Market Entry By Two Multinational Firms

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Preliminary Draft (*Please do not quote*)

Abstract

This paper presents a general analysis of two multinational firms’ sequential selection of entry modes to a foreign market. It explicitly shows the influence of a multinational firm’s decision on a rival multinational firm’s mode of entry and explores possible impacts of market potential, technological capability, trade costs and market entry costs on multinational firms’ optimal entry modes. The main finding of this study is that economic integration in the form of reduced trade costs influences a multinational firm’s incentive to acquire a local firm in a non-monotonic way. Our results also suggest that if fixed market entry costs are neither sufficiently large nor sufficiently small, a reduction in trade costs will not lead to acquisitions unless there is some technological asymmetry among firms.

Keywords: Multinational Firms; Sequential Market Entry; Foreign Direct Investment; Acquisition

JEL Classification: D21; F23; L13

1 Introduction

This paper presents a general analysis of two multinational firms’ sequential selection of entry modes to a foreign market. We allow the firms intending to enter a pre-determined, single host country to select their entry modes from three options. The first option is to produce at home and ship the goods to the host country, which we refer to as international trade. If a firm has decided not to trade, but to produce in the host country, it has the option to set up its own subsidiary in the host country, which we refer to as a greenfield investment. Alternatively, a firm may acquire a local firm in the host country, which we refer to as an acquisition. According to the traditional theory on the choice of mode of entry, a multinational firm prefers to produce at home and exports if locating a subsidiary in a host country is not as efficient. Similarly, a multinational firm may

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1See Hennart and Park (1993). Alternatively, see Neary (2008) for a comprehensive treatment of the relationship between trade and greenfield investment. Neary (2008) reconciles theory which predicted that the horizontal FDI is discouraged when trade costs fall with the experience of the 1990s, that is, FDI grew much faster than trade in the 1990s even though that period experienced dramatic reductions in trade costs.
opt to acquire an already established local firm if entry by establishing its own subsidiary is more costly. Note that by acquiring a local firm, a multinational firm also acquires some knowledge of the local market, which is not the case for a greenfield investment. However, the acquisition of a local firm may require some additional costs such as product and process adaptation costs, which is studied by Görg (2000). He finds that a foreign entrant favours acquiring a local firm over making greenfield investment, in most cases, unless additional costs associated with the greenfield investment are very low relative to costs associated with the acquisition.

There are not many theoretical studies that discuss whether a multinational firm’s choice of an entry mode is a greenfield investment or an acquisition. Furthermore, relatively few studies include international trade as a third option and identify why multinational firms prefer a particular mode of entry. For instance, Müller (2007) examines possible impacts of investment costs, technology differences, market size, market structure and competition intensity on a multinational firm’s choice of entry mode in a model à la Hotelling in which firms compete by prices. According to his finding, a higher cost of greenfield investment makes an acquisition more attractive, whereas if the investment cost is too large, the acquisition becomes unattractive, and no entry is the optimal choice. However, he does not allow the multinational firm to trade. He shows that a multinational firm is better-off by greenfield investment if the technology difference is sufficiently large, or if the market is either very or not competitive, whereas if competition is moderate, he finds that an acquisition is the optimal entry mode. Eicher and Kang (2005) extend Müller (2007)’s study by allowing international trade, and so they are able to discuss the impact of trade costs on a multinational firm’s optimal entry mode. They show that the optimal entry mode is a function of fixed costs, trade costs and market size, provided that competition is sufficiently weak or product differentiation is strong. According to their finding, a multinational firm always acquires a local firm in a sufficiently large market when trade is free and transport costs are zero. If trade costs are low, a greenfield investment replaces trade for low fixed costs. Once fixed costs reach high levels, they show that a multinational firm chooses acquisition in a very large market, trade in a moderately large market, and no entry in a small market. Using data on US multinational firms’ entry modes across transition countries they find a high positive correlation between acquisition and market size, and between international trade and market size, whereas there is no correlation between greenfield investment and market size. Furthermore, Horn and Persson (2001) examine international versus national mergers by allowing more than one merger to take place at a time, and find that high trade costs may increase the profitability of national mergers relative to international mergers leading to reduced competition in the local market. In what follows, Norbäck and Persson (2004) find that domestic firms can actually prevent foreign firms from becoming strong local competitors, and so high greenfield investment costs and high trade costs do not necessarily induce foreign acquisitions. They also conclude that foreign firms would gain considerably in such situations. Similarly, by allowing local firms to react to a foreign entry by merging, or by exiting, Haller (2008) models the impact of an acquisition and a greenfield
investment on choices of domestic firms, and shows that a multinational firm may favour greenfield investment over acquiring a local firm if local firms are relatively competitive, or if local firms reduce competition by merging.

Most of the studies in the literature consider only one multinational firm and model its entry choice, and ignore possible impacts of a multinational firm’s choice on another multinational firm entering the same host country. Javorcik and Saggi (2003) analyse two multinational firms’ preferred entry modes when firms have different technological capabilities. They allow two different modes of entry: a greenfield investment and a joint venture. They also assume the host country has only one local firm lacking the ability to produce alone. According to their findings, the efficient multinational firm is less likely to choose a joint venture, and more likely to make greenfield investment relative to the inefficient multinational firm. They also test the empirical validity of their findings, and obtain statistically significant results supporting their conclusions. In a different context, Bjorvatn (2004) also examines two multinational firms’ choices of entry modes. He allows two multinational firms intending to enter the same host country to choose simultaneously their modes of entry from three different options: trade, greenfield investment or acquisition. He focuses on the relationship between economic integration and the profitability of acquisitions. He predicts that economic integration, in the form of reduced trade costs and/or reduced costs of greenfield investment, may trigger acquisitions. In a more recent study, Norbäck and Persson (2008) also allow for competition among many multinational firms entering the same host country. They explicitly address the question whether firms enter a foreign market via greenfield investment or via an acquisition of a local firm’s assets. They argue that there may be fierce bidding competition over acquiring a local firm’s assets if entry by acquisition provides a large market share. So, the acquirer’s ex post profit may be less than the profit of an entrant making greenfield investment.

Our study is closely related to Bjorvatn (2004)’s paper, although the structure of our model is different. We consider a sequential game among players, and we do not confine ourselves to particular parameter values, so we are able to provide a more comprehensive model of strategic decision-making with more than one multinational firm. The major contribution of this study is that there is more than one multinational firm entering the same host country. The implications of assuming more than one multinational firm sequentially entering the same host country is, to our knowledge, not well developed in this literature, where the most common approach is to assume a single multinational firm. Therefore, the main focus of the paper is to provide a comprehensive treatment of two multinational firms’ optimal choices of their entry modes so as to explicitly show the influence of a multinational firm’s choice of its entry mode on a rival multinational firm’s mode of entry. We also analyse the influence of exogenous parameters (e.g., market potential, the technological capability of firms, per unit trade cost, and the fixed cost of foreign market entry) on multinational firms’ optimal foreign market entry strategies. As we will discuss later, our main finding is that economic integration (e.g., a reduction in trade costs) affects a multinational firm’s

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2It is crucial to capture competition among multinational firms as it is widely accepted that multinational firms are quite responsive to each other’s choice of an entry mode (see Caves (1996)).
incentive to acquire a local firm in a non-monotonic way. A reduction in trade costs may or may not trigger acquisitions and this relies on the technology gap between a multinational firm and a local firm. If fixed costs of greenfield investment are neither sufficiently large nor sufficiently small, a reduction in trade costs will not lead a multinational firm to acquire a local firm unless multinational firms have some cost advantage over a local firm. Moreover, if the technology gap is substantial, a multinational firm will always want to acquire a local firm, irrespective of trade costs and/or fixed costs of market entry. Our results also suggest that the net gain of a multinational firm from acquiring a local firm is a function of market potential, technological capability of the local firm, trade costs and fixed greenfield costs. We can identify two main incentives leading a multinational firm to acquire a local firm: a market-structure effect and a cost-saving effect. The market-structure effect increases with the technological capability of the local firm, whereas the cost-saving effect decreases; that is, all else being equal, a multinational firm will gain more when it acquires a strong rival, whereas the cost of acquiring a strong rival will be high. Furthermore, we find a positive monotonic relationship between market potential and the market-structure effect, that is, the market-structure effect increases with the market potential. However, there is a negative monotonic relationship between market potential and the cost-saving effect, that is, the cost-saving effect decreases with the market potential. The cost-saving effect is negative if the first-moving multinational firm exports and no acquisition is possible. Finally, trade costs have a negative impact on the cost-saving effect if trade is the rival multinational firm’s optimal mode of entry and no acquisition is allowed.

