Mergers in a Heterogeneous Firm Model

Toby Kendall* and Cillian Ryan†

Preliminary and incomplete version
August 31, 2007

Abstract

This paper introduces the choice between acquisition and greenfield FDI into a heterogeneous firm (Melitz) model. We first show that the most profitable merger will involve the most efficient firm in one country acquiring the least efficient in the other country. With perfectly transferable technology, acquisition is always more profitable than greenfield FDI and is the most profitable mode of supplying the foreign market for high productivity firms. If a firm’s technological advantage is only partly transferable, firms with the highest productivity will supply the foreign market with greenfield investment. Allowing firms to supply their home market from a foreign subsidiary will result in the most efficient firms replacing domestic production with imports from their foreign subsidiaries if the foreign country has lower wages than the domestic country and transport costs are low.

1 Introduction

In recent years, international mergers have become an increasingly important component of FDI, accounting for a majority of new investment in developed countries. Calderón et al. (2002) report that merger and acquisition activity almost doubled as a percentage of GDP (and increased as a share of total investment) in industrialised countries between the late 1980s and the late 1990s. Over the same period in developing countries, while

*Corresponding author: Department of Economics, University of Birmingham, Edgbaston, Birmingham B15 2TT, UK. Email: t.kendall@bham.ac.uk
†European Research Institute and Department of Economics, University of Birmingham, Edgbaston, Birmingham B15 2TT, UK, email c.ryan@bham.ac.uk.
greenfield investment still accounted for a majority of FDI, mergers and acquisitions increased by more than nine times as a share of GDP, whereas the increase in total FDI inflows was approximately threefold.

While most literature on FDI has focussed on either greenfield investment or mergers exclusively, this paper complements a growing literature allowing for both possibilities (Mattoo et al., 2004, Bjorvatn, 2004, Bertrand, 2005, Ferrett, 2005). However the framework we use is different to these papers, as we follow the recent literature on heterogeneous-firm trade models. Melitz (2003) presents a model in which firms within an industry have differing levels of productivity. Firms pay a fixed cost to enter the industry, then discover their productivities. The more efficient firms produce, while the less efficient firms immediately exit the industry. Opening to trade induces the least efficient firms that were producing to leave the industry, while the most efficient become exporters. Helpman et al. (2004) also allow firms to enter foreign markets through FDI and show that the most efficient firms will choose this mode of entry while the next most efficient will export. Their empirical results support this prediction. We use a similar theoretical framework to Helpman et al. (2004), but allow for production abroad to take the form of either greenfield FDI or the acquisition of a foreign firm.

One important issue in modelling mergers is whether an efficient producer can transfer its technological advantage fully and costlessly to a less efficient partner. Most recent papers on mergers (for example Long and Vousden, 1995, Falvey, 1998, Horn and Levinsohn, 2001 and Ryan, 2006) 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 uses the alternative assumption that a technologically superior acquiring firm will generally only be able to transfer some of its technological advantage to the acquired firm.¹ Hence it is assumed that the productivity of the acquired firm will generally lie between the productivity of the acquiring firm’s original plant and the pre-takeover productivity of the acquired plant. The reasons for this are as follows. Firstly, the plant

---

¹Note that whereas Mattoo et al., 2004 also allow for imperfect transfer of a technological advantage, they assume this to be a choice made by the firm. In contrast, this paper assumes that it is instead a constraint facing the firm and that the maximum possible technology transfer will always take place.
which is acquired will 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. 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, we allow the post-takeover productivity of the acquired plant to be lower than that of the acquiring firm’s original plant.

The degree of technology transfer proves to be crucial to our results. We show that when a firm’s technological advantage is perfectly transferable, acquiring the least efficient foreign target dominates greenfield FDI in profitability, so any production in the foreign country will be through acquisition. However, if a firm can only transfer part of its technological advantage, greenfield investment will be more profitable for the most efficient foreign firms, although there might still be an intermediate range of productivities over which entry by acquisition is the most profitable strategy.

The rest of this paper is set out as follows. Section 2 presents the model, first under autarky and then considering the different modes of supplying the foreign market, before undertaking an initial analysis of merger incentives. Section 3 analyses a domestic firm’s foreign market entry choice between acquisition, greenfield FDI and exporting. Section 4 concludes.

