase in profits in market 2 dominates the fall in profits in market 1, so the overall effect of regional integration on firm 3's profits is positive. Hence entry by FDI becomes more profitable.

### *Case 3 (TO)*

The effect of regional integration on profits earned by firm 3 if it acquires the existing firm in country 1 is:

$$-\frac{d\pi_3^{TO}}{dt_u} = \frac{4(2-\gamma)(c_1 - c_3^m)}{[(2+\gamma)(2-\gamma)]^2} = \frac{4(2-\gamma)(\gamma - \delta)(c_1 - c_3)}{\gamma[(2+\gamma)(2-\gamma)]^2} \tag{19}$$

As with FDI, the effect on the profitability of entry by acquiring the firm in country 1 is positive, for  $\gamma > 0$ ,  $\delta < \gamma$  and  $c_1 > c_3$ . As these are the necessary and sufficient conditions for a takeover to be profitable in the first place, any profitable takeover is made more profitable by regional integration. The intuition for this case is similar to that for FDI: when production is located in country 1, the positive effect of regional integration on profits earned in country 2

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<sup>9</sup> When  $\gamma = 0$ , there is no competition between products and only changes in tariffs which directly affect firm 3 will change its profits.

outweighs the negative effect on profits earned in country 1. Hence regional integration increases the profitability of any profitable merger.

Putting together the results of this section so far leads to Proposition 1 as follows:

**Proposition 1:** *Regional integration reduces the profitability of exporting for the firm in country 3, while increasing the profitability of both mergers and FDI. Hence regional integration makes the foreign firm more likely to enter by locating production in the region.*

The result that regional integration increases the relative profitability of producing within the integrating area is in line with the results of Motta and Norman (1996) and Kendall and Ryan (2002). However it is also possible in this model to answer a further question: how does regional integration influence the choice between entering by greenfield FDI or entering by acquiring an existing firm in the region?

The effects of regional integration on the profitability of both greenfield FDI and takeovers are positive. To see which effect is stronger, equations (18) and (19) are compared, leading to the following condition for regional integration to increase the profitability of FDI relative to mergers (for  $\gamma > 0$ ):

$$\frac{\gamma(2-\gamma)[(2-\gamma)\alpha - (2+\gamma)c_3 + \gamma(c_1 + c_2 + t_u)] - 2\gamma(2+\gamma)t_u}{(1+\gamma)^2} > \frac{8(2-\gamma)(\gamma-\delta)(c_1 - c_3)}{(2+\gamma)^2} \quad (20)$$

This leads directly to Proposition 2:

**Proposition 2:** *The higher the cost of technology transfer, the more likely regional integration is to promote greenfield FDI at the expense of takeovers.*

**Proof:** The left-hand side of inequality (20) is independent of  $\delta$ , while the right-hand side is decreasing in  $\delta$ . Hence the higher is  $\delta$ , *ceteris paribus*, the more likely inequality (20) is to hold. ■



An equivalent, easier to interpret, condition for regional integration to increase the profitability of FDI relative to mergers for the special case of  $\gamma = 1$  (homogeneous products) is given below:

$$9(\alpha - 3c_3 + c_1 + c_2 - 5t_u) > 32(1 - \delta)(c_1 - c_3) \quad (21)$$

The discussion of the implications of regional integration which follow is based on inequality (21) above, but relates more generally to the case of differentiated products as shown by inequality (20).

With costless technology transfer ( $\delta = 0$ ) it is not clear whether the inequality will hold, although unless the demand parameter  $\alpha$  is high relative to the cost parameters, regional integration will promote takeovers relative to greenfield FDI in the case of costless technology transfer.

It is immediately apparent that inequality (21) is more likely to hold when technology transfer is more costly, that is when  $\delta$  is higher.<sup>10</sup> A sufficiently high cost of technology transfer will ensure that the increase in profitability of FDI as a result of regional integration will be greater than the increase in profitability of a takeover. The more costly is technology transfer, the lower will be the market share of firm 3 in countries 1 and 2 when it takes over a local firm and the less will be the gain from reducing trade costs between these countries. Hence regional integration increases the negative effect of costly technology transfer on the profitability of acquiring a local firm relative to FDI.

## 5. Conclusions

This paper has presented a model of a firm's decision on how to enter markets in other countries, and considered the effects of regional integration on that decision. The results of Section 3 show that higher tariffs against foreign firms raise the profitability of FDI and takeovers relative to exporting; lower fixed costs of setting up a new plant make FDI relatively

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<sup>10</sup> More generally, when  $\delta/\gamma$  is higher.

more profitable; lowering the cost of technology transfer raises the relative profitability of acquiring a domestic firm; while the effects of differences in marginal costs between domestic and foreign firms are unclear. The results in Section 4 first suggest that regional integration will promote production by foreign firms in the region rather than supplying the markets by exporting. It is further shown that the effect of regional integration on the choice between greenfield FDI and takeovers of domestic firms depends on the cost of technology transfer: the more costly is technology transfer, the more likely regional integration is to promote greenfield FDI over mergers.

While this paper does not offer formal welfare analysis, the choice of mode of entry is clearly important to both consumers and producers in the integrating region. Greenfield FDI will lead to higher output and lower costs than both takeovers and exporting as the marginal cost (including trade costs) faced by the foreign firm will be lowest in the first case. Additionally, entry through acquisition will result in two firms rather than three selling in countries 1 and 2, reducing both competition and the number of varieties available to consumers. In contrast, these same factors make greenfield FDI the worst outcome for producers in the integrating countries.

The observed trend towards FDI through mergers and acquisitions rather than greenfield FDI suggests that in most industries the cost of technology transfer is low enough for regional integration to promote entry through acquisition. However, a higher cost of technology transfer could explain why some industries, such as the British car industry, appear to have reversed the trend and moved from acquisitions to greenfield FDI.

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