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The Impact of Multinational Entry on Domestic Market Structure and R&D

Stefanie A. Haller*

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Abstract

We model the impact of different modes of multinational entry on the choices of domestic firms. Focusing on the competitive effects of foreign presence in the host country we demonstrate that greenfield investment will increase competition only if it is not countered by anti-competitive reactions on the part of the domestic firms. Considering also cross-border mergers and acquisitions the model, thus, provides two alternative explanations for the increase in concentration ratios in industries with mostly horizontal foreign direct investment. Moreover, foreign presence is shown to raise total investment in the local industry at the cost of crowding out domestic R&D.

Keywords: greenfield investment, cross-border mergers and acquisitions, host-country effects, market structure, cost-reducing R&D investment

JEL classification: F23, L11, O31

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1 Introduction

Worldwide foreign direct investment (FDI) has grown impressively in the past 30 years. According to the World Investment Report 2004 (UNCTAD (2004)) FDI inward stock has grown on average at 13,1% per year between 1986 and 2003. Since the late 1980s FDI has increasingly taken the form of cross-border mergers and acquisitions (M&A) rather than greenfield investment (UNCTAD (2000)). At the same time concentration ratios in industries with strong horizontal FDI activity such as automobiles, pharmaceuticals and banking have risen (UNCTAD (1999)). Taken together this suggests that multinational enterprises (MNE) are increasing in size, if not also in efficiency.¹ The impact of these multinational players is likely to be felt strongest in the markets they enter. Previous work has mainly examined this in the light of technology spillovers from the foreign to the domestic firms. However, entry by a foreign multinational enterprise constitutes first of all a major change in the market structure of the host country industry. This may induce a reaction by the domestic firms that can take the form of investment in technology, exit, or a domestic merger. The aim of this chapter is to emphasise this latter aspect by examining the interaction between different modes of multinational entry and the induced moves of the domestic firms regarding changes in market structure, R&D investment and welfare.

From the perspective of an individual multinational firm, the choice between a cross-border merger or acquisition and greenfield entry is ascribed to different firm characteristics (see UNCTAD (2000, p. 145) and Kang and Johansson (2000)). Good organisational and managerial skills, high advertising intensity, and the prospect of a speedy market entry are more conducive to M&A. Whereas a technological advantage works in favour of greenfield investment. Host country governments, in turn, tend to have different concerns when it comes to choose between these two alternatives. Often they favour greenfield investment as it is said to increase competition by adding new production capacity to the market. M&As, in contrast, are associated with a decrease in competition or at best with no change in market structure. However, this perception disregards that firms acquired by foreign investors may initiate competition with incumbents in the host country, for example with the help of superior technological skills from parent companies. Furthermore, if inefficient target firms which otherwise may be forced to exit are acquired and restructured by foreign investors, M&As may enhance competition in the host country. By the same token, it is possible that an initial increase in competition through greenfield entry may trigger domestic firms to exit or to merge. While documentation of these issues is scarce, exit is shown to be a relevant strategy for domestic firms by De Backer and Sleuwaegen (2003). They find that import competition as well as FDI discourage entry and stimulate exit of domestic entrepreneurs in a sample of Belgian manufacturing firms. Accentuating the importance of research and development (R&D) in their analysis of Irish manufacturing, Görg and Strobl (2003) show that the presence of foreign firms can also have a life-enhancing effect on domestic firms, but this is the case only in high-tech sectors.

¹A number of empirical studies confirm that MNEs are, in most cases, the largest and most efficient firms in an industry. See Barba Navaretti and Venables (2004, ch. 7.3) for an overview.

Next to its original intentions the empirical literature on technology spillovers renders a closer look at the impact of foreign entry on changes in market structure and competition in the host country an interesting exercise. A difficulty with many of these papers is that the available data does very often not allow to divorce spillover effects from pro-competitive effects of multinational presence. Görg and Strobl (2003) ascribe their above mentioned finding of a life-enhancing effect on Irish firms to technology spillovers from the foreign firms in the market. However, the majority of the empirical studies examining horizontal spillovers finds a negative impact of foreign presence on domestic firms or industries (see Görg and Greenaway (2004) for a survey). This suggests that the pro-competitive effects from foreign entry outweigh potential spillover effects at least in the short run. Sembenelli and Siotis (2005) confirm this in their study of Spanish manufacturing firms where they make an attempt to disentangle the pro-competitive and the spillover effects. They find that especially in non-R&D intensive sectors the entry of MNEs dampens the profit margins of local firms in the short run, to give way to efficiency-enhancing effects in the longer run. Overall, this suggests that the pro-competitive effects from foreign entry on the host country are strong and that domestic firms are more likely to be able to put up with them in high-tech sectors.

The theoretical literature has long treated foreign direct investment as a homogenous phenomenon, where cross-border mergers and acquisitions and greenfield investment are observationally equivalent. The focus of recent papers breaking with this tradition is mostly on the multinational firms' motives for choosing one mode of entry over another accounting for host country characteristics, e.g. Horn and Persson (2001), Bjorvatn (2004), Eicher and Kang (2004), Nocke and Yeaple (2004). In the model presented here we look at i) how the MNE's mode of entry choice is affected when the firms in the host country are allowed to react; ii) how this interaction affects market structure and iii) its impact on the level of R&D investments and welfare in the host country. To this end, we build a four-stage game where the MNE chooses between entry via acquisition of a domestic firm and greenfield investment in the first stage of the game. The domestic firms can react to this choice in the second stage. In the last two stages of the game all active firms first invest in process R&D before engaging in Cournot competition in the product market. Two of the issues in this chapter have been addressed before in settings with one incumbent in the host country. Veugelers and Vanden Houte (1990) study the impact of foreign competition on the innovative efforts of a domestic firm. Mukherjee (2004) looks at the welfare implications of greenfield versus acquisition entry in a model of foreign entry and R&D competition.

The assumption of an asymmetric duopoly as the initial market structure in the host country allows us to demonstrate that the impact of foreign entry on the host country is not independent of possible reactions by the local incumbents. In particular, we show that a concentrated market structure may result even in the case of greenfield entry when the domestic firms merge or exit the market as a consequence. In this way, the chapter provides an explanation for the increase in concentration ratios in industries where horizontal FDI is prevalent that is complementary to the surge in cross-border M&A as a share of FDI. Moreover, we show that a technological advantage of the multinational firm only

favours greenfield investment over an acquisition when either the domestic firms are sufficiently competitive or when they are induced to eliminate competition among themselves by merging. Looking at the incentives to engage in cost-reducing R&D investment in such a setting, we obtain a result that is very much in line with the empirical evidence: The presence of a more efficient foreign firm in the domestic market will increase total R&D investment in the industry. However, this comes at the cost of crowding out domestic R&D when compared to a situation with domestic firms only. This is in contrast to Veugelers and Vanden Houte (1990). In their model the less differentiated products, the less likely a negative impact of multinational presence on local innovative efforts. Finally, while consumer surplus increases, full profit repatriation on the part of the foreign firm reduces producer surplus by so much that domestic welfare will typically be lower after foreign entry. As the focus in this chapter is on competition, this should be regarded as a lower bound to domestic welfare after foreign entry.

The remainder of the chapter is structured as follows: Section 2 presents the components of the model. In Section 3 the model itself is addressed. First, the properties of the model are presented in the benchmark equilibrium without foreign entry (3.1); then the game with foreign entry is analysed (3.2). Section 4 illustrates the equilibrium market structure. Section 5 compares the associated R&D (5.1) and welfare levels (5.2) to the benchmark situation without foreign presence. Section 6 concludes.

2 The Setup

As the focus here is on the impact of the mode of foreign entry on changes in domestic market structure, all action will take place in one country. We look at one particular industry in this country. There are two domestic firms in this industry, $H1$ and $H2$. They differ in their level of marginal cost, $H1$ is more efficient than $H2$: $c_{H1} \leq c_{H2}$. The potential multinational entrant M is assumed to be more efficient than the domestic firms, its marginal cost is given by c_M , where $c_M \leq c_{H1} \leq c_{H2}$.