2 The model

The model is similar to the theoretical model in Helpman et al. (2004), but allows for the possibility of acquisition as an alternative to greenfield FDI. It is assumed that there are two countries, the domestic country $i$ and the foreign country $j$, each containing two sectors, one producing a homogeneous good while the other produces differentiated goods. We first consider the autarkic case in which each country’s market is only served by firms located in that country, before allowing for interaction between countries in the forms of exporting, greenfield FDI and acquisitions.
2.1 Autarky

Country $i$ is analysed here, with similar equations applying for country $j$.

Labour is the only factor of production. Each unit of labour in country $i$ is paid a wage of $w_i$. Before producing anything, a domestic firm that wishes to enter the differentiated goods sector must first pay a fixed entry cost of $f_E$. After paying this cost, the firm then draws its labour-per-unit-output $a$ from a distribution $G(a)$. On learning the value of $a$, the firm then decides whether to produce, in which case it will incur an additional fixed cost of $f_D$, representing the costs of running the domestic plant and distribution network.

Demand for any firm in sector $h$ is of the standard CES form, given by $A_i p^{1-\varepsilon}$, where the elasticity of substitution $\varepsilon = \frac{1}{1-\alpha} > 1$. This means that a firm with a labour requirement of $a$, producing and selling in country $i$, receives a price of $p_{ii} = \frac{w_i a}{\alpha}$, sells output $q_{ii} = A_i \left[ \frac{w_i a}{\alpha} \right]^{-\varepsilon}$ and earns operating profits of

$$\pi_{ii} = (1-\alpha) A_i \left[ \frac{w_i a}{\alpha} \right]^{1-\varepsilon} - f_D$$

The initial market equilibrium will see firms that have paid the fixed entry cost $f_E$ produce if and only if their labour-per-unit-output $a$ is low enough that expected operating profits, given by equation 1, are non-negative, while less productive firms will immediately exit the industry. Free entry implies that the expected operating profits of a potential entrant equal the fixed entry cost $f_E$.

2.2 Foreign sales

A firm in country $i$ ($j$) that wants to sell in country $j$ ($i$) faces three possible modes of supplying the foreign market: exporting, greenfield FDI or acquiring a firm in the foreign market. We analyse each in turn.

Exporting

In order to enter country $j$’s market as an exporter, a firm in country $i$ must first pay a fixed cost of $f_X$ to enter the foreign market. This fixed cost can be thought of as the cost of setting up a sales and distribution network in the foreign country. Having entered the market, all export sales incur a per-unit iceberg transport cost of $\tau > 1$. Hence a firm with a labour requirement of $a$, producing in country $i$ (where the wage is $w_i$) and selling
in \( j \), receives a price of \( p_{ij} = \frac{\tau w_j a}{\alpha} \), sells output \( q_{ij} = A_i \left[ \frac{\tau w_i a}{\alpha} \right]^{-\varepsilon} \) and earns operating profits of

\[
\pi^X_{ij} = (1 - \alpha) A_j \left[ \frac{\tau w_j a}{\alpha} \right]^{1-\varepsilon} - f_X
\] (2)

**Greenfield FDI**

If a firm located in country \( i \) establishes a plant in country \( j \), it is assumed to be able to use its existing technology in the plant it establishes, hence keeping its labour-per-unit-output \( a \). However, because production takes place in country \( j \), the relevant wage is \( w_j \) rather than \( w_i \). Hence the price and output are identical to those of a local plant with the same productivity. Establishing the plant incurs a fixed cost of \( f_I \), which covers the costs of setting up and running then plant and of a foreign sales and distribution network. The operating profits of the plant are therefore

\[
\pi^I_{ij} = (1 - \alpha) A_j \left[ \frac{\tau w_j a}{\alpha} \right]^{1-\varepsilon} - f_I
\] (3)

**Acquisition**

We now consider a case where a firm located in country \( i \) (the predator) acquires a firm located in country \( j \) (the target). The predator and target have labour-per-unit-output of \( a_P \) and \( a_T \) respectively. The predator is assumed to have superior technology, hence \( a_P < a_T \).\(^2\) We assume that the predator can transfer at least some, but not necessarily all, of its technological advantage; the degree to which technology is transferable is captured by the parameter \( \mu \), which is in the range \( 0 < \mu \leq 1 \), with post-merger productivity in the target plant given by \( a_M = \mu a_P + (1 - \mu) a_T \).