The remainder of this paper is structured as follows: the model is introduced in Section 2. In section 3, we solve the model for the optimal entry modes and determine the potential equilibrium pairs of modes of entry. Section 4 presents the main results and investigates the equilibrium market structure by simulating the model with different parameter values. Finally, Section 5 concludes. For convenience, we have relegated the proofs and technical details to the Appendix.

2 The Model

In our model, we have two countries: a source country and a host country. The source country has two multinational firms (MNFs): MNF₁ and MNF₂. The host country has only one local firm: firm 1. All firms are assumed to have constant marginal cost of production. Denote by $c$ firm 1’s marginal cost of production where $c \in [0, 1]$. MNF₁ and MNF₂ are assumed to be ex ante symmetric in their marginal cost of production, which is normalised to zero (i.e., $c_m = 0$). All active firms in the host country produce a homogenous good. Consumer behavior in the host country can be expressed by the inverse demand function $P(Q) = (a - Q)$, where $Q = q_1 + q_{m1} + q_{m2}$. $Q$ is the aggregate supply, which comprises the MNFs’ outputs $q_{m1}$ and $q_{m2}$, and the local output $q_1$. There are three different ways to enter the host country: acquisition, greenfield investment or trade. We assume that all firms produce positive amounts, irrespective
of the MNFs’ modes of entry. The MNFs sequentially choose their modes of entry. We assume that the acquisition option is available only to the first-moving firm MNF₁, whereas greenfield investment and trade are available to both MNFs. The available options and the structure of the game are given in Figure 1.

Figure 1: The structure of the game

We model the acquisition similar to Salant et.al (1983) such that a foreign firm pays an acquisition price \( \Omega \) to the local firm and the local firm vanishes. We assume that there is no efficiency loss when MNF₁ acquires firm 1 such that MNF₁ is able to use its more efficient technology. Alternatively, an MNF may want to produce at home and ship the goods to the host country. The shipment of goods requires additional costs (e.g., transport costs and tariffs), which we refer to as trade costs. Denote by \( t \) the per unit trade cost, which is identical for both firms. Therefore, the marginal cost of any MNF opting for trade is represented by \( t \) (i.e., \( c_m + t = t \)). An MNF can save the per unit trade cost simply by making a greenfield investment. However, this investment requires a fixed cost of setting up a subsidiary in the host country. Denote by \( f \) the fixed cost of making a greenfield investment.

It is assumed that the main motivation for MNFs entering the host country is to serve local consumers, and so the model concentrates on the horizontal FDI. The interaction between firms takes place in four stages. In the first stage, MNF₁ makes an acquisition offer to the local firm. The MNF₁’s offer is a take-it-or-leave-it offer. If firm 1 accepts MNF₁’s offer, MNF₂ will choose its mode of entry between greenfield and trade, and the two MNFs will compete à la Cournot. If firm 1 rejects the offer, MNF₁ will choose its mode of entry between greenfield and trade in the second stage. In what follows, MNF₂ will choose its mode of entry in the next stage. And finally,

3. The assumption of all firms making positive profits, irrespective of a mode of entry, requires \( a > \max\{3c, 3t\} \) that we implicitly assume throughout this study.
4. We assume that there is no additional cost of acquiring a local firm. The acquisition price constitutes the sole cost of acquiring the local firm.
5. We assume that the technology transfer of an MNF from the source country to its subsidiary in the host country is costless.
6. In the literature on international trade, transport costs and tariffs are usually assumed specific to countries and/or industries, but not to firms.
all firms will compete à la Cournot. The game is solved backwards for the sub-game perfect Nash equilibrium.

3 The optimal modes of entry

3.1 Trade versus greenfield investment

An MNF’s choice of a mode of entry affects not only its own profit, but the rival MNF’s profit as well. There are basically two effects: a cost-saving effect and a market-structure effect. As we will discuss later, the cost-saving effect is determined by the relative cost of an entry mode, while the market-structure effect is related to the level of competition in the host market, which is determined by both MNFs’ optimal entry modes. Let $\pi_{m1}^{t(t)}$ and $\pi_{m2}^{t(t)}$ denote MNF1’s and MNF2’s profit, respectively, in the case that both MNFs choose trade as their modes of entry. $\pi_{m1}^{t(t)}$ and $\pi_{m2}^{t(t)}$ are given in equation (1) (see Appendix for details):

\[
\pi_{m1}^{t(t)} = \pi_{m2}^{t(t)} = \left( \frac{a + c - 2t}{4} \right)^2.
\]

Note that the superscript $t$ refers to trade and that the superscript in brackets represents the rival firm’s choice of an entry mode. In (1), both MNFs’ profits decrease with the per unit trade cost $t$. If only one MNF chooses trade, but the other MNF opts for greenfield investment, the profit of the MNF choosing trade decreases with $t$, whereas the profit of the MNF making greenfield investment increases with $t$. Let $\pi_{m1}^{t(g)}$ and $\pi_{m2}^{t(g)}$ denote MNF1’s and MNF2’s profit, respectively, in the case that MNF1 chooses trade and MNF2 chooses greenfield investment as the mode of entry. Note that the superscript $g$ refers to greenfield investment. Similarly, let $\pi_{m1}^{g(t)}$ and $\pi_{m2}^{g(t)}$ denote MNF1’s and MNF2’s profit, respectively, in the case that MNF1 chooses greenfield investment and MNF2 chooses trade as the mode of entry. Equation (2) and (3) gives $\left(\pi_{m1}^{t(g)}, \pi_{m2}^{t(g)}\right)$ and $\left(\pi_{m1}^{g(t)}, \pi_{m2}^{g(t)}\right)$, respectively (see Appendix for details):

\[
(2) \quad \pi_{m1}^{t(g)} = \pi_{m2}^{t(g)} = \left( \frac{a + c - 3t}{4} \right)^2,
\]

\[
(3) \quad \pi_{m1}^{g(t)} = \pi_{m2}^{g(t)} = \left( \frac{a + c + t}{4} \right)^2 - f.
\]

Alternatively, both MNFs may make a greenfield investment. In that case, let $\pi_{m1}^{g(g)}$ and $\pi_{m2}^{g(g)}$ denote MNF1’s and MNF2’s profit, respectively, which are given in equation (4) (see Appendix for details):

\[
(4) \quad \pi_{m1}^{g(g)} = \pi_{m2}^{g(g)} = \left( \frac{a + c}{4} \right)^2 - f.
\]
In the second stage of the game, MNF_1 has two options: trade versus greenfield investment. MNF_1 chooses greenfield investment, irrespective of its rival’s choice, if and only if \( \pi^{g(t)}_{m1} \geq \pi^{t(t)}_{m1} \) and \( \pi^{g(g)}_{m1} \geq \pi^{t(g)}_{m1} \). Following MNF_1’s choice, MNF_2 chooses its entry mode between greenfield investment and trade. MNF_2 also chooses greenfield investment, irrespective of MNF_1’s choice, if and only if \( \pi^{g(t)}_{m2} \geq \pi^{t(t)}_{m2} \) and \( \pi^{g(g)}_{m2} \geq \pi^{t(g)}_{m2} \). This leads us to Proposition 1.