All firms in the market can make investments to reduce marginal cost by an amount x_i . Accordingly the kind of investment considered is process R&D.² Investment is associated with a cost of γx_i^2 for all firms, where γ measures the degree of convexity of the cost function. Convexity of investment cost is ensured by $\gamma > \frac{3}{4}$.³

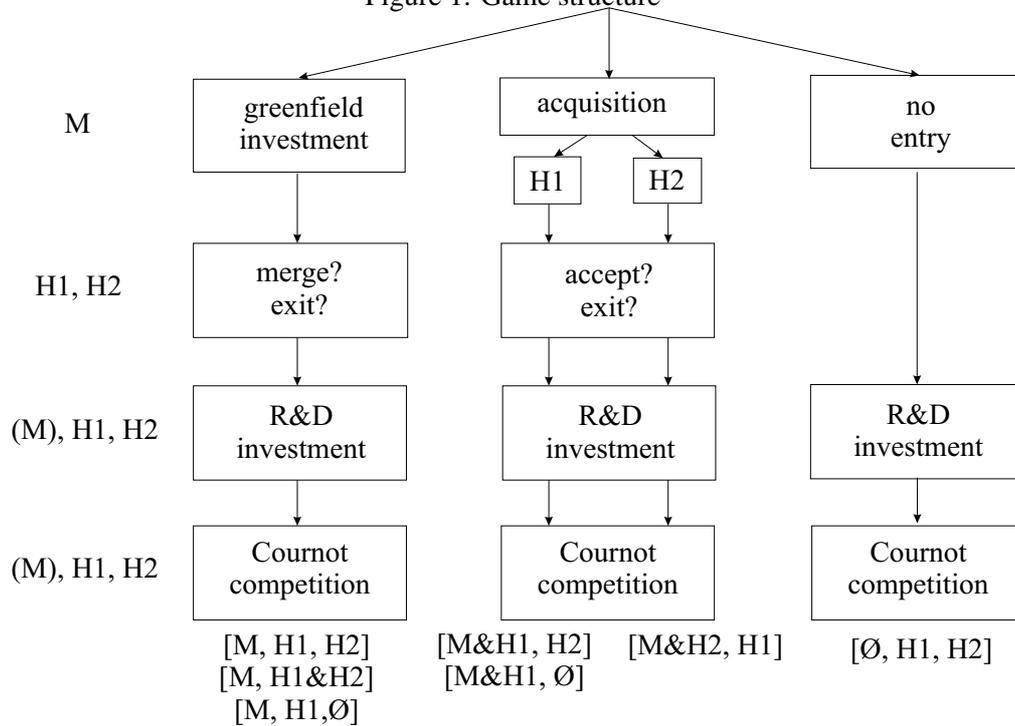
Firms are producing a homogenous good. Hence, demand is the same for all firms with the indirect demand function given by $p = a - Q$, where a represents the size of the market and $Q = \sum_{i=1}^n q_i$ is the sum over all firms' sales. For firms to produce positive levels of output, we need $a > c_{H2} \geq c_{H1} \geq c_M > 0$. The multinational's and the domestic firms' profits are then given by, respectively

$$\Pi_i(q_i, x_i) = (p - (c_i - x_i)) q_i - \gamma x_i^2, \text{ where } i = M, H1, H2. \quad (1)$$

²This way of modelling R&D goes back to Brander and Spencer (1983). Investments that increase demand can be modelled in a similar way (see e.g. Veugelers and Vanden Houte (1990)).

³Note that this condition is stronger than the second order condition on investment. It is sufficient for the denominator of profits to be positive in a situation with three (or less) active firms in the market.

Figure 1: Game structure



The structure of the game is outlined in Figure 1. In the first stage the multinational firm decides whether and if so how to enter the domestic market. It can either acquire one of the domestic firms or set up its own plant (i.e. greenfield investment).⁴ If the MNE decides to enter via an acquisition, it will make a take-it-or-leave-it offer to one of the domestic firms. Mergers and acquisitions are modelled here as was first done by Salant, Switzer and Reynolds (1983), that is the target firm is compensated for being taken over and then vanishes.⁵ Greenfield investment by the MNE is associated with a fixed cost of setting up production facilities f .

When the domestic firms can react to the MNE's decision in the second stage, they observe the multinational's decision of the first stage. That is they either observe a greenfield entry on the part of the MNE or either of them receives a takeover offer. In the case of greenfield investment, entry by the MNE may induce exit or a merger among the domestic firms. In the case of entry via acquisition, the domestic firms can accept or reject the take-it-or-leave-it offer. Similarly an acquisition also has the potential to force the non-acquired firm out of the market.

In the third stage of the game, all active old and new entities of firms decide how much to invest in a cost reducing technology before engaging in Cournot competition in the last stage of the game. The game consists of these last two stages for the domestic firms only if the multinational firm decides not

⁴This choice of alternatives for a firm to serve a market abroad is not exhaustive, especially exports are disregarded for simplicity. See e.g. Bjorvatn (2004) on the latter and Buckley and Casson (1998) for a fairly comprehensive treatment of possible supply modes from abroad.

⁵Note, however, that the assumption of different marginal cost does not imply the Salant, Switzer and Reynolds (1983) result that mergers will only be profitable if they involve at least 80% of the firms in an industry.

to enter the market. As will be detailed further in the next section, the notation in square brackets at the bottom of Figure 1 describes the resulting market structure outcomes. For example $[\emptyset, H1, H2]$ states that only the two domestic firms are present in the market.

To understand the structure of the game and in particular the possibility of mergers and acquisitions, note that we assume a competition authority in the background that follows a simple rule: namely to prohibit mergers or acquisitions that lead to monopoly. A final assumption is that whenever two firms form a new entity, they will be able to use the technology of the more efficient firm without additional cost, i.e. technology transfer is costless.⁶

3 The Model

3.1 Benchmark without Foreign Entry

The situation without foreign entry, i.e. the right hand arm of Figure 1, is considered to be the initial market structure and also the benchmark. We are, hence, looking at the solution to a two-stage game, where the two domestic firms decide about investments in technology in the first stage and engage in Cournot competition in the second stage. The game is solved by backward induction. Equilibrium profits are given in the top part of Table 1 (see $[\emptyset, H1, H2]$). For $H2$ to produce positive quantities in equilibrium, the following condition needs to be satisfied:

$$c_{H2}^{D exit} \leq \frac{3\gamma(a + c_{H1}) - 2a}{2(3\gamma - 1)}. \quad (2)$$

Above this threshold, $H2$ will exit the market. This condition also implies that both firms have positive levels of investment in equilibrium.

Sales are increasing in market size a , decreasing in own initial marginal cost c_i , increasing in the marginal cost of the competitor(s) c_{-i} , decreasing in the technology parameter γ , and decreasing in the number of active firms in the market. With the exception of c_{-i} , the same is true for investment. Whether a firm's investment level is increasing or decreasing in the marginal cost of its competitor(s) depends on its efficiency relative to the average efficiency (marginal cost) in the market. As shown in Boone (2000), firms that are far ahead or far behind their competitors have the least incentives to reduce marginal cost.

⁶Authors who consider technology transfer explicitly include Wang and Blomström (1992), Glass and Saggi (2002) and Mattoo, Olarreaga and Saggi (2004).

Table 1: Net profits

Domestic Firms only (Benchmark)	
[\emptyset , $H1$, $H2$]	
$H1$	$\gamma(9\gamma - 4) \left(\frac{3\gamma(a - 2c_{H1} + c_{H2}) - 2(a - c_{H1})}{(9\gamma - 2)(3\gamma - 2)} \right)^2$
$H2$	$\gamma(9\gamma - 4) \left(\frac{3\gamma(a + c_{H1} - 2c_{H2}) - 2(a - c_{H2})}{(9\gamma - 2)(3\gamma - 2)} \right)^2$
Greenfield Investment	
[M , $H1$, $H2$]	
M	$\gamma(16\gamma - 9) \left(\frac{4\gamma(a - 3c_M + c_{H1} + c_{H2}) - 3(a - c_M)}{(16\gamma - 3)(4\gamma - 3)} \right)^2 - f$
$H1$	$\gamma(16\gamma - 9) \left(\frac{4\gamma(a + c_M - 3c_{H1} + c_{H2}) - 3(a - c_{H1})}{(16\gamma - 3)(4\gamma - 3)} \right)^2$
$H2$	$\gamma(16\gamma - 9) \left(\frac{4\gamma(a + c_M + c_{H1} - 3c_{H2}) - 3(a - c_{H2})}{(16\gamma - 3)(4\gamma - 3)} \right)^2$
[M , $H1\&H2$]	
M	$\gamma(9\gamma - 4) \left(\frac{3\gamma(a - 2c_M + c_{H1}) - 2(a - c_M)}{(9\gamma - 2)(3\gamma - 2)} \right)^2 - f$
$H1\&H2$	$\gamma(9\gamma - 4) \left(\frac{3\gamma(a + c_M - 2c_{H1}) - 2(a - c_{H1})}{(9\gamma - 2)(3\gamma - 2)} \right)^2$
[M , $H1$, \emptyset]	
M	$\gamma(9\gamma - 4) \left(\frac{3\gamma(a - 2c_M + c_{H1}) - 2(a - c_M)}{(9\gamma - 2)(3\gamma - 2)} \right)^2 - f$
$H1$	$\gamma(9\gamma - 4) \left(\frac{3\gamma(a + c_M - 2c_{H1}) - 2(a - c_{H1})}{(9\gamma - 2)(3\gamma - 2)} \right)^2$
$H2$	0
Acquisition of $H2$	
[$M\&H2$, $H1$]	
M	$\gamma(9\gamma - 4) \left(\frac{3\gamma(a - 2c_M + c_{H1}) - 2(a - c_M)}{(9\gamma - 2)(3\gamma - 2)} \right)^2 - v_2$
$H1$	$\gamma(9\gamma - 4) \left(\frac{3\gamma(a + c_M - 2c_{H1}) - 2(a - c_{H1})}{(9\gamma - 2)(3\gamma - 2)} \right)^2$
$H2$	$v_2 = \max \left[0; \gamma(9\gamma - 4) \left(\frac{3\gamma(a + c_M - 2c_{H2}) - 2(a - c_{H2})}{(9\gamma - 2)(3\gamma - 2)} \right)^2 \right]$
Acquisition of $H1$	
[$M\&H1$, $H2$]	
M	$\gamma(9\gamma - 4) \left(\frac{3\gamma(a - 2c_M + c_{H2}) - 2(a - c_M)}{(9\gamma - 2)(3\gamma - 2)} \right)^2 - v_1$
$H1$	$v_1 \geq \gamma(9\gamma - 4) \left(\frac{3\gamma(a + c_M - 2c_{H1}) - 2(a - c_{H1})}{(9\gamma - 2)(3\gamma - 2)} \right)^2$
$H2$	$\gamma(9\gamma - 4) \left(\frac{3\gamma(a + c_M - 2c_{H2}) - 2(a - c_{H2})}{(9\gamma - 2)(3\gamma - 2)} \right)^2$
[$M\&H1$, \emptyset]	
M	$\gamma \frac{(a - c_M)^2}{4\gamma - 1} - v_1$
$H1$	$v_1 \geq \gamma(9\gamma - 4) \left(\frac{3\gamma(a + c_M - 2c_{H1}) - 2(a - c_{H1})}{(9\gamma - 2)(3\gamma - 2)} \right)^2$
$H2$	0