Price and output for the acquired plant in country \( j \) are as for a domestic plant with labour-per-unit-output of \( a_M \). In addition, a merger incurs two other costs. Firstly, the predator must pay the target a sum equal to its pre-merger profits. Secondly, there is a fixed merger cost (likely to include legal, administrative and organisational expenses) of \( f_M \). The operating profits of the acquired plant are given by:

\(^2\)As will later be shown, mergers are most profitable between pairs of firms with the largest differences in productivity. Labelling the high technology firm the predator and the low technology firm the target is for expositional convenience, but in fact the instigator of any merger or acquisition is unimportant.
\[
\pi_{ij}^M = (1 - \alpha) A_j \left[ \frac{w_j \theta_M}{\alpha} \right]^{1-\varepsilon} - f_M
\] (4)

We make the additional assumption that only firms that produce in the market can be acquired. Therefore those that pay the entry cost \( f_E \), but draw a low level of productivity and decide not to produce, are not potential takeover targets.

**Ranking of fixed costs**

We make two assumptions about the comparative sizes of the various fixed costs. First, we assume that \( f_I > f_X \), reflecting the fact that greenfield FDI will additionally incur the costs of building a new plant abroad. Our second assumption concerns the level of merger costs; we assume that \( f_I > f_M \), reflecting that the merger costs (likely to include legal, administrative and organisational expenses) are likely to be small relative to the costs of establishing new production facilities. Given that the acquired plant will already have a sales network in place, there seems no compelling reason to assume anything about the relative magnitudes of \( f_M \), \( f_D \) and \( f_X \).

**2.3 Analysis of merger incentives**

In this subsection, we shall merely analyse the profitability of mergers in absolute terms, while leaving the question of their profitability relative to other methods of serving the foreign market until the following section. Throughout the main body of this paper, it is assumed that any firm will only supply each market from a single source. This is equivalent to assuming that when a firm owns more than one plant, it produces an identical variety of the product in each location. This assumption, together with the assumptions of a large number of firms and the zero profits earned by the marginal firm, rules out the possibility of acquisitions within a country (that is, where predator and target belong to the same country). In the appendix, we reconsider merger incentives when firms use the acquired plant to produce the variety of the acquired firm, thus becoming multi-product firms, which allows us to consider competition between domestic and foreign firms for targets.

We consider here the acquisition by a predator in country \( i \) of a target in country \( j \) and define the function \( \Phi \), which represents the profitability of the merger:
\[ \Phi = (1 - \alpha)A_j \left\{ \left[ \frac{w_j a_M}{\alpha} \right]^{1-\varepsilon} - \left[ \frac{w_j a_T}{\alpha} \right]^{1-\varepsilon} \right\} - f_M + f_D \]  

(5)

Directly from the above equation, we derive the following lemma, regarding the effects of productivity on merger profitability:

**Lemma 1** The profitability of an acquisition is decreasing in the labour-per-unit-output of the predator and increasing in that of the target. Hence the most profitable acquisition will involve the most efficient domestic (foreign) firm acquiring the least efficient foreign (domestic) firm.

**Proof.** Recalling our definition of \( a_M = \mu a_P + (1 - \mu) a_T \), we differentiate equation (5) with respect to \( a_P \) and \( a_T \), yielding

\[
\frac{d\Phi}{da_P} = (1 - \alpha)A_j(1 - \varepsilon)\mu \frac{w_j}{\alpha} \left\{ \frac{w_j [\mu a_P + (1 - \mu) a_T]}{\alpha} \right\}^{-\varepsilon} < 0
\]  

(6)

and

\[
\frac{d\Phi}{da_T} = (1 - \alpha)A_j(1 - \varepsilon)\frac{w_j}{\alpha} \left[ (1 - \mu) \left\{ \frac{w_j [\mu a_P + (1 - \mu) a_T]}{\alpha} \right\}^{-\varepsilon} - \left\{ \frac{w_j a_T}{\alpha} \right\}^{-\varepsilon} \right] > 0
\]  

(7)

Equation (6) implies that the most profitable merger will involve the most efficient predator, while equation (7) implies that the most profitable merger will involve the least efficient target.  

We also note that, given the earlier assumption that only those firms that initially produce are takeover targets, the least efficient potential target makes an operating profit of zero. Hence equation (4) above gives not only the profits of the plant after it has been acquired, but also the profit earned by the predator in the foreign market net of the cost of acquisition.