**Proposition 1** If both MNFs have only the two options trade or greenfield investment, the greenfield investment is both firms’ dominant strategy if and only if \( f \leq f_l \) where \( f_l = \frac{3}{16} (2a - 2c - 3t) t \). The respective market structure is characterised by one local firm and two MNFs both entering the host country by making greenfield investment.

**Proof.** See Appendix. ■

For a given level of the market potential \( a \) and the fixed cost \( f \), the chance of observing both MNFs making greenfield investment increases with the per unit trade cost, that is, the higher the per unit trade cost, the higher the chance of observing both MNFs opting for greenfield investment.

Trade can also be both MNFs’ dominant strategy. If both MNF_1 and MNF_2 choose trade irrespective of its rival’s choice, that is, if \( \pi^{t(t)}_{m2} = \pi^{t(t)}_{m1} \geq \pi^{g(t)}_{m2} \) and \( \pi^{t(g)}_{m2} \geq \pi^{g(g)}_{m1} \), trade is the dominant strategy of both MNFs, which leads us to Proposition 2.

**Proposition 2** If both MNFs have only the two options trade or greenfield investment, trade is both firms’ dominant strategy if and only if \( f \geq f_u \) where \( f_u = \frac{3}{16} (2a + 2c - t) t \). The respective market structure is characterised by one local firm and two MNFs both exporting to the host country.

**Proof.** See Appendix. ■

Note that, for a given level of \( a \) and \( f \), the chance to observe both firms exporting is negatively related to the per unit trade cost as the profit of the exporting firm increases when the per unit trade cost decreases.

It is also possible to observe MNF_1 making a greenfield investment and MNF_2 exporting in equilibrium, which happens if \( \pi^{g(t)}_{m2} \geq \pi^{t(t)}_{m2} \), \( \pi^{g(g)}_{m2} \leq \pi^{t(g)}_{m2} \) and \( \pi^{g(t)}_{m1} \geq \pi^{t(g)}_{m1} \), and that leads us to Proposition 3.

**Proposition 3** If both MNFs have only the two options trade or greenfield investment, MNF_1 makes a greenfield investment and MNF_2 trades if and only if \( f_l \leq f \leq f_u \). The respective market structure is characterised by one local firm and two MNFs with two different types of entry.

**Proof.** See Appendix. ■

Propositions 1 – 3 describe the possible equilibrium pairs of modes of entry if firm 1 rejects MNF_1’s offer in the first stage of the game.
3.2 Acquisition

The first-moving MNF has the option to acquire the local firm in the first stage of the game. If MNF\(_1\) acquires firm 1, the market structure will change as there will be only two MNFs competing à la Cournot in the host country. Let \(\pi^{t(a)}_{m_2} \) and \(\pi^{g(a)}_{m_2} \) denote MNF\(_2\)'s profit when it trades and when it makes a greenfield investment, respectively, conditional on MNF\(_1\) having acquired the local firm. Equations (5) and (6) give \(\pi^{t(a)}_{m_2} \) and \(\pi^{g(a)}_{m_2} \), respectively (see Appendix for details):

\[
\begin{align*}
\pi^{t(a)}_{m_2} &= \left(\frac{a - 2t}{3}\right)^2, \\
\pi^{g(a)}_{m_2} &= \left(\frac{a}{3}\right)^2 - f.
\end{align*}
\]

MNF\(_2\) chooses greenfield investment if and only if \(\pi^{g(a)}_{m_2} \geq \pi^{t(a)}_{m_2}\). Otherwise, it opts for trade. This leads us to Proposition 4.

**Proposition 4** If MNF\(_1\) acquires firm 1, MNF\(_2\) makes a greenfield investment if and only if \(f \leq \tilde{f}\) where \(\tilde{f} = \frac{a}{3}(a - t)\). Otherwise, it exports.

**Proof.** See Appendix.

Now, consider the first stage of the game in which MNF\(_1\) offers an acquisition price to firm 1. Let \(\pi^{a(g)}_{m_1} \) and \(\pi^{a(t)}_{m_1} \) denote MNF\(_1\)'s profit when it acquires firm 1 and when its rival makes a greenfield investment or goes for trade, respectively. \(\pi^{a(g)}_{m_1} \) and \(\pi^{a(t)}_{m_1} \) are given by equation (7) and (8), respectively (see Appendix for details):

\[
\begin{align*}
\pi^{a(g)}_{m_1} &= \left(\frac{a}{3}\right)^2 - \Omega, \\
\pi^{a(t)}_{m_1} &= \left(\frac{a + t}{3}\right)^2 - \Omega.
\end{align*}
\]

All else being equal, the operating profit given by (7) is less than the operating profit given by (8). This is because the market will be more competitive if MNF\(_2\) makes a greenfield investment compared to MNF\(_2\) exporting, provided that MNF\(_1\) acquires the local firm.

MNF\(_1\) offers an acquisition price at which firm 1 is indifferent between rejection and acceptance. Note that firm 1’s profit when it rejects the offer is determined by the MNFs’ alternative options. Let \(\pi^{g/g}_1, \pi^{g/t}_1, \) and \(\pi^{t/t}_1 \) denote firm 1’s profit when it rejects the acquisition offer, that is, \(\pi^{g/g}_1 \) when both MNFs make greenfield investments, \(\pi^{g/t}_1 \) when one MNF makes a greenfield investment and the other MNF exports, and \(\pi^{t/t}_1 \) when both MNFs export. \(\pi^{g/g}_1, \pi^{g/t}_1, \) and \(\pi^{t/t}_1 \) are given by equations (9), (10), and (11), respectively (see Appendix for details):

\[
\begin{align*}
\pi^{g/g}_1 &= \left(\frac{a - 3e}{4}\right)^2,
\end{align*}
\]
There is an indirect relationship between the fixed cost of greenfield investment $f$ and the cost of acquiring the local firm $\Omega$. If $f$ is relatively low such that $f \leq f_{\ell}$, there will be fierce competition in the host country if firm 1 rejects MNF$_1$'s offer as both MNFs will make a greenfield investment, which will lower the local firm’s profit, and so $\Omega$ will be relatively low (see equation (10)). Similarly, if $f$ is relatively large such that $f \geq f_{u}$, there will be less competition in the host country if firm 1 rejects MNF$_1$'s offer as both MNFs will export, which will make the local firm’s profit relatively large, provided that the per unit trade cost is positive, and so $\Omega$ will be relatively large (see equation (11)).

We use bold font to show that MNF$_1$ has to choose between acquisition and the alternative strategy which is either greenfield investment or trade. For a given level of $f$, MNF$_1$ will decide on its entry mode by considering the market potential $a$, the local firm’s marginal cost of production $c$, and the per unit trade cost $t$. Table 1 summarises all potential equilibrium pairs of the entry modes due to Proposition 1-4.