3.2 The Model with Foreign Entry

Now the game where the MNE actually enters the host country market can be addressed. Again, solving by backward induction the equilibrium profits under the different entry modes of the MNE can be obtained as given in Table 1. The different market structure outcomes are explained in detail below.

When the foreign firm acquires home firm $H1$ for the takeover price v_1 , there are two possible market structure outcomes. One in which the new joint entity of $M\&H1$ shares the market with the less efficient home firm $[M\&H1,H2]$, and another one where the acquisition of $H1$ by the MNE induces $H2$ to exit $[M\&H1,\emptyset]$. We assume that the competition authorities cannot fully observe the firms' cost parameters and, thus, will only block mergers or acquisitions that lead to monopoly directly (i.e. when there are initially only two firms in the market), but not when a monopoly arises due to the exit of the less efficient firm after a takeover. When, instead, the MNE decides to acquire $H2$ for the takeover price v_2 , the market consists of the new entity $M\&H2$ and the more efficient domestic firm $[M\&H2,H1]$. As will be shown later, exit of $H1$ due to the takeover is a theoretical possibility but will not occur in equilibrium.

If the MNE engages in greenfield investment and establishes its own plant in the host country market there are three possible market structure outcomes. One possibility is that all three firms are active $[M,H1,H2]$. The other two possibilities are that the two domestic firms merge $[M,H1\&H2]$ or that the less efficient domestic firm is driven out of the market $[M,H1,\emptyset]$.

We will now analyse each of the multinational's alternatives separately, in order to then determine the equilibrium outcomes depending on parameter values. Consider first the case of multinational entry by acquisition.

3.2.1 Acquisition decision

If the MNE decides to enter the domestic market by acquisition, its choice among the domestic firms will depend on the cost of the target firm and on the profits under the resulting market structure.

Acquisition of the more efficient domestic firm $H1$

When the more efficient domestic firm $H1$ gets a take-it-or-leave-it-offer from the MNE, it will accept the offer for any quote v_1 that gives it at least the profits it would earn if the MNE had decided to take over the other domestic firm $H2$, that is

$$v_1 \geq \gamma (9\gamma - 4) \left(\frac{3\gamma (a + c_M - 2c_{H1}) - 2(a - c_{H1})}{(9\gamma - 2)(3\gamma - 2)} \right)^2. \quad (3)$$

If $H1$ accepts, this leaves the MNE with net profits of $\Pi_M^{M\&H1,H2} - v_1$. It is straightforward to show that under the assumed ranking of marginal cost $c_{H2} \geq c_{H1} \geq c_M$ an acquisition of $H1$ is always profitable (see also Appendix A.1.1).

When the MNE decides to buy $H1$, the condition for the less efficient domestic firm $H2$ to leave the market becomes more stringent as compared to the situation without foreign presence (equation (2)):

$$c_{H2}^{A_{exit}} > \frac{3\gamma(a + c_M) - 2a}{2(3\gamma - 1)} \quad (4)$$

Thus, above this threshold the newly merged entity of $M\&H1$ will earn monopoly profits after compensating $H1$ for the takeover. These are always positive as $a > c_M$ by assumption.

In this range of parameter values the MNE could instead obtain $H2$ for free ($v_2 = 0$). It turns out, however, that the monopoly outcome is more attractive for the MNE even though it has to compensate $H1$ for the takeover. In other words, the MNE prefers to pay a price to have the market to itself, than to share it with a competitor for free. (Proof: see Appendix A.1.2.)

Acquisition of the less efficient domestic firm $H2$

If, instead, the MNE makes a take-it-or-leave-it-offer to the less efficient domestic firm, $H2$ will accept for any price that is at least as large as the profits it would earn if the MNE took over $H1$:

$$v_2 = \max \left[0; \gamma(9\gamma - 4) \left(\frac{3\gamma(a + c_M - 2c_{H2}) - 2(a - c_{H2})}{(9\gamma - 2)(3\gamma - 2)} \right)^2 \right]. \quad (5)$$

As long as v_2 is non-zero, the MNE's profits after the takeover $\Pi_M^{M\&H2,H1} - v_2$ are positive for $c_{H2} \geq c_{H1} \geq c_M$ and $c_{H2} \leq \frac{3\gamma(2a - c_M + c_{H1}) - 2(2a - c_M)}{2(3\gamma - 1)}$ (see also Appendix A.1.3).

Note that an acquisition of $H2$ by the MNE will not induce the more efficient domestic firm $H1$ to leave the market. As is demonstrated in Appendix A.1.4 the hypothetical threshold for $H1$ to exit in this case lies in the region where the MNE will prefer to acquire $H1$. Therefore, $H1$ will always be in the market when the MNE acquires $H2$.

Acquisition of $H1$ versus acquisition of $H2$

Comparing the payoffs for the MNE under both scenarios gives the threshold above which the MNE will prefer to acquire $H1$ rather than $H2$:

$$c_{H2}^{A_{H2vsH1}} > \frac{9\gamma^2(2a + 8c_M - 5c_{H1}) - 24\gamma(a + c_M - c_{H1}) + 4a(2a - c_{H1})}{45\gamma^2 - 24\gamma + 4} \quad (6)$$

This result states that for small values of c_{H2} relative to c_{H1} the MNE will acquire the less efficient domestic firm $H2$. When $H2$ is rather inefficient compared to $H1$ the MNE will acquire the more efficient domestic firm $H1$. The intuition for this result can be obtained by looking at the profits after the takeover and acquisition prices. Holding everything else constant in the case of the acquisition of $H1$, the profits for the MNE after the takeover depend positively on c_{H2} while the price of $H1$ (v_1) is independent of c_{H2} . In the case of the acquisition of $H2$, in contrast, the profits after the takeover for

the MNE do not depend on c_{H2} , the takeover price v_2 is, however, decreasing in c_{H2} :

$$\begin{aligned} & \Pi_M^{M\&H1,H2}(\cdot, c_{H2}) - v_1(\cdot) \\ & \quad + \\ & \Pi_M^{M\&H2,H1}(\cdot) - v_2(\cdot, c_{H2}) \\ & \quad - \end{aligned}$$

The MNE's net profits from a takeover of either of the domestic firms are increasing in c_{H2} over the relevant range of parameter values. As the profits from an acquisition of $H1$ ($\Pi_M^{M\&H1,H2}$) and the takeover price for $H2$ ($v_2 = \Pi_{H2}^{M\&H1,H2}$) are the profits of two firms in the same market, it is sufficient to look at the direct effect of a change in c_{H2} . Taking derivatives it is not difficult to show that this direct effect is stronger on the MNE's profits after a takeover of $H1$ than on v_2 . *Ceteris paribus* the larger c_{H2} - that is the less efficient $H2$ relative to $H1$ - the more likely that the MNE buys $H1$. Put simply, in order to eliminate as much competition as possible the MNE would always like to acquire $H1$, however, there are instances when it can only afford $H2$.⁷

As the upper bound on the profitability of a takeover of $H2$ is larger than the threshold obtained in equation (6), a takeover of $H2$ will always be profitable for the MNE up to the threshold above which it prefers to acquire $H1$. Note from above that we need not worry about the profitability of a takeover of $H1$ as this is profitable over the whole range of parameter values.