**3 The foreign market entry mode choice**

In this section, we begin by focussing on the choice between greenfield FDI and acquisition, before also considering the choice between these two modes of entry and exporting. We shall first consider cases where production abroad is only to supply the host market,
before going on to consider the implications of allowing a firm to produce abroad to satisfy demand in its home market.

### 3.1 Merger vs. greenfield FDI

Propositions 1 and 2 relate to cases where a foreign plant is only used to supply the foreign market. We first consider what happens if the predator’s technological advantage is perfectly transferable to the target.

**Proposition 1** When technology is perfectly transferable ($\mu = 1$) acquisition of the least profitable target is always preferred to greenfield FDI.

**Proof.** When $\mu = 1$, $a_M = a_P$. Remembering that the least efficient target makes zero profits, acquisition is more profitable if $\pi^M_{ij} > \pi^I_{ij}$. Comparing equations (4) and (3) with $a = a_P$, this is always true for $f_I > f_M$. $\blacksquare$

The intuition behind this result is straightforward. With $\mu = 1$, both acquisition and greenfield FDI yield foreign plants with the same productivity. Therefore the only factor affecting the firm’s choice between these modes of entry is the fixed costs and it is cheaper to acquire a target making zero profits and pay a fixed cost of $f_M$ than to establish a new plant with a fixed cost of $f_I$.

Figure 1 illustrates this case. The horizontal axis shows a transformation of $a$, such that moving to the right represents an increase in productivity (a fall in labour-per-unit-output $a$), while the horizontal axis shows profits. The diagrams are all drawn for $A_i = A_j$ and $f_D < f_M$, with other fixed costs ranked as assumed in the previous section. The slopes of the three profit schedules depend on the costs of supplying the domestic (for $\pi_D$) or foreign (for $\pi_M$ and $\pi_I$) market, which potentially consist of wages in the two countries and transport costs. For Figures 1 and 2 the only comparison we are interested in is between profits earned in the foreign market from acquisition and greenfield investment, so for simplicity we assume $w_i = w_j$ and the slopes of $\pi_D$ and $\pi_I$ are equal.

In Figure 1, we are considering the case where a predator can transfer its entire technological advantage to the target, hence the acquired plant will produce with the same productivity as a newly established plant and $\pi_M$ and $\pi_I$ have the same slopes. It is immediately obvious that, because $f_I > f_M$, $\pi_M$ lies above $\pi_I$ and acquisition is always more profitable than greenfield FDI.
We are left with the result that, when a predator’s technological advantage is perfectly transferable, the most efficient domestic firms will enter the following market by acquiring the least efficient foreign firms, while no greenfield FDI will occur. For $f_D < f_M$, there will be an intermediate range of productivity over which firms will only produce in their original domestic plants.\(^3\)

We now consider the case where a domestic firm can only transfer part of its technological advantage when it acquires a foreign plant, $0 < \mu < 1$.

**Proposition 2** When the predator’s technological advantage is only partly transferable, there may be a range of productivity where a merger is preferred, but for high enough productivity greenfield FDI is always preferred.

\(^3\)We leave until later consideration of whether these firms will supply the foreign market by exporting.
Proof. Greenfield FDI is more profitable if the value of equation (3) with $a = a_P$ is greater than that of equation (4). This means greenfield FDI is preferred if

$$\left(1 - \alpha \right) \left( \frac{w_j}{\alpha} \right)^{1-\epsilon} \left\{ a_P^{1-\epsilon} - \left[ \mu a_P + (1 - \mu) a_T \right]^{1-\epsilon} \right\} > f_I - f_M \quad (8)$$

The right-hand-side of the inequality above is positive; the left-hand-side is positive for $\mu < 1$ and $a_P < a_T$.

For a given $a_T$, there is a positive finite value of $a_P$, which we call $a_P^*$, where the two sides of inequality (8) are equal. There are also positive finite levels of $a$, $a_P^I$ and $a_P^M$, for which profits from greenfield FDI and acquisition (given by equations (3) and (4)) respectively are zero. When $a_P < a_P^*$ and $a_P < a_P^I$, greenfield FDI is more profitable than acquisition and yields positive profits, hence the firm will choose this mode of entry. When $a_P > a_P^*$, acquisition is more profitable than greenfield FDI. If there is a range such that $a_P^* < a_P < a_P^I$, firms with productivity in this range would choose to enter by acquiring a foreign firm. □

The intuition behind the above result is as follows. For very high levels of productivity (low levels of $a$), firms will always want to fully exploit their superior technology by establishing a new plant, rather than only partially exploiting it by acquiring an existing plant. Thus, even though the fixed cost of establishing a new plant is higher, this is the preferred mode of entry. For intermediate levels of productivity, the additional profit per unit from fully exploiting the predator’s superior technology is not sufficient to offset the higher fixed cost of greenfield FDI.