Table 1: Possible equilibrium pairs of the entry modes

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Equilibrium entry modes (MNF$_1$, MNF$_2$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(S.1)</td>
<td>$f \leq f_{\ell}$ : $f \leq \tilde{f}$ (acquisition, greenfield) or (greenfield, greenfield)</td>
</tr>
<tr>
<td>(S.2)</td>
<td>$f \leq f_{\ell}$ : $f \geq \tilde{f}$ (acquisition, trade) or (greenfield, greenfield)</td>
</tr>
<tr>
<td>(S.3)</td>
<td>$f_{\ell} \leq f \leq f_{u}$ : $f \leq \tilde{f}$ (acquisition, greenfield) or (greenfield, trade)</td>
</tr>
<tr>
<td>(S.4)</td>
<td>$f_{\ell} \leq f \leq f_{u}$ : $f \geq \tilde{f}$ (acquisition, trade) or (greenfield, trade)</td>
</tr>
<tr>
<td>(S.5)</td>
<td>$f \geq f_{u}$ : $f \leq \tilde{f}$ (acquisition, greenfield) or (trade, trade)</td>
</tr>
<tr>
<td>(S.6)</td>
<td>$f \geq f_{u}$ : $f \geq \tilde{f}$ (acquisition, trade) or (trade, trade)</td>
</tr>
</tbody>
</table>

Note that the ranking of the thresholds of $f$ is not clear and, depending on the parameters of the model $a, c$ and $t$, three different types of ranking may arise: $\tilde{f} \leq f_{\ell} \leq f_{u}$, $f_{\ell} \leq \tilde{f} \leq f_{u}$ or $f_{\ell} \leq f_{u} \leq \tilde{f}$. In what follows, there are six different possibilities that have to be distinguished. Each possibility corresponds to a different range of $f$ and is given in Table 1.

Each scenario in Table 1 counts two potential equilibrium pairs of modes of entry, and MNF$_1$’s choice of its own entry mode will determine the unique equilibrium pair of modes of entry. MNF$_1$ opts for acquisition in any scenario if and only if the net gain of MNF$_1$ from acquiring firm 1 is nonnegative in that scenario. Table 2 depicts the net gain for each scenario separately. If the net gain is zero, MNF$_1$ will become indifferent between acquisition and the alternative strategy. If the net gain is positive, it will acquire the local firm.
Net gain of MNF as MNF acquires the local firm, provided that the market potential is large, whereas a local firm’s reservation price will.

Note that, in each row of Table 2, the expression in the first set of square brackets represents the market-structure effect, that is, the net gain from reducing competition in the market. The expression in the second set of square brackets is the cost-saving effect, that is, the net gain (loss) from choosing a less (more) costly entry mode. The cost-saving effect will be positive in (S.1), (S.2), (S.3), and (S.4) if and only if the fixed cost of greenfield investment is larger than the acquisition price. Furthermore, there is no fixed cost to be saved in (S.5) and (S.6) as MNF₁’s alternative strategy is trade in these scenarios, and so the acquisition price should be smaller than the positive market-structure effect in order for the net gain of acquisition to be positive. Note that MNF₁ can still save the per unit trade cost in (S.5) and (S.6), and that the market-structure effect already encompasses it. The market-structure effect is positive in all scenarios except (S.3). The market-structure effect in (S.3) may take positive or negative values, and the sign depends on 𝑎, 𝑐 and 𝑡. For instance, the market-structure effect in (S.3) takes negative values for a sufficiently high per unit trade cost, because the market becomes more competitive when MNF₁ acquires the local firm as MNF₂ chooses greenfield investment, whereas it would have chosen trade if MNF₁ had made a greenfield investment.

4 The equilibrium market structures

4.1 Main Results

It is clear from Table 2 that the net gain of the first-moving MNF from acquiring the local firm is a function of 𝑎, 𝑐 and 𝑡. The market-structure effect decreases with 𝑐, but the cost-saving effect increases, across all scenarios. All else being equal, MNF₁ will gain more when it acquires a strong rival, whereas the cost of acquiring a strong rival will be high. We show that there is a threshold of 𝑐 which is a linear function of 𝑎 and 𝑡, and the net gain increases with 𝑐 up until that threshold, whereas it starts decreasing when 𝑐 increases further above the threshold (see Appendix for details). There is a positive monotonic relationship between 𝑎 and the market-structure effect, and a negative monotonic relationship between 𝑎 and the cost-saving effect. The market-structure effect increases with 𝑎, whereas the cost-saving effect decreases, across all scenarios. The reason is that, all else being equal, a multinational firm gains more from reducing competition by acquiring a local firm, provided that the market potential is large, whereas a local firm’s reservation price will.

Table 2: The net gain of MNF₁ from the acquisition of firm 1

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>Net gain of MNF₁</th>
</tr>
</thead>
<tbody>
<tr>
<td>(S.1) 𝑡_{m1}^{(g)} − t_{m1}^{(g)}</td>
<td>\left(\frac{a}{2}\right)^2 - \left(\frac{a+c}{t}\right)^2 + \frac{f}{t} - \left(\frac{a-3c}{4}\right)^2</td>
</tr>
<tr>
<td>(S.2) 𝑡_{m1}^{(t)} − t_{m1}^{(g)}</td>
<td>\left(\frac{a+t}{3}\right)^2 - \left(\frac{a+c}{t}\right)^2 + \frac{f}{t} - \left(\frac{a-3c}{4}\right)^2</td>
</tr>
<tr>
<td>(S.3) 𝑡_{m1}^{(g)} − t_{m1}^{(t)}</td>
<td>\left(\frac{a}{2}\right)^2 - \left(\frac{a+c+t}{4}\right)^2 + \frac{f}{t} - \left(\frac{a-3c+t}{4}\right)^2</td>
</tr>
<tr>
<td>(S.4) 𝑡_{m1}^{(t)} − t_{m1}^{(t)}</td>
<td>\left(\frac{a+t}{3}\right)^2 - \left(\frac{a+c+t}{4}\right)^2 + \frac{f}{t} - \left(\frac{a-3c+t}{4}\right)^2</td>
</tr>
<tr>
<td>(S.5) 𝑡_{m1}^{(g)} − t_{m1}^{(t)}</td>
<td>\left(\frac{a}{2}\right)^2 - \left(\frac{a+c-2t}{4}\right)^2 - \left(\frac{a-3c+2t}{4}\right)^2</td>
</tr>
<tr>
<td>(S.6) 𝑡_{m1}^{(t)} − t_{m1}^{(t)}</td>
<td>\left(\frac{a+t}{3}\right)^2 - \left(\frac{a+c-2t}{4}\right)^2 - \left(\frac{a-3c+2t}{4}\right)^2</td>
</tr>
</tbody>
</table>
also be high as it can make more profit in a large market. As we will discuss more when considering numerical illustrations, trade costs affect the net gain from acquisition in a non-monotonic way. It is because the market-structure effect is positively related to \( t \) in \((S.2)\), \((S.4)\), \((S.5)\) and \((S.6)\), but negatively related in \((S.3)\), whereas the cost-saving effect is negatively related to \( t \) in all scenarios, except \((S.1)\) and \((S.2)\) (see Appendix for details).

The technology gap between MNF\(_1\) and the local firm critically affects the MNF\(_1\)’s decision on whether or not to acquire the local firm. For instance, if the technology gap is sufficiently large such that \( c > \frac{1}{15} a \), MNF\(_1\) always prefers acquisition to greenfield investment, and the optimal response of MNF\(_2\) to its rival’s choice of acquisition will be determined by \( f^7 \). Similarly, if the per unit trade cost is bounded above such that \( t < 2c \), MNF\(_1\) also prefers acquisition to trade, provided that \( c > \frac{1}{15} a \). But if the per unit trade cost is bounded below and if the technology gap is not sufficiently large (i.e., \( t > 2c \) and \( c < \frac{1}{15} a \)), the best strategy for both MNFs is to operate at home and export. If the trade is MNF\(_2\)’s dominant strategy, MNF\(_1\) is still better off by acquiring the local firm, provided that \( c > \frac{1}{15} a \).