3.2.2 Greenfield decision

With greenfield entry by the MNE the number of firms in the market increases and so the condition for the less efficient domestic firm to stay in the market is more stringent than in the acquisition case (cf. equation (4)). $H2$ will exit the market above

$$c_{H2}^{G_exit} > \frac{4\gamma(a + c_M + c_{H1}) - 3a}{3(4\gamma - 1)}. \quad (7)$$

Under greenfield entry, a merger among the domestic firms may become possible. While the competition authority would have blocked a merger to monopoly in a situation with the two domestic firms only, entry by the MNE may now induce the authorities to look at such a merger more favourably. A merger among the domestic firms $H1$ and $H2$ will be profitable if their joint profits after the merger are larger than the sum of their individual profits in the absence of a merger: $\Pi_{H1\&H2}^{M,H1\&H2} \geq \Pi_{H1}^{M,H1,H2} + \Pi_{H2}^{M,H1,H2}$. The implied threshold for a domestic merger to be profitable $c_{H2}^{D_merger}$ is given in Appendix A.1.5 as it is very long and does not provide any intuition.

⁷Note that the threshold implied by equation (6) is not necessarily larger than c_{H1} . Thus when c_M is large relative to c_{H1} , the MNE may be able to afford $H1$ over the whole range of parameter values.

3.2.3 Greenfield *versus* Acquisition

For the comparison between greenfield investment and a foreign acquisition, the dimension considered so far, namely the marginal cost of the ‘pivotal’ firm $H2$ is not sufficient. While acquisitions by the MNE and the reactions of the domestic firms depend on marginal cost only, for greenfield investment the fixed cost of setting up a plant f also plays a role. The MNE’s profits net of takeover prices or fixed cost as given in Table 1 need to be compared to obtain a full characterisation of market structure outcomes. The thresholds for c_{H2} computed above determine which of the respective greenfield and acquisition alternatives have to be compared. The next section presents graphical illustrations of the equilibrium structures under different parameter combinations.

4 Equilibrium

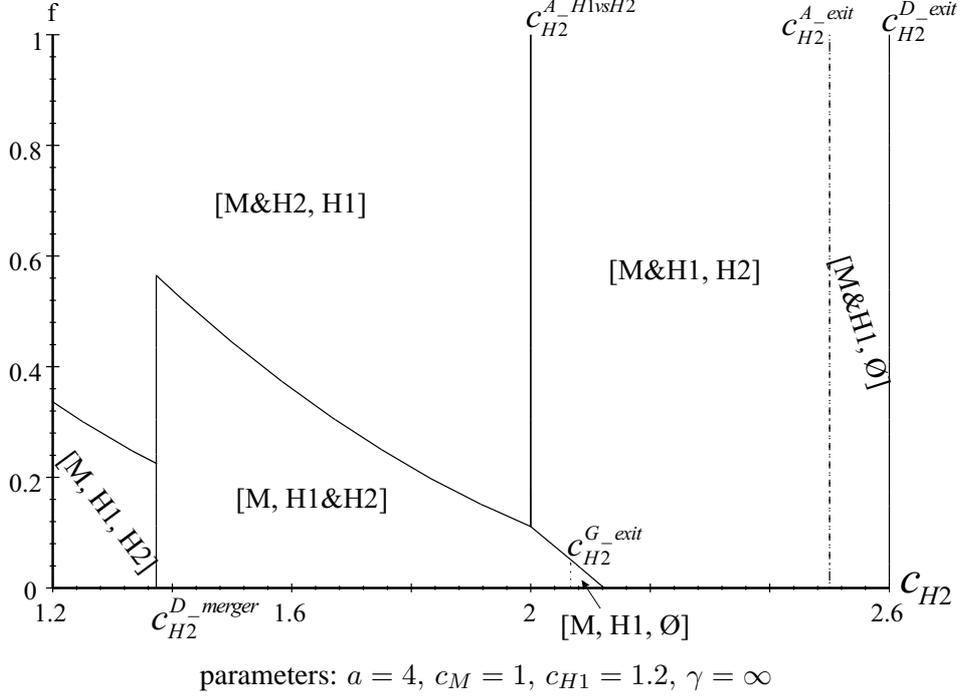
In order to separate the market structure outcome of the game from the additional effect of cost reducing R&D, we first assume that R&D investment is infinitely costly, that is $\gamma = \infty$. This amounts to analysing the game in Figure 1 without R&D investment in the third stage.⁸ Fixing $a = 4$, $c_M = 1$, $c_{H1} = 1.2$ (and $\gamma = \infty$) the equilibrium outcomes can be represented in f , c_{H2} -space as given in Figure 2. The choice of parameter values allows for a rich set of market structure outcomes, as market size is relatively large compared to the firms’ marginal costs.

The domestic firm $H2$ is by assumption less efficient than $H1$ ($c_{H2} \geq c_{H1}$), therefore, attention can be constrained to values of c_{H2} larger than $c_{H1} = 1.2$. The upper bound for the field of action is given by the condition for $H2$ to be in the market when the domestic firms are in the market alone (equation (2)), that is here equal to $c_{H2}^{D_exit} = 2.6$. The vertical loci in the Figure represent the thresholds for c_{H2} computed above. The non-vertical lines are obtained by comparing profits of the relevant greenfield and acquisition alternatives as given in Table 1 and solving for the fixed cost of greenfield investment f .

Assuming the fixed cost of greenfield investment f to be equal to zero, we move along the horizontal c_{H2} – axis from left to right. Close to the origin, that is, when $H2$ is almost as efficient as $H1$, we observe an area where the MNE engages in greenfield investment and the two domestic firms stay in the market independently. For values of c_{H2} above $c_{H2}^{D_merger}$, the less efficient domestic firm $H2$ would only capture a small share of the market. By merging the two domestic firms are able to increase their profit as one firm with marginal cost c_{H1} above the sum of their individual profits. For values of c_{H2} to the right of $c_{H2}^{G_exit}$ greenfield investment by the MNE will induce $H2$ to exit the market.

⁸Note that this reduces the equilibrium profits given in Table 1 to those of a Cournot game with two or three asymmetric firms.

Figure 2: Equilibrium market structure without investment

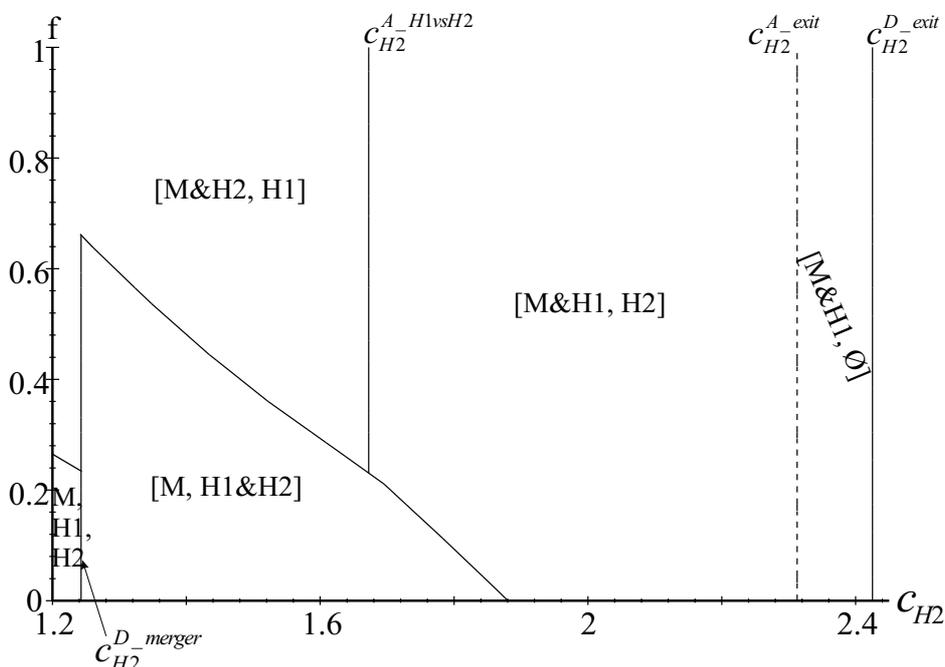


For values of c_{H2} up to where the diagonal line meets the horizontal axis, the MNE will engage in greenfield investment; for values of c_{H2} above that, it will prefer to acquire $H1$. In this range, $H2$ is such an inefficient competitor that the MNE can afford to buy out the more efficient domestic firm $H1$ and still earn higher profits than if it were sharing the market with $H1$, as would be the case under greenfield investment. In a situation where $H2$ is very inefficient even the acquisition of $H1$ will induce it to exit the market and create a monopoly for the MNE. This is the case for values of c_{H2} larger than $c_{H2}^{A_exit}$.