The result of Proposition 2 is illustrated in Figure 2. The significant difference for Figure 1 is that the slope of $\pi_M$ is no longer the same as the slope of the other two profit functions. Its flatter slope reflects the fact that $\mu < 1$ and technology transfer is imperfect. The point where this line intersects $\pi_I$ shows where the two types of entry yield equal profits. To the right of this line, greenfield FDI is always the optimal mode of entry. As Figure 2 is drawn, these two profit functions intersect at a positive level of profits, hence in this case there is an intermediate productivity range where entry by acquisition is optimal.
3.2 Exporting vs. acquisition vs. greenfield FDI

The choice between exporting and acquisition yields far less clear-cut results than the choice between greenfield FDI and either alternative mode of supplying the foreign market, at least when technology is not perfectly transferable. We make the additional assumption here that $w_i \geq w_j$ as if the inequality was reversed, it could trivially be shown that exporting dominates the other modes of supplying the foreign market for domestic firms, when wages are sufficiently low in the domestic country.

**Proposition 3** With perfect technology transfer and positive transport costs, acquisition is the most profitable mode of entry for firms with high productivity but firms with lower productivity may prefer to export. When a firm’s technological advantage is only partly transferable, firms with the highest productivity will choose greenfield investment, while those with lower productivity might export or acquire a foreign plant.
Proof. For the case with $\mu = 1$, it was demonstrated in the proof of Proposition 1 that acquisition dominates greenfield FDI. Comparing equations (2) and (4), the relative profits from exporting and acquisition depend on the relative levels of $\tau w_i$ and $w_j$, and of $f_X$ and $f_M$. By assumption $\tau w_i > w_j$, so for sufficiently low $a_P$, acquisition will always yield higher profits. If $f_X < f_M$, there could be an intermediate range of $a$ where exporting yields profits that are both positive and greater than profits from acquisition.

For the case with $\mu < 1$, we define two more positive finite threshold levels of $a$: $a^X_P$ is the value for which profits from exporting, given by equation (2), equal zero and $a^{**}_P$ is the value for which profits from exporting and greenfield FDI, given by equations (2) and (3), are equal. The ranking of $a^X_P$ and $a^{**}_P$ is indeterminate, as is that of $a^X_P$, $a^I_P$ and $a^M_P$. However, there exist positive values of $a_P$ such that $a_P < a^X_P$, $a_P < a^{**}_P$ and $a_P < a^I_P$ and for these low values of labour-per-unit-output, greenfield FDI is always optimal. ■

Exporting can be thought of in terms of the earlier diagrams: the presence of positive transport costs results in a flatter profit function than $\pi_D$ or $\pi_I$, however the relative slopes of the profit functions for exporting and an acquired foreign plant depend on $w_i$, $w_j$, $\mu$ and $\tau$. Without imposing more structure on these parameters and the fixed costs, we cannot say anything about the relative ranking of exporting and acquisition when $\mu < 1$. However, the fact that the profit function for exporting is relatively flat is enough to ensure that firms with very high productivity levels will never choose to export.

3.3 Importing from a foreign plant

We now consider the possibility of a domestic firm producing in the foreign country not only to serve that market, but also to supply the domestic market. As we still assume that all plants owned by any firm produce a single product, the only reason to import from a foreign plant is to replace domestic production, therefore supplying the home market from a foreign firm will only happen when this is the cheapest way of supplying the market. The conditions under which this occurs are identified in the following proposition.