### 4.2 Numerical Illustrations

In this section, we simulate the general model using different parameter values for trade costs, fixed greenfield costs and the MNFs’ cost advantage. In each illustration below, the market potential is normalised to one (i.e., \( a = 1 \)), and so the per unit trade cost is bounded above such that \( t \in [0, \frac{1}{3}] \) for any \( c \in [0, \frac{1}{3}] \). Furthermore, in each figure, the vertical axis represents the fixed cost of greenfield investment, and the horizontal axis represents the per unit trade cost. The thick dashed line corresponds to \( f_u \). At any given fixed cost of greenfield investment which is to the left and above the thick dashed line, the MNFs prefer trade to greenfield investment as trade is less costly. Similarly, the thin dashed line corresponds to \( f_l \). At any given fixed cost which is to the right and below the thin dashed line, the MNFs prefer greenfield investment to trade as it is relatively cheap to set up a subsidiary in the host country. Note that if a given fixed cost of greenfield investment is in between these two lines, and if the local firm rejects the acquisition offer, it is optimal for the first-moving firm to make a greenfield investment, but it is not for MNF\(_2\). So, MNF\(_2\) will export. Finally, the straight line corresponds to \( f \). If a given fixed cost of greenfield investment is to the left and above this line, MNF\(_2\)’s optimal entry mode when MNF\(_1\) acquires firm 1 is to produce at home and export. Similarly, if the fixed cost is relatively low, that is, if it is to the right and below the straight line, it is more profitable for MNF\(_2\) to make a greenfield investment when its rival acquires the local firm.

---

7 This result applies to \((S.1)\), \((S.2)\), \((S.3)\) and \((S.4)\).
8 This result applies to \((S.5)\).
9 This result applies to \((S.6)\).
Illustration 1 \((a = 1, c = 0 \text{ and } t < \frac{1}{3})\)

We first analyse the case in which the MNFs have no peculiar cost advantage over the local firm such that the local firm and the MNFs use the same technology (i.e., \(c_n = c = 0\)). This case corresponds to Bjorvatn (2004)’s study. Note that there is no technology gap in this case, and so \(c < \frac{1}{15} a\) for all \(a > 0\). Figure 2 illustrates the MNFs’ optimal modes of entry which are represented by the capital letters \(A, G\) and \(T\) for acquisition, greenfield investment and trade, respectively. The equilibrium pairs of modes of entry are given in brackets where the first capital letter represents MNF\(_1\)’s equilibrium mode of entry and the second capital letter represents MNF\(_2\)’s equilibrium mode of entry.\\(^{10}\)

\(< \text{ Insert Figure 2 } >\)

According to Figure 2, trade is the optimal entry mode for both MNFs when the per unit trade cost is sufficiently low (i.e., \(t \leq \frac{1}{14}\)). However, if the fixed cost of greenfield investment is also sufficiently low, such as \(f \leq \frac{1}{17}\), it may be the case that both MNFs make a greenfield investment. When the per unit trade cost is higher, such that \(t > \frac{1}{14}\), acquisition is optimal for MNF\(_1\), provided that the fixed cost of greenfield investment is not too low (i.e., \(\frac{1}{17} < f \leq f_t\)). The reason is that if \(\frac{1}{17} < f \leq f_t\), there will be sufficient fixed greenfield costs to be saved increasing MNF\(_1\)’s incentive to acquire the local firm. There will also be fierce competition in the no-acquisition case, which lowers the acquisition price. So the positive market-structure effect will be larger than the negative cost-saving effect and the net gain will be positive leading MNF\(_1\) to acquire the local firm. Acquisition is also the optimal entry mode for high levels of fixed costs (i.e., \(f > \bar{f}\)), provided that \(t > \frac{1}{14}\). This is because if MNF\(_1\)’s alternative strategy is to export (i.e., \(f_u < \bar{f} < f\)), there will be less competition in the no-acquisition case that will raise the local firm’s reservation price. However, the market-structure effect will increase more with trade costs and the net gain from acquisition will be positive. Similarly, if MNF\(_1\)’s alternative strategy is to make a greenfield investment (i.e., \(\bar{f} < f < f_u\)), the local firm’s reservation price will be smaller and there will be large fixed greenfield costs to be saved, which also leads MNF\(_1\) to acquire the local firm.

For intermediate levels of fixed cost, such as \(f_t < f < f_u\), MNF\(_1\) makes a greenfield investment, whereas MNF\(_2\) exports in equilibrium, provided that \(f < \bar{f}\). Note that this result is different from Bjorvatn (2004)’s finding that MNF\(_1\) acquires the local firm and the other MNF makes a greenfield investment. This difference due to the sequential game we employ. We solve the game for the sub-game perfect Nash equilibrium, whereas he concentrates on the profitability of mergers in a simultaneous set-up. In his paper, Bjorvatn (2004) claims that MNF\(_1\) exports and MNF\(_2\) makes a greenfield investment in equilibrium if no acquisition is allowed. But that is not the unique pure-strategy Nash equilibrium in a simultaneous game. There is also another pure-strategy Nash equilibrium such that MNF\(_1\) makes a greenfield investment and MNF\(_2\) exports. If the former is the

\\(^{10}\)For example, \(AG – GG(AG)\) represents \((S.1)\) given in Table 1, and \((AG)\) is the unique equilibrium pair of modes of entry, that is, MNF\(_1\) acquires the local firm and MNF\(_2\) makes a greenfield investment in equilibrium.
case, MNF₁ acquires the local firm and the other MNF makes a greenfield investment in equilibrium when acquisition is allowed. But if the latter is the case, or if the MNFs sequentially select their entry modes, MNF₁ will not acquire the local firm, but will make a greenfield investment and MNF₂ will export in equilibrium. This leads us to the following proposition.

**Proposition 5** If the MNFs have no cost advantage over the local firm, economic integration in the form of reduced trade costs will lead the first-moving MNF to acquire the local firm only if fixed greenfield costs are sufficiently large, such that \( f > \tilde{f} \), or sufficiently small, such that \( \frac{1}{T} < f \leq f_t \).

**Proof.** See Figure 2. ■

Note that the local firm’s reservation price decreases with the cost advantage of the multinational firms (see (S.3) given in Table 2).

**Illustration 2** (\( a = 1 \), \( c = 0.06 \) and \( t < \frac{1}{3} \))

Figure 3 illustrates the case where the MNFs have a small cost advantage over the local firm (i.e., \( c = 0.06 \)). But, the technology gap is still not sufficiently large, so we are still looking at the case \( c < \frac{1}{15}a \). According to Figure 3, greenfield investment is the optimal choice for both MNFs if the fixed cost is sufficiently low, such that \( f < 0.001 \). Similarly, trade becomes both MNFs’ optimal entry mode if the per unit trade cost is sufficiently low, such that \( t \leq 0.004 \).

< Insert Figure 3 >

Note that in Figure 2 where all firms are symmetric in technology, trade is the optimal choice for both MNFs, provided that \( f_u < f < \tilde{f} \). In Figure 3 where some asymmetry is allowed, the same result holds either for sufficiently low or for sufficiently high per unit trade cost, whereas for intermediate values of the per unit trade cost, acquisition becomes more profitable for MNF₁. The reason is that the market-structure effect increases with \( t \), but so does the acquisition price as the MNFs’ relative cost advantage vanishes with an increase in \( t \), which reduces competition. Hence, the net gain of acquiring the local firm increases for sufficiently low levels of \( t \), whereas it starts decreasing after some high level of \( t \). Consequently, for some \( t \), the net gain turns out to be negative leading both MNFs to export.

Furthermore, in Figure 2, MNF₁ makes a greenfield investment and MNF₂ exports, provided that \( f_t < f < f_u \) and \( f < \tilde{f} \). On the contrary, in Figure 3, the acquisition is the first-moving MNF’s optimal entry mode for some pairs of \((t, f)\), whereas it is the greenfield investment for some other pairs. This leads us to the following proposition.

**Proposition 6** If the MNFs have a cost advantage over the local firm, economic integration in the form of reduced trade costs may also lead the first-moving MNF to acquire the local firm for some moderately large fixed greenfield costs.

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11 Note that this is the unique pure-strategy Nash equilibrium in a sequential game when no acquisition is allowed.