Next consider a move along the vertical axis, that is a situation when both domestic firms have identical marginal cost ($c_{H2} = c_{H1}$). For low values of fixed setup cost f we observe greenfield investment with both domestic firms in the market while, for larger values of f , acquiring $H2$ is more profitable. The diagonal locus compares the MNE's profits under greenfield investment with both domestic firms in the market to those under an acquisition of $H2$. Below this threshold the MNE shares the profits with two other firms in the market and has to cover the fixed setup cost, whereas above it, it has to pay the takeover price to acquire $H2$, but then only shares the market with $H1$. Greenfield investment is profitable up to higher values of fixed setup cost when it induces the domestic firms to merge (to the right of $c_{H2}^{D_merger}$). In fact, when comparing the MNE's profits under an acquisition of $H2$ to those under greenfield investment with only one efficient domestic firm in the market along the curved locus f is exactly equal to the takeover price for $H2$.

We now turn to investigate the situation with R&D investment. Figure 3 depicts the equilibrium market structure for the same parameters as in Figure 2 but now $\gamma = 3$ rather than infinity. First note

Figure 3: Equilibrium market structure with investment



parameters: $a = 4$, $c_M = 1$, $c_{H1} = 1.2$, $\gamma = 3$

that the field of action contracts, that is $c_{H2}^{D_exit}$ is lower than above. The same observation is also true for all other thresholds; the R&D stage introduces fiercer competition to the game. Given the way R&D investment is modelled, the multinational, as the most efficient firm, also benefits the most from investing to reduce its marginal cost. This distorts the market structure in favour of the MNE. For example $H2$ can be more efficient than above and the MNE will still be able to afford $H1$. In fact, greenfield investment in this case is no longer profitable up to the level of c_{H2} , where the less efficient domestic firm would choose to exit the market.

Summarising the insights of these figures one obtains the following: First, the threshold for the less efficient domestic firm to exit is lower under either form of foreign presence than in its absence. This reflects a finding by De Backer and Sleuwaegen (2003) who show that the inflow of FDI increases domestic exit rates in a sample of Belgian manufacturing firms.

Second, while it is often held that greenfield investment is more likely when the MNE has a technological advantage, this is not the case per se in this setting. A technological advantage alone is not sufficient. Greenfield investment here is an attractive choice for the MNE in two cases. One is when the domestic firms are both rather competitive relative to the MNE. The reason for this is that when all three firms have similar levels of marginal cost, their profits are close to those in an equilibrium with symmetric firms, and hence an acquisition of either of the domestic firms becomes

very expensive for the MNE.⁹ In the other case, that is when the domestic firms react by merging, greenfield entry is attractive because the reduction in competition is without cost for the MNE; it only has to incur the cost of setting up a plant.

The third result concerns the MNE's choice of takeover target. In principle, the MNE would always like to acquire the more efficient domestic firm $H1$ in order to eliminate the stronger competitor. However, as long as the MNE's and the domestic firms' marginal costs are not too different, it will only be able to afford the weaker domestic firm $H2$.¹⁰ Empirically, at least the first observation is in line with Harris and Robinson (2002), who using a sample of UK manufacturing plants, demonstrate that foreign acquirers have higher productivity levels (as measured by total factor productivity) and that they buy the most productive domestic plants.

Finally, with R&D in the model, the pressure on the domestic firms is stronger. It permits the MNE, as the most efficient firm, to achieve a position in the market where it faces relatively little competition over a wider range of parameter values than in the situation without R&D.

5 R&D Investment and Welfare

Having analysed the impact of R&D on the equilibrium market structure, we now turn to comparing investment levels and welfare in a situation with the MNE in the market to the benchmark situation with domestic firms only.

5.1 R&D Investment

Table 2 provides the R&D levels associated with the different market structures for each firm individually and at the industry level. The right column of Table 2 compares the investment under the benchmark situation with domestic firms only to that under the different market structures. One can see that the presence of a more efficient foreign firm in the market results in a higher total level of investment targeted at the domestic market for all market structures other than the monopoly case. Not surprisingly, a monopolist has little incentive to invest.

Note, however, that entry of the more efficient multinational firm in most cases leads to the extinction of at least one of the domestic firms. As firms' investment levels are decreasing in own marginal

⁹Applying a differentiated products interpretation to a Hotelling model, Eicher and Kang (2004) obtain a different result. They show that high degrees of competition (i.e. little product differentiation) reduce the likelihood that the MNE coexists with the local firm, as entry by the more efficient MNE drives the domestic firm out of the market.

¹⁰These results have to be compared to recent models of cross-border mergers and acquisitions in a general equilibrium context. In Neary (2004) trade liberalisation may lead to cross-border merger waves with low-cost home (foreign) firms buying up high-cost foreign (home) firms.

In Nocke and Yeaple (2004) cross-border M&A involve either the most or the least efficient active firms depending on whether firms differ in their mobile or non-mobile capabilities. In an industry where firms differ in mobile factors (i.e. technology), the most efficient firms engage in cross-border M&A, less efficient firms engage in greenfield FDI, while the least efficient active firms export. In an industry where firms differ in immobile capabilities the ranking of choices for the most efficient to least efficient firms is greenfield FDI, exports, cross-border M&A.

Table 2: Investment levels

Investment	Comparison to Benchmark*
Domestic Firms only (Benchmark)	
[\emptyset , H1, H2]	
H1	$2 \frac{3\gamma(a-2c_{H1}+c_{H2})-2(a-c_{H1})}{(9\gamma-2)(3\gamma-2)}$ -
H2	$2 \frac{3\gamma(a+c_{H1}-2c_{H2})-2(a-c_{H2})}{(9\gamma-2)(3\gamma-2)}$ -
total	$2 \frac{2a-c_{H1}-c_{H2}}{9\gamma-2}$ -
Greenfield Investment	
[M, H1, H2]	
M	$\frac{4\gamma(a-3c_M+c_{H1}+c_{H2})-3(a-c_M)}{(16\gamma-3)(4\gamma-3)}$ -
H1	$\frac{4\gamma(a+c_M-3c_{H1}+c_{H2})-3(a-c_{H1})}{(16\gamma-3)(4\gamma-3)}$ $\frac{(60\gamma^2-85\gamma+30)a + (-324\gamma^2+288\gamma-48)c_M + \gamma^{-1}(16\gamma-3)(4\gamma-3)(9\gamma-2)(3\gamma-2)}{(204\gamma^2-131\gamma+12)c_{H1} + (60\gamma^2-72\gamma+6)c_{H2}} > 0$
H2	$\frac{4\gamma(a+c_M+c_{H1}-3c_{H2})-3(a-c_{H2})}{(16\gamma-3)(4\gamma-3)}$ $\frac{(60\gamma^2-85\gamma+30)a + (-324\gamma^2+288\gamma-48)c_M + \gamma^{-1}(16\gamma-3)(4\gamma-3)(9\gamma-2)(3\gamma-2)}{(16\gamma-3)(4\gamma-3)(9\gamma-2)(3\gamma-2)} + \frac{(60\gamma^2-72\gamma+6)c_{H1} + (204\gamma^2-131\gamma+12)c_{H2}}{(16\gamma-3)(4\gamma-3)(9\gamma-2)(3\gamma-2)} > 0$
total	$3 \frac{3a-c_M-c_{H1}-c_{H2}}{16\gamma-3}$ $-\frac{(17a-27c_M+5c_{H1}+5c_{H2})\gamma-6(a-c_M)}{(16\gamma-3)(9\gamma-2)} < 0$
[M, H1&H2] or [M, H1, \emptyset]	
M	$\frac{3\gamma(a-2c_M+c_{H1})-2(a-c_M)}{(9\gamma-2)(3\gamma-2)}$ -
H1(&H2)	$\frac{3\gamma(a+c_M-2c_{H1})-2(a-c_{H1})}{(9\gamma-2)(3\gamma-2)}$ $\frac{c_{H2}-c_M}{(9\gamma-2)(3\gamma-2)} > 0$
total	$2 \frac{2a-c_M-c_{H1}}{9\gamma-2}$ $c_M - c_{H2} < 0$
Acquisition of H2	
[M&H2, H1]	
M	$\frac{3\gamma(a-2c_M+c_{H1})-2(a-c_M)}{(9\gamma-2)(3\gamma-2)}$ -
H1	$\frac{3\gamma(a+c_M-2c_{H1})-2(a-c_{H1})}{(9\gamma-2)(3\gamma-2)}$ $\frac{c_{H2}-c_M}{(9\gamma-2)(3\gamma-2)} > 0$
H2	0 $2 \frac{3\gamma(a+c_{H1}-2c_{H2})-2(a-c_{H2})}{(9\gamma-2)(3\gamma-2)} > 0$
total	$2 \frac{2a-c_M-c_{H1}}{9\gamma-2}$ $c_M - c_{H2} < 0$
Acquisition of H1	
[M&H1, H2]	
M	$\frac{3\gamma(a-2c_M+c_{H2})-2(a-c_M)}{(9\gamma-2)(3\gamma-2)}$ -
H1	0 $2 \frac{3\gamma(a-2c_{H1}+c_{H2})-2(a-c_{H1})}{(9\gamma-2)(3\gamma-2)} > 0$
H2	$\frac{3\gamma(a+c_M-2c_{H2})-2(a-c_{H2})}{(9\gamma-2)(3\gamma-2)}$ $\frac{c_{H1}-c_M}{(9\gamma-2)(3\gamma-2)} > 0$
total	$2 \frac{2a-c_M-c_{H2}}{9\gamma-2}$ $c_M - c_{H1} < 0$
[M&H1, \emptyset]	
M	$\frac{a-c_M}{4\gamma-1}$ -
H1, H2	0 $2 \frac{2a-c_{H1}-c_{H2}}{9\gamma-2} > 0$
total	$\frac{a-c_M}{4\gamma-1}$ $\frac{\gamma(7a+9c_M-8c_{H1}-8c_{H2})-2(a+c_M-c_{H1}-c_{H2})}{(4\gamma-1)(9\gamma-2)} > 0$

