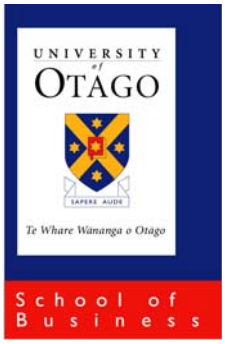

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The Choice of Market Entry Mode:
Greenfield Investment, M&A and Joint Ventures

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Abstract

Multinational firms may enter a market by different modes of foreign direct investment (FDI). This paper endogenizes both