12 The net gain is negatively related to \( t \) for \( c < t \) (i.e., \( \forall c < t \partial_t \left[ \pi_{m1}^{af}(q) - \pi_{m1}^{af}(t) \right] < 0 \)). Similarly, it is positively related to \( t \) for \( c > t \) (i.e., \( \forall c > t \partial_t \left[ \pi_{m1}^{af}(q) - \pi_{m1}^{af}(t) \right] > 0 \)). See (S.5) in Table 2 and Appendix for details.
Proof. See Figure 3. ■

In what follows, we allow a sufficiently large technology gap such that \( c > \frac{1}{15}a \). We illustrate the implications in two different figures: Figures 4 and 5. In Figure 4, the given parameter values are as follows: \( a = 1, \ c = 0.2 \) and \( t < \frac{1}{3} \), which enables us to consider the case \( f_l < \tilde{f} < f_u \). In Figure 5, however, we change the marginal cost of the local firm from 0.2 to 0.3 in order to capture the case \( \tilde{f} < f_l < f_u \).

< Insert Figures 4 and 5 >

As mentioned earlier, MNF_1 will always acquire the local firm if the technology gap is sufficiently large, that is, if \( c > \frac{1}{15}a \). Both Figures 4 and 5 illustrate the case of \( c > \frac{1}{15}a \). It is clear from both figures that MNF_1 acquires firm 1 in equilibrium, irrespective of trade costs and/or fixed greenfield costs. Furthermore, for any given per unit trade cost, MNF_2 makes a greenfield investment if the fixed cost of greenfield investment is relatively small such that \( f < \tilde{f} \). Otherwise it exports.

5 Conclusion

We have analysed two multinational firms’ selection of entry modes. We have allowed these firms to sequentially select their entry modes from three alternative options: acquisition, greenfield investment or trade. The novelty of this study is the existence of two multinational firms instead of one entering the same host country. The implications of assuming more than one multinational firm sequentially entering the same host country is, to our knowledge, not well developed in this literature, where the most common approach is to assume a single multinational firm. Therefore, the main purpose of the paper is to provide a general model of strategic decision-making with more than one multinational firm so as to explicitly show the influence of a multinational firm’s decision on a rival multinational firm’s mode of entry. We have also examined the impacts of exogenous parameters (e.g., market potential, the technology gap, per unit trade cost, and fixed market entry costs) on multinational firms’ optimal foreign market entry strategies.

We have found that the relationship between economic integration in the form of reduced trade costs, and acquisition is rather complicated as a reduction in trade costs affects the net gain from acquisition in a non-monotonic way. We have shown that the influence of a reduction in trade costs on a multinational firm’s incentive to acquire a local firm relies on the technological capability of firms. Furthermore, we have illustrated that if fixed costs are neither sufficiently large nor sufficiently small, a reduction in trade costs will not lead a multinational firm to acquire a local firm unless a local firm uses a relatively inferior technology. If the technology gap becomes very large, a multinational firm will always want to acquire a local firm, irrespective of trade costs and/or fixed costs of market entry.
References


A. Appendix:

A.1. Solution to the Cournot competition

A.1.1. Greenfield versus Trade

Both firms have to choose their modes of entry between greenfield investment and trade. There will be four different possibilities:

(1) Both MNFs export: Firms’ maximisation problems give the following FOCs,

\[ q_1(q_{m1}, q_{m2}) = \left( a - \frac{(q_{m1} + q_{m2}) - c}{2} \right), \]

\[ q_{m1}(q_1, q_{m2}) = \left( a - \frac{(q_1 + q_{m2}) - t}{2} \right), \]

\[ q_{m2}(q_1, q_{m1}) = \left( a - \frac{(q_1 + q_{m1}) - t}{2} \right). \]

which lead to the following equilibrium output levels:

\[ q_1^* = \frac{1}{4} (a - 3c + 2t), \]

\[ q_{m1}^* = \frac{1}{4} (a + c - 2t), \]

\[ q_{m2}^* = \frac{1}{4} (a + c - 2t). \]

Firms’ equilibrium profits are \( \left( \frac{a-3c+2t}{4} \right)^2 \) for firm 1, and \( \left( \frac{a+c-2t}{4} \right)^2 \) and \( \left( \frac{a+c-2t}{4} \right)^2 \) for MNF1 and MNF2, respectively.

(2) MNF1 exports, whereas MNF2 makes a greenfield investment: Firms’ maximisation problems give the following FOCs,

\[ q_1(q_{m1}, q_{m2}) = \left( a - \frac{(q_{m1} + q_{m2}) - c}{2} \right), \]

\[ q_{m1}(q_1, q_{m2}) = \left( a - \frac{(q_1 + q_{m2}) - t}{2} \right), \]

\[ q_{m2}(q_1, q_{m1}) = \left( a - \frac{(q_1 + q_{m1})}{2} \right). \]
which lead to the following equilibrium output levels:

\begin{align*}
q_1^* &= \frac{1}{4} (a - 3c + t), \\
q_{m1}^* &= \frac{1}{4} (a + c - 3t), \\
q_{m2}^* &= \frac{1}{4} (a + c + t).
\end{align*}

Firms’ equilibrium profits are \( (\frac{a-3c+t}{4})^2 \) for firm 1, and \( (\frac{a+c-3t}{4})^2 \) and \( \left[ (\frac{a+t}{4})^2 - f \right] \) for MNF_1 and MNF_2, respectively. As we have a symmetric game, if MNF_1 makes a greenfield investment and MNF_2 exports, the equilibrium profits will be \( \left[ (\frac{a+t}{4})^2 - f \right] \) and \( (\frac{a+c-3t}{4})^2 \) for MNF_1 and MNF_2, respectively.

(4) Both MNFs make a greenfield investment: Firms’ maximisation problems give the following FOCs,

\begin{align*}
q_1(q_{m1}, q_{m2}) &= \left( a - (q_{m1} + q_{m2}) - c \right), \\
q_{m1}(q_1, q_{m2}) &= \left( a - (q_1 + q_{m2}) \right), \\
q_{m2}(q_1, q_{m1}) &= \left( a - (q_1 + q_{m1}) \right).
\end{align*}

which lead to the following equilibrium output levels:

\begin{align*}
q_1^* &= \frac{1}{4} (a - 3c), \\
q_{m1}^* &= \frac{1}{4} (a + c), \\
q_{m2}^* &= \frac{1}{4} (a + c).
\end{align*}

Firms’ equilibrium profits are \( (\frac{a-3c}{4})^2 \) for firm 1, and \( \left[ (\frac{a+c}{4})^2 - f \right] \) and \( \left[ (\frac{a+c}{4})^2 - f \right] \) for MNF_1 and MNF_2, respectively.
A.1.2. Acquisition

Let MNF 1 acquire firm 1. There will be two possibilities such that MNF 2 may export, or it may make a greenfield investment. These are our 5th and 6th possibilities given below.

(5) MNF 1 acquires firm 1, whereas MNF 2 exports: Firms’ maximisation problems give the following FOCs,

\[ q_{m1}(q_{m2}) = \left( \frac{a - q_{m2}}{2} \right), \]
\[ q_{m2}(q_{m1}) = \left( \frac{a - q_{m1} - t}{2} \right). \]

which lead to the following equilibrium output levels:

\[ q^{*}_{m1} = \frac{1}{3} (a + t), \]
\[ q^{*}_{m2} = \frac{1}{3} (a - 2t). \]

Firms’ equilibrium profits are Ω for firm 1, and \( \left( \frac{a+1}{3} \right)^2 - \Omega \) and \( \left( \frac{a-2t}{3} \right)^2 \) for MNF 1 and MNF 2, respectively. Note that Ω is the acquisition price.