* $x_i^{\emptyset, H1, H2} - x_i^{\text{[market structure]}}$, where $i = H1, H2, \text{total}$

cost and increasing in their competitors' marginal cost, a more efficient firm in the market reduces their R&D spending. This can also be seen from Table 2, where we see that R&D investment of the domestic firms is higher in the benchmark case than under any of the market structures where the MNE is in the market. Hence, investment by the MNE crowds out R&D investment by the domestic firm(s).

These results are in line with empirical findings by various authors: Lipsey (2002) in a survey of home country effects of FDI concludes that overall productivity is improved by the presence of foreign-owned operations. Concerning the innovative efforts of domestic firms, Veugelers and Vanden Houte (1990) find them to be reduced by foreign presence in a sample of Belgian manufacturing firms, - especially when products are not so differentiated as is the case here. For small Venezuelan enterprises, Aitken and Harrison (1999) show that foreign equity participation is positively correlated with plant productivity, whereas foreign investment negatively affects the productivity of domestically owned firms. Finally, Driffield (2001), in a sample of UK manufacturing firms, estimates inward investment to stimulate productivity growth in the domestic sector by around 0.75% per annum. He argues that this is a result of the productivity advantage exhibited by foreign firms and that it cannot be attributed to investment or output spillovers. Moreover, he finds that foreign R&D appears to crowd out domestic R&D with a negligible effect on domestic productivity.

5.2 Welfare

The welfare levels associated with the different market structure outcomes are given in Table 3. Comparing the situation with two domestic firms only to any situation with foreign presence, welfare in the host country is higher without the MNE in the market (see Appendix A.3). While there are efficiency gains due to foreign entry that result in higher consumer surplus, the MNE is able to fully convert its superior efficiency into profits and extract them to the detriment of the host country under any possible market structure outcome.

This result should not be used to demonise any form of foreign direct investment, rather it can be considered as a lower bound to host country welfare. Very often, host countries are able to benefit substantially from the presence of multinationals. Most easily this will be the case if the MNE does not fully repatriate its profits, but reinvests some of the earnings in the host country. Host countries may further benefit from MNEs under their jurisdiction through taxation, training of local workers, technology spillovers, and creation of employment.

From Table 3 it is also straightforward to see that the host country would not necessarily make itself better off by banning foreign entry by acquisition: welfare under an acquisition of $H2$ [$M\&H2,H1$] is higher than welfare under greenfield entry with the domestic firms merging [$M,H1\&H2$].¹¹

¹¹Mukherjee (2004) obtains a similar result in a setting with one local incumbent only.

Table 3: Welfare in the host country

	Producer Surplus	Consumer Surplus	Acquisition Price
$[\emptyset, H1, H2]$	$9\gamma^2 \frac{(2a-c_{H1}-c_{H2})^2}{2(9\gamma-2)^2}$	$\gamma(9\gamma-4) \left(\frac{3\gamma(a-2c_{H1}+c_{H2})-2(a-c_{H1})}{(9\gamma-2)(3\gamma-2)} \right)^2$ $+ \gamma(9\gamma-4) \left(\frac{3\gamma(a+c_{H1}-2c_{H2})-2(a-c_{H2})}{(9\gamma-2)(3\gamma-2)} \right)^2$	
$[M, H1, H2]$	$8\gamma^2 \frac{(3a-c_M-c_{H1}-c_{H2})^2}{(16\gamma-3)^2}$	$\gamma(16\gamma-9) \left(\frac{4\gamma(a+c_M-3c_{H1}+c_{H2})-2(a-c_{H1})}{(9\gamma-2)(3\gamma-2)} \right)^2$ $+ \gamma(16\gamma-9) \left(\frac{4\gamma(a+c_M+c_{H1}-3c_{H2})-2(a-c_{H2})}{(9\gamma-2)(3\gamma-2)} \right)^2$	
$[M, H1 \& H2]$	$9\gamma^2 \frac{(2a-c_M-c_{H1})^2}{2(9\gamma-2)^2}$	$\gamma(9\gamma-4) \left(\frac{3\gamma(a+c_M-2c_{H1})-2(a-c_{H1})}{(9\gamma-2)(3\gamma-2)} \right)^2$	
$[M, H1, \emptyset]$			
$[M \& H2, H1]$	$9\gamma^2 \frac{(2a-c_M-c_{H1})^2}{2(9\gamma-2)^2}$	$\gamma(9\gamma-4) \left(\frac{3\gamma(a+c_M-2c_{H1})-2(a-c_{H1})}{(9\gamma-2)(3\gamma-2)} \right)^2$	$\gamma(9\gamma-4) \left(\frac{3\gamma(a+c_M-2c_{H2})-2(a-c_{H2})}{(9\gamma-2)(3\gamma-2)} \right)^2$
$[M \& H1, H2]$	$9\gamma^2 \frac{(2a-c_M-c_{H2})^2}{2(9\gamma-2)^2}$	$\gamma(9\gamma-4) \left(\frac{3\gamma(a+c_M-2c_{H2})-2(a-c_{H2})}{(9\gamma-2)(3\gamma-2)} \right)^2$	$\gamma(9\gamma-4) \left(\frac{3\gamma(a+c_M-2c_{H1})-2(a-c_{H1})}{(9\gamma-2)(3\gamma-2)} \right)^2$
$[M \& H1, \emptyset]$	$2\gamma^2 \frac{(a-c_M)^2}{(4\gamma-1)^2}$		$\gamma(9\gamma-4) \left(\frac{3\gamma(a+c_M-2c_{H1})-2(a-c_{H1})}{(9\gamma-2)(3\gamma-2)} \right)^2$

6 Concluding Remarks

This chapter analyses the impact of entry mode and presence of a foreign firm on the firms in a host country. While the prevailing literature is concentrated on technology or productivity spillovers, we focus on the effects stemming from foreign competition. In particular, we examine changes in market structure when the domestic firms do not stay idle after foreign entry. We also investigate how the interaction between a multinational entrant and the domestic firms affects R&D investments and welfare.

While much of the increase in concentration ratios in industries where horizontal FDI is prevalent can certainly be ascribed to the surge in cross-border mergers and acquisitions over the last decade or more, this chapter offers a complementary explanation. We argue that this can also be due to domestic firms merging or exiting the market as a reaction to foreign entry. Moreover, with the chosen setup it is possible to demonstrate that foreign entry may in fact make it desirable and feasible for domestic incumbents to merge. In turn, anticipating this kind of anti-competitive reaction a multinational considering to enter the market may prefer to set up its own plant (greenfield investment) to an acquisition of a local firm. When this sort of strategic interaction is combined with cost-reducing R&D investments by all active firms, a technological advantage of the MNE translates into higher R&D investment at the industry level. However, this comes at the cost of crowding out R&D investment by the domestic firm(s).