Proposition 4 When the foreign country has a lower wage, for sufficiently low transport costs, the most efficient domestic firms will satisfy demand in their own country through acquisition in the foreign country with perfect technology transfer, or greenfield FDI in the foreign country otherwise. In the latter case, there may be an intermediate productivity range in which domestic firms supply the domestic market through foreign acquired plants.
Proof. A domestic firm can supply the domestic and foreign firms both from a domestic plant, both from a foreign plant, or supply the domestic market from a domestic plant and the foreign market from a foreign plant. If a foreign plant is established, it could be by greenfield FDI or acquisition. Hence there are five possible modes of supplying the two markets. Below we give the profits for each possible case \((d, f)\), where \((d, f) \in \{D, I, M\}\):

\[
\begin{align*}
(D, D) & \quad \pi_{ii} + \pi_{ij}^X \\
(D, I) & \quad \pi_{ii} + \pi_{ij}^I \\
(D, M) & \quad \pi_{ii} + \pi_{ij}^M \\
(I, I) & \quad \pi_{ii}^{IX} + \pi_{ij}^I \\
(M, M) & \quad \pi_{ii}^{MX} + \pi_{ij}^M
\end{align*}
\]

where \(\pi_{ii}, \pi_{ij}^X, \pi_{ij}^I\) and \(\pi_{ij}^M\) are as defined earlier and \(\pi_{ii}^{IX}\) and \(\pi_{ii}^{MX}\) are profits earned from domestic sales of a foreign plant under greenfield FDI and acquisition respectively, given by:

\[
\pi_{ii}^{IX} + (1 - \alpha) A_i \left[ \frac{\tau w_j a}{\alpha} \right]^{1-\varepsilon} - f_{DX} \tag{9}
\]

and

\[
\pi_{ii}^{MX} + (1 - \alpha) A_i \left[ \frac{\tau w_j a_M}{\alpha} \right]^{1-\varepsilon} - f_{DX} \tag{10}
\]

where \(f_{DX}\) represents the costs of running a sales and distribution network in the domestic country. Because no plant is run in the home country in these two cases and the fixed costs of running the foreign plant are accounted for in \(\pi_{ij}^I\) and \(\pi_{ij}^M\), we assume \(f_{DX} < f_D\).

A sufficient condition for profits from \((I, I)\) \(((M, M))\) to exceed those from \((D, I)\) \(((D, M))\), if the firm already produces in the foreign country to supply the foreign market, is \(\tau w_j < w_i\). Hence if \(\tau w_j < w_i\) and the firm’s optimal method of supplying the foreign market is either greenfield FDI or acquisition, domestic demand will be supplied from the firm’s foreign plant. The rest of the proof follows directly from the proof of Proposition 3. ■
4 Conclusions

This paper has introduced the choice between acquisition and greenfield FDI into a heterogeneous firm (Melitz) model. We first showed that the most profitable merger will involve the most efficient firm in one country acquiring the least efficient in the other country. We then considered the choice between acquisition and greenfield FDI under different assumptions about technology transfer. With perfectly transferable technology, acquisition is always more profitable than greenfield FDI, whereas if a firm’s technological advantage is only partly transferable, firms with the highest productivity will prefer greenfield investment.

Considering domestic firms’ choice between exporting, greenfield FDI and acquisition, with perfect technology transfer and positive transport costs, acquisition is the most profitable mode of entry for firms with high productivity but firms with lower productivity may prefer to export. When a firm’s technological advantage is only partly transferable, firms with the highest productivity will choose greenfield investment, while those with lower productivity might export or acquire a foreign plant. If we allow the domestic firm to supply its home market by importing from its foreign subsidiary, the most efficient firms will use foreign plants to satisfy domestic demand when the foreign country has a lower wage and transport costs are low.

References


**Appendix: Multi-product firms**

Whereas we assumed throughout the main text that each firm sells a single product and hence will only use a single plant to supply each market, here we analyse the case where an acquired plant continues to produce the (different) variety it produced before acquisition. We do not offer a complete treatment of multi-product firms, but instead reconsider merger incentives and competition for a target between domestic and foreign firms.

**Proposition 5** *When the acquired plant continues to produce its original variety, the most profitable takeover in either country involves the least efficient firm in that country being acquired by the most efficient firm, regardless of which country it is located in.*

**Proof.** The result follows directly from Lemma 1. The effect of the predator’s productivity on merger profitability is independent of the location of the predator. ■

It should be noted that the incentive for a domestic firm to acquire a foreign plant here is different to in the main text. There, the plant would only be acquired if it was the most profitable way for the domestic firm to sell its own variety in the foreign market and hence acquisition was clearly a substitute for either greenfield investment or exporting. Here the incentive for acquisition is to acquire an additional variety, thus it would potentially be a compliment to one of the other modes of supplying the foreign market.

15