(6) MNF 1 acquires firm 1, whereas MNF 2 makes a greenfield investment: Firms’ maximisation problems give the following FOCs,

\[ q_{m1}(q_{m2}) = \left( \frac{a - q_{m2}}{2} \right), \]
\[ q_{m2}(q_{m1}) = \left( \frac{a - q_{m1}}{2} \right). \]

which lead to the following equilibrium output levels:

\[ q^{*}_{m1} = \frac{a}{3}, \]
\[ q^{*}_{m2} = \frac{a}{3}. \]

Firms’ equilibrium profits are Ω for firm 1, and \( \left( \frac{a}{3} \right)^2 - \Omega \) and \( \left( \frac{a}{3} \right)^2 - f \) for MNF 1 and MNF 2, respectively.
A.2. Proof of Propositions

A.2.1. Proof of Proposition 1

MNF\(_1\) prefers greenfield investment, irrespective of MNF\(_2\)’s choice, if and only if \(\pi_{m1}^{g(t)} \geq \pi_{m1}^{t(t)}\) and \(\pi_{m1}^{g(t)} \geq \pi_{m1}^{t(g)}\). Solving \(\pi_{m1}^{t(t)} \geq \pi_{m1}^{t(g)} \iff \left(\frac{a+c+t}{t}\right)^2 - f \geq \left(\frac{a+c-2t}{t}\right)^2\), and \(\pi_{m1}^{g(t)} \geq \pi_{m1}^{t(g)} \iff \left(\frac{a+c}{t}\right)^2 - f \geq \left(\frac{a+c-3t}{t}\right)^2\) for \(f\) gives two different conditions such as \(f \leq \frac{3}{16} t (2a + 2c - t)\) and \(f \leq \frac{3}{16} t (2a + 2c - 3t)\), respectively. The necessary and sufficient conditions can be reduced to only one condition, that is, \(f \leq \frac{3}{16} t (2a + 2c - 3t)\) as it is obvious that \(f \leq \frac{3}{16} t (2a + 2c - 3t) \leq \frac{3}{16} t (2a + 2c - t)\). Similarly, MNF\(_2\) prefers greenfield investment, irrespective of its rival’s choice, if and only if \(\pi_{m2}^{g(t)} \geq \pi_{m2}^{t(t)}\) and \(\pi_{m2}^{g(t)} \geq \pi_{m2}^{t(g)}\). There is no need to show explicitly that this condition should apply to MNF\(_2\) as we already know that \(\pi_{m1}^{g(t)} = \pi_{m2}^{g(t)}\), \(\pi_{m1}^{t(t)} = \pi_{m2}^{t(t)}\), \(\pi_{m1}^{g(t)} = \pi_{m2}^{g(t)}\), and \(\pi_{m1}^{t(g)} = \pi_{m2}^{t(g)}\) (see (A.1) above).

A.2.2. Proof of Proposition 2

MNF\(_1\) prefers trade, irrespective of MNF\(_2\)’s choice, if and only if \(\pi_{m1}^{g(t)} \leq \pi_{m1}^{t(t)}\) and \(\pi_{m1}^{g(g)} \leq \pi_{m1}^{t(t)}\). Solving \(\pi_{m1}^{t(t)} \leq \pi_{m1}^{t(g)} \iff \left(\frac{a+c+t}{t}\right)^2 - f \leq \left(\frac{a+c-2t}{t}\right)^2\) and \(\pi_{m1}^{g(g)} \leq \pi_{m1}^{t(g)} \iff \left(\frac{a+c}{t}\right)^2 - f \leq \left(\frac{a+c-3t}{t}\right)^2\) for \(f\) gives two different conditions such as \(f \geq \frac{3}{16} t (2a + 2c - t)\) and \(f \geq \frac{3}{16} t (2a + 2c - 3t)\), respectively. The necessary and sufficient conditions can be reduced to the condition \(f \geq \frac{3}{16} t (2a + 2c - 3t)\) as it is obvious that \(f \geq \frac{3}{16} t (2a + 2c - 2t) \geq \frac{3}{16} t (2a + 2c - 3t)\). Similarly, MNF\(_2\) prefers greenfield investment, irrespective of its rival’s choice, if and only if \(\pi_{m2}^{g(t)} \leq \pi_{m2}^{t(t)}\) and \(\pi_{m2}^{g(g)} \leq \pi_{m2}^{t(t)}\). There is no need to show explicitly that this condition should apply to MNF\(_2\) as we already know that \(\pi_{m1}^{g(t)} = \pi_{m2}^{g(t)}\), \(\pi_{m1}^{t(t)} = \pi_{m2}^{t(t)}\), \(\pi_{m1}^{g(g)} = \pi_{m2}^{g(g)}\), and \(\pi_{m1}^{t(g)} = \pi_{m2}^{t(g)}\) (see (A.1) above).

A.2.3. Proof of Proposition 3

MNF\(_2\) prefers greenfield investment when MNF\(_1\) opts for trade if \(\pi_{m2}^{g(t)} \geq \pi_{m2}^{t(t)}\). Similarly, MNF\(_2\) prefers trade when MNF\(_1\) opts for greenfield investment if \(\pi_{m2}^{g(g)} \leq \pi_{m2}^{t(t)}\). In (A.2.1) and (A.2.2), we already show that \(\pi_{m2}^{g(t)} \geq \pi_{m2}^{t(t)} \iff f \leq \frac{3}{16} t (2a + 2c - t)\) and \(\pi_{m2}^{g(g)} \leq \pi_{m2}^{t(g)} \iff f \geq \frac{3}{16} t (2a + 2c - 3t)\), respectively. When \(\frac{3}{16} t (2a + 2c - 3t) \leq f \leq \frac{3}{16} t (2a + 2c - t)\), MNF\(_1\) makes greenfield investment if \(\pi_{m1}^{g(t)} \geq \pi_{m1}^{t(g)} \iff f \leq \frac{1}{2} t (a + c - t)\), which always holds for any \(f \in [\frac{3}{16} t (2a + 2c - 3t), \frac{3}{16} t (2a + 2c - t)]\) as \(\frac{3}{16} t (2a + 2c - t) \leq \frac{1}{2} t (a + c - t)\).

A.2.3. Proof of Proposition 4

MNF\(_2\) prefers greenfield investment when MNF\(_1\) acquires firm 1 if \(\pi_{m2}^{g(a)} \geq \pi_{m2}^{t(a)}\). Solving \(\pi_{m2}^{g(a)} \geq \pi_{m2}^{t(a)} \iff \left(\frac{a}{t}\right)^2 - f \geq \left(\frac{a-2t}{t}\right)^2\) for \(f\) gives the condition \(f \leq \frac{a}{4} t (a - t)\).
A.3. Impacts of $c$, $a$, and $t$

A.3.1. The change of the net gain (N.G.), the market-structure effect (M-S.E.), and the cost-saving effect (C-S.E.) with $c$