Regarding welfare, the model allows us to derive a lower bound to host country welfare after foreign entry. Entry of a more efficient foreign firm enhances consumer surplus. However, even if both domestic firms are present in the market after multinational entry, their profits are greatly reduced. This is due to the focus on competition which does not account for the possibilities of host countries to extract rents from multinational firms. A possible extension of the model is to compare the welfare outcomes of different policies towards MNEs and domestic firms in detail.

These results provide an intuitive explanation for a recurrent finding in the empirical literature on spillover effects, namely that foreign presence has a negative impact on the productivity of domestic firms. As suggested by Sembenelli and Siotis (2005) these pro-competitive effects are likely to be short-run phenomena, while technology spillovers and efficiency gains through multinationals take longer to materialise. Along somewhat different lines, Markusen and Venables (1999) emphasise the potential of backward and forward linkages created by multinationals to offset the possibility of foreign firms substituting for domestic production.

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A Appendix

A.1 Takeover Profitability and Related Thresholds

A.1.1 Profitability of a takeover of $H1$:

Solving $\Pi_M^{M\&H1,H2} - v_1 \geq 0$ yields $c_{H2} \leq \frac{-3\gamma(2a-c_M-2c_{H1})+2(2a-c_M-c_{H1})}{3\gamma}$ and $c_{H2} \geq \frac{3\gamma(3c_M-2c_{H1})-2(c_M-c_{H1})}{3\gamma}$. Both of these potential thresholds are dominated by the assumed structure of marginal cost $c_{H2} \geq c_{H1} \geq c_M$, as

$$c_{H2} \leq \frac{-3\gamma(2a-c_M-2c_{H1})+2(2a-c_M-c_{H1})}{3\gamma} - c_{H1} = -\frac{9\gamma-2}{3\gamma} (c_{H1} - c_M) < 0$$

and

$$c_{H2} \geq \frac{3\gamma(3c_M-2c_{H1})-2(c_M-c_{H1})}{3\gamma} - c_{H1} = -\frac{3\gamma-2}{3\gamma} (2a - c_M - c_{H1}) < 0$$

A.1.2 Acquiring $H1$ when it is optimal for $H2$ not to supply the market versus incorporating $H2$ for free

To compare the profits of the MNE when it becomes a monopolist after the acquisition of $H1$ as $H2$ exits to incorporating $H2$ for free, we can write

$$\begin{aligned} & \Pi_M^{M\&H1,\emptyset} - v_1 - \left(\Pi_M^{M\&H2,H1} - 0 \right) \\ &= \frac{(a-c_M)^2}{4\gamma-1} - \gamma(9\gamma-4) \left[\left(\frac{3\gamma(a+c_M-2c_{H1})-2(a-c_{H1})}{(9\gamma-2)(3\gamma-2)} \right)^2 + \left(\frac{3\gamma(a-2c_M+c_{H1})-2(a+c_M)}{(9\gamma-2)(3\gamma-2)} \right)^2 \right]. \end{aligned} \quad (8)$$

Taking the derivative w.r.t. c_{H1}

$$\begin{aligned} & \frac{\partial}{\partial c_{H1}} \left(\Pi_M^{M\&H1,\emptyset} - v_1 - \left(\Pi_M^{M\&H2,H1} - 0 \right) \right) \\ &= \frac{\gamma(a(162\gamma^3-288\gamma^2+168\gamma-32)+c_M(648\gamma^3-504\gamma^2+96\gamma)+c_{H2}(-810\gamma^3+792\gamma^2-264\gamma+32))}{729\gamma^4-1296\gamma^3+792\gamma^2-192\gamma+16} < 0. \end{aligned}$$

The coefficients on a and c_{H2} sum to the negative of the coefficient on c_{H1} , hence this expression is decreasing in c_{H1} . When c_{H1} approaches its upper bound a^{12} , we have:

$$\Pi_M^{M\&H1,\emptyset} - v_1 - \left(\Pi_M^{M\&H2,H1} - v_2^{\min} \right) = \frac{891\gamma^3 - 693\gamma^2 + 132\gamma - 4}{(9\gamma - 2)^2 (3\gamma - 2)^2 (4\gamma - 1)} \gamma^2 (a - c_M)^2 > 0.$$

Therefore, it is never profitable for the MNE to incorporate $H2$ for free, when it can become a monopolist by acquiring $H1$.

¹²Note that 8 does not depend on c_{H2} .

A.1.3 Profitability of a costly takeover of $H2$

Solving $\Pi_M^{M\&H2,H1} - v_2 \geq 0$, where $v_2 = \gamma(9\gamma - 4) \left(\frac{3\gamma(a+c_M-2c_{H2})-2(a-c_{H2})}{(9\gamma-2)(3\gamma-2)} \right)^2$ yields

$$\frac{3\gamma(3c_M - 2c_{H1}) - 2c_{H1}}{2(3\gamma - 1)} \leq c_{H2} \leq \frac{3\gamma(2a - c_M + c_{H1}) - 2(2a - c_1)}{2(3\gamma - 1)}.$$

The lower bound is less stringent than the assumed structure of marginal cost $c_{H2} \geq c_{H1} \geq c_M$:

$$\frac{3\gamma(3c_M - 2c_{H1}) - 2c_{H1}}{2(3\gamma - 1)} - c_{H1} = -\frac{9\gamma - 2}{2(3\gamma - 1)}(c_{H1} - c_M) < 0.$$

Therefore, acquiring $H2$ will be profitable for any value of c_{H2} between $c_{H2} \geq c_{H1} \geq c_M$ and $c_{H2} \leq \frac{3\gamma(2a-c_M+c_{H1})-2(2a-c_M)}{2(3\gamma-1)}$.

Note that this upper bound is larger than the threshold for a takeover of $H1$ to be more profitable than a takeover of $H2$ ($c_{H2}^{A_{H1vsH2}}$):

$$\begin{aligned} & \frac{3\gamma(2a-c_M+c_{H1})-2(2a-c_M)}{2(3\gamma-1)} - \frac{9\gamma^2(2a+8c_M-5c_{H1})-24\gamma(a+c_M-c_{H1})+4a(2a-c_{H1})}{45\gamma^2-24\gamma+4} \\ &= \frac{9\gamma-2}{2(3\gamma-1)(45\gamma^2-24\gamma+4)} \left[(18\gamma^2 - 12\gamma) a - (36\gamma^2 - 36\gamma + 4) c_M + (45\gamma^2 - 24\gamma + 4) c_{H1} \right]. \end{aligned}$$

The coefficients on a and c_{H2} add up to the coefficient to c_M . Hence, given that we have assumed $a > c_{H2} \geq c_M$ this term is always larger than zero.

A.1.4 A takeover of $H2$ will never induce $H1$ to leave the market

The threshold for $H1$ to exit the market when $H2$ is taken over is $c_{H1}^{A_{exit}} > \frac{3\gamma(a+c_M)-2a}{2(3\gamma-1)}$. Solving solving equation (6) for c_{H1} instead of c_{H2} yields

$$c_{H1}^{A_{H1vsH2}} = \frac{9\gamma^2(2a + 8c_M - 5c_{H2}) - 24\gamma(a + c_M + c_{H2}) - 4(2a - c_{H2})}{(3\gamma - 1)(45\gamma^2 - 24\gamma + 4)}.$$

Comparing the two

$$\begin{aligned} & c_{H1}^{A_{exit}} - c_{H1}^{A_{H1vsH2}} \\ &= \frac{(27\gamma^3+18\gamma^2-36\gamma+8)a - (279\gamma^3+216\gamma^2+36\gamma)c_M + (270\gamma^3-234\gamma^2+72\gamma-8)c_{H2}}{2(3\gamma-1)(45\gamma^2-24\gamma+4)} > 0. \end{aligned}$$

Under given assumptions this term is always larger than zero, as the coefficients on a and c_{H2} add up to the coefficient on c_M . $H1$ will, therefore, always be in the market when the MNE acquires $H2$.

A.1.5 Threshold for a merger among the domestic firms in the case of greenfield investment by the MNE

$$c_{H2}^{D_merger} = \frac{32\gamma^2(a+c_M+3c_{H1})-12\gamma(3a+c_M+2c_{H1})+9a}{160\gamma^2-72\gamma+9} + \frac{(16\gamma-3)}{(16\gamma-9)(9\gamma-2)(3\gamma-2)(160\gamma^2-72\gamma+9)} \sqrt{\gamma(16\gamma-9)} z,$$

where

$$\begin{aligned} z = & 20736\gamma^6 (a + c_M - 2c_{H1})^2 - 144\gamma^5 (391a + 415c_M - 806c_{H1}) (a + c_M - 2c_{H1}) \\ & + 24\gamma^4 (a (2195a + 5171c_M - 9561c_{H1}) + 2442c_M^2 - 10055c_Mc_{H1} + 9808c_{H1}^2) \\ & - \gamma^3 (17a (839a + 3840c_M - 5518c_{H1}) + 26016c_M^2 - 117312c_Mc_{H1} + 105559c_{H1}^2) \\ & - \gamma^2 (a (6511a - 19330c_M + 6308c_{H1}) - 5921c_M^2 - 31172c_Mc_{H1} + 18740c_{H1}^2) \\ & + 12\gamma (11a (34a - 29c_M - 39c_{H1}) - 51c_M^2 + 421c_Mc_{H1} + 4c_{H1}^2) \\ & - 36 (a - c_{H1}) (19a - 12c_M - 7c_{H1}) \end{aligned} \quad (9)$$

A.2 Derivatives of Net Acquisition Profits

$$\begin{aligned} \frac{\partial}{\partial c_{H2}} \left[\Pi_M^{M\&H1,H2} \right] &= 6\gamma^2 (9\gamma - 4) \frac{(3\gamma-2)(a-c_M)+3\gamma(c_{H2}-c_M)}{(9\gamma-2)^2(3\gamma-2)^2} > 0 \\ \frac{\partial}{\partial c_{H2}} \left[v_2 = \Pi_{H2}^{M\&H2,H1} \right] &= 4\gamma (9\gamma - 4) (3\gamma - 1) \frac{3\gamma(a+c_M-2c_{H2})-2(a-c_{H2})}{(9\gamma-2)^2(3\gamma-2)^2} \\ &\geq 0 \text{ for } c_{H2} \geq c_{H2}^{A_exit} = \frac{3\gamma(a+c_M)-2a}{2(3\gamma-1)} \\ &< 0 \text{ for } c_{H2} < c_{H2}^{A_exit} = \frac{3\gamma(a+c_M)-2a}{2(3\gamma-1)} \end{aligned}$$

$$\frac{\partial}{\partial c_{H2}} \left[\Pi_M^{M\&H1,H2} \right] - \frac{\partial}{\partial c_{H2}} [v_2] = 2\gamma \frac{9\gamma - 4}{27\gamma^2 - 24\gamma + 4} (a - c_{H2}) > 0$$

A.3 Welfare

Having a close look at Table 3 allows us to rank unambiguously two market structures according to the associated welfare levels for all parameters right away:

$$\begin{aligned} W^{M\&H2,H1} &> W^{M,H1\&H2} \\ W^{M\&H2,H1} &\geq W^{M\&H1,H2} \end{aligned}$$

Welfare when the MNE buys $H2$ is larger than when it engages in greenfield investment with one domestic firm in the market and it is also larger than welfare under an acquisition of $H1$ when $H2$ remains in the market.

We use the dominated welfare level of greenfield investment with one domestic firm and compare it to the monopoly outcome. It is sufficient to base the comparison on consumer surplus as producer

surplus in the case of $W^{M,H1\&H2}$ cancels with the acquisition price under $W^{M\&H1,\emptyset}$:

$$\begin{aligned} & CS^{M,H1\&H2} - CS^{M\&H1,\emptyset} \\ &= 9\gamma^2 \frac{(2a-c_M-c_{H1})^2}{2(9\gamma-2)^2} - 2\gamma^2 \frac{(a-c_{H1})^2}{(4\gamma-1)^2} \\ &= \frac{(6\gamma(7a-5c_M-2c_{H1})-10a+7c_M+3c_{H1})(6\gamma(a+c_M-2c_{H1})-2a-c_M+3c_{H1})}{2(9\gamma-2)^2(4\gamma-1)^2}. \end{aligned}$$

This expression is equal to or larger than zero for $c_{H1} \leq \frac{2a(3\gamma-1)+c_M(6\gamma-1)}{4\gamma-1}$. By definition the largest value c_{H1} can take is c_{H2} . If both domestic firms have identical marginal cost, the exit threshold in a situation with domestic firms only applies to both firms equally and becomes $c_{H2}^{D_exit} = c_{H1}^{D_exit} = a$. The condition on c_{H1} ($= c_{H2}$) derived above is larger than a :

$$\begin{aligned} & \frac{2a(3\gamma-1)+c_M(6\gamma-1)}{4\gamma-1} - c_{H1}^{D_exit} \\ &= \frac{2a(3\gamma-1)+c_M(6\gamma-1)}{4\gamma-1} - a = \frac{a(2\gamma-1)+c_M(6\gamma-1)}{4\gamma-1} > 0. \end{aligned}$$

Hence, welfare under greenfield investment with one domestic firm in the market is larger than under the monopoly outcome over the whole range of parameter values.

It remains to establish that welfare in a purely domestic setting is larger than the two undominated results with foreign presence, namely $W^{M,H1,H2}$ and $W^{M\&H2,H1}$. The comparison between $W^{\emptyset,H1,H2}$ and $W^{M,H1,H2}$ can be simplified.¹³ It is sufficient to consider a situation with symmetric firms and without investment. Welfare in a situation without foreign presence is given by

$$\begin{aligned} W^{[\emptyset,H1,H2]} &= CS + PS \\ &= \frac{2}{9}(a-c)^2 + \frac{1}{9}(a-c)^2 + \frac{1}{9}(a-c)^2 = \frac{4}{9}(a-c)^2. \end{aligned}$$

Welfare under greenfield with the two domestic firms in the market is given by

$$\begin{aligned} W^{[M,H1,H2]} &= CS + PS \\ &= \frac{9}{32}(a-c)^2 + \frac{1}{16}(a-c)^2 + \frac{1}{16}(a-c)^2 = \frac{13}{32}(a-c)^2. \end{aligned}$$

As $\frac{4}{9} > \frac{13}{32}$ we have shown that $W^{\emptyset,H1,H2} > W^{M,H1,H2}$.

The crucial parameter for the comparison between $W^{\emptyset,H1,H2}$ and $W^{M\&H2,H1}$ is c_{H1} . When c_{H1} is largest (c_M) welfare will be highest under both scenarios, whereas the opposite is true at its minimum c_{H2} . Hence, we need to show that $W^{\emptyset,H1,H2} - W^{M\&H2,H1} \geq 0$ within these boundaries.

¹³Note that the sum of total sales in a market (and, therefore, also profits) with n asymmetric firms ordered according to marginal cost $c_1 \leq \dots \leq c_i \leq \dots \leq c_n$ will never be larger than the sum of total sales in a market with n symmetric firms with marginal cost c_1 : $\sum_{i=1}^n q_i = \frac{na - \sum_{i=1}^n c_i}{n+1} \leq \sum_{i=1}^n q_i = \frac{na - nc_1}{n+1}$.

At $c_{H1} = c_M$

$$\begin{aligned} & W^{\emptyset, H1, H2} - W^{M\&H2, H1} \\ &= \frac{3\gamma^2(c_{H2}-c_M)(81\gamma^2(c_{H2}-c_M)+12\gamma(2a+3c_M-5c_{H2})-4(4a-c_M-3c_{H2}))}{2(9\gamma-2)^2(3\gamma-2)^2}. \end{aligned}$$

This expression is nonnegative for $c_{H2} \geq c_M$. At $c_{H1} = c_{H2}$

$$\begin{aligned} & W^{\emptyset, H1, H2} - W^{M\&H2, H1} \\ &= \frac{3\gamma^2(c_{H2}-c_M)(3\gamma(4a+5c_M-9c_{H2})-2(4a-3c_M+7c_{H2}))}{2(3\gamma-2)^2(9\gamma-2)}. \end{aligned}$$

This expression is nonnegative between $c_M \leq c_{H2} \leq \frac{3\gamma(4a+5c_M)-2(4a+3c_M)}{27\gamma-14}$. This upper bound is smaller than the upper bound for a takeover of $H2$ ($c_{H2}^{A, H1vsH2}$) solved at $c_{H1} = c_{H2}$:

$$\begin{aligned} & \frac{3\gamma(4a+5c_M)-2(4a+3c_M)}{27\gamma-14} - c_{H2}^{A, H1vsH2} \Big|_{c_{H1}=c_{H2}} \\ &= \frac{3\gamma(4a+5c_M)-2(4a+3c_M)}{27\gamma-14} - \frac{9\gamma^2(a+4c_M)-12\gamma(a+c_M)+4a}{45\gamma^2-24\gamma+4} \\ &= 3(a-c_M) \frac{(33\gamma^2-4)(3\gamma-2)}{(45\gamma^2-24\gamma+4)(27\gamma-14)} > 0. \end{aligned}$$

Therefore, welfare in a situation with two domestic firms in the market is larger than welfare in a situation where the MNE buys $H2$ and shares the market with $H1$ within the range of parameter values where a takeover of $H2$ is profitable for the MNE.

With the above rankings for welfare levels we have also established that welfare will always be highest without foreign presence.