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>$\frac{\partial (N.G.)}{\partial c}$</th>
<th>$\frac{\partial (M-S.E.)}{\partial c}$</th>
<th>$\frac{\partial (C-S.E.)}{\partial c}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(S.1)</td>
<td>$\frac{1}{2}a - \frac{7}{8}c$</td>
<td>$-\frac{1}{8}a - \frac{1}{8}c &lt; 0$</td>
<td>$\frac{2}{3}a - \frac{9}{28}c &gt; 0$</td>
</tr>
<tr>
<td>(S.2)</td>
<td>$\frac{1}{2}a - \frac{7}{8}c$</td>
<td>$-\frac{1}{8}a - \frac{1}{8}c &lt; 0$</td>
<td>$\frac{2}{3}a - \frac{9}{28}c &gt; 0$</td>
</tr>
<tr>
<td>(S.3)</td>
<td>$\frac{1}{2}a - \frac{7}{8}c + \frac{1}{4}t$</td>
<td>$-\frac{1}{8}a - \frac{1}{8}c - \frac{1}{8}t &lt; 0$</td>
<td>$\frac{2}{3}a - \frac{9}{28}c + \frac{5}{4}t &gt; 0$</td>
</tr>
<tr>
<td>(S.4)</td>
<td>$\frac{1}{2}a - \frac{7}{8}c + \frac{1}{4}t$</td>
<td>$-\frac{1}{8}a - \frac{1}{8}c - \frac{1}{8}t &lt; 0$</td>
<td>$\frac{2}{3}a - \frac{9}{28}c + \frac{5}{4}t &gt; 0$</td>
</tr>
<tr>
<td>(S.5)</td>
<td>$\frac{1}{2}a - \frac{7}{8}c + 2t$</td>
<td>$-\frac{1}{8}a - \frac{1}{8}c + \frac{1}{4}t &lt; 0$</td>
<td>$\frac{2}{3}a - \frac{9}{28}c + \frac{5}{4}t &gt; 0$</td>
</tr>
<tr>
<td>(S.6)</td>
<td>$\frac{1}{2}a - \frac{7}{8}c + 2t$</td>
<td>$-\frac{1}{8}a - \frac{1}{8}c + \frac{1}{4}t &lt; 0$</td>
<td>$\frac{2}{3}a - \frac{9}{28}c + \frac{5}{4}t &gt; 0$</td>
</tr>
</tbody>
</table>

The market-structure effect is negatively related to $c$, whereas the cost-saving effect is positively related. The change of the net gain with $c$ is positive in (S.1) and (S.2) for $c < \frac{1}{2}a$. It is also positive in (S.3) and (S.4) for $c < \frac{1}{4}(a+t)$, and in (S.5) and (S.6) for $c < \frac{1}{5}(a+4t)$.

A.3.2. The change of the net gain (N.G.), the market-structure effect (M-S.E.), and the cost-saving effect (C-S.E.) with $a$

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>$\frac{\partial (N.G.)}{\partial a}$</th>
<th>$\frac{\partial (M-S.E.)}{\partial a}$</th>
<th>$\frac{\partial (C-S.E.)}{\partial a}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(S.1)</td>
<td>$-\frac{1}{30}a + \frac{1}{2}c$</td>
<td>$\frac{7}{72}a - \frac{1}{2}c &gt; 0$</td>
<td>$\frac{2}{9}c - \frac{1}{3}a &lt; 0$</td>
</tr>
<tr>
<td>(S.2)</td>
<td>$-\frac{1}{30}a + \frac{1}{2}c + \frac{2}{3}t$</td>
<td>$\frac{7}{72}a - \frac{1}{2}c + \frac{2}{3}t &gt; 0$</td>
<td>$\frac{2}{9}c - \frac{1}{3}a &lt; 0$</td>
</tr>
<tr>
<td>(S.3)</td>
<td>$-\frac{1}{30}a + \frac{1}{2}c - \frac{1}{4}t$</td>
<td>$\frac{7}{72}a - \frac{1}{2}c - \frac{1}{4}t &gt; 0$</td>
<td>$\frac{2}{9}c - \frac{1}{3}a - \frac{1}{6}t &lt; 0$</td>
</tr>
<tr>
<td>(S.4)</td>
<td>$-\frac{1}{30}a + \frac{1}{2}c + \frac{1}{8}t$</td>
<td>$\frac{7}{72}a - \frac{1}{2}c + \frac{1}{8}t &gt; 0$</td>
<td>$\frac{2}{9}c - \frac{1}{3}a - \frac{1}{6}t &lt; 0$</td>
</tr>
<tr>
<td>(S.5)</td>
<td>$-\frac{1}{30}a + \frac{1}{2}c + \frac{2}{3}t$</td>
<td>$\frac{7}{72}a - \frac{1}{2}c + \frac{1}{8}t &gt; 0$</td>
<td>$\frac{2}{9}c - \frac{1}{3}a - \frac{1}{6}t &lt; 0$</td>
</tr>
<tr>
<td>(S.6)</td>
<td>$-\frac{1}{30}a + \frac{1}{2}c + \frac{2}{3}t$</td>
<td>$\frac{7}{72}a - \frac{1}{2}c + \frac{1}{8}t &gt; 0$</td>
<td>$\frac{2}{9}c - \frac{1}{3}a - \frac{1}{6}t &lt; 0$</td>
</tr>
</tbody>
</table>

The market-structure effect is positively related to $a$, whereas the cost-saving effect is negatively related. The change of the net gain with $a$ is positive in (S.1) and (S.5) for $a < 9c$. It is also positive in (S.2) and (S.6) for $a < 9c + 8t$. If $c < \frac{5}{2}t$, the net gain in (S.3) decreases with $a$, but if $c > \frac{5}{2}t$, the net gain increases with $a$ for $a < 9(c-t)$. Similarly, if $c < \frac{1}{3}t$, the net gain in (S.6) also decreases with $a$. 
A.3.3. The change of the net gain (N.G.), the market-structure effect (M-S.E.), and the cost-saving effect (C-S.E.) with $t$

<table>
<thead>
<tr>
<th>Scenarios</th>
<th>$\frac{\partial \text{N.G.}}{\partial t}$</th>
<th>$\frac{\partial \text{M-S.E.}}{\partial t}$</th>
<th>$\frac{\partial \text{C-S.E.}}{\partial t}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>(S.1)</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>(S.2)</td>
<td>$\frac{2}{5}a + \frac{2}{5}t &gt; 0$</td>
<td>$\frac{2}{5}a + \frac{2}{5}t &gt; 0$</td>
<td>0</td>
</tr>
<tr>
<td>(S.3)</td>
<td>$\frac{1}{4}c - \frac{1}{4}a - \frac{1}{4}t &lt; 0$</td>
<td>$-\frac{1}{8}a - \frac{1}{8}c - \frac{1}{8}t &lt; 0$</td>
<td>$\frac{3}{5}c - \frac{1}{5}a - \frac{1}{5}t &lt; 0$</td>
</tr>
<tr>
<td>(S.4)</td>
<td>$\frac{1}{4}c - \frac{1}{30}a - \frac{1}{30}t$</td>
<td>$\frac{7}{5}a - \frac{1}{5}c + \frac{7}{72}t &gt; 0$</td>
<td>$\frac{2}{5}c - \frac{1}{5}a - \frac{1}{5}t &lt; 0$</td>
</tr>
<tr>
<td>(S.5)</td>
<td>$c - t$</td>
<td>$\frac{1}{2}a + \frac{1}{2}c - \frac{1}{2}t &gt; 0$</td>
<td>$\frac{3}{4}c - \frac{1}{4}a - \frac{1}{4}t &lt; 0$</td>
</tr>
<tr>
<td>(S.6)</td>
<td>$\frac{2}{5}a + c - \frac{7}{9}t$</td>
<td>$\frac{17}{30}a + \frac{1}{4}c - \frac{5}{18}t &gt; 0$</td>
<td>$\frac{2}{5}c - \frac{1}{5}a - \frac{1}{5}t &lt; 0$</td>
</tr>
</tbody>
</table>

The market-structure effect is positively related to $t$ in (S.2), (S.4), (S.5) and (S.6), but negatively related in (S.3). The cost-saving effect is negatively related to $t$ in all scenarios, but (S.1) and (S.2). The change of the net gain with $t$ is positive in (S.2), and negative in (S.3). In (S.5), the net gain decreases with $t$ for $t > c$. In (S.4), the relation is positive if and only if $t < (9c - a)$. Similarly, in (S.6), the relation is positive if and only if $t < \frac{1}{7}(2a + 9c)$. 

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Figure 2: No cost advantage

Figure 3: A relatively small cost advantage
Figure 4: A moderate cost advantage

Figure 5: A relatively high cost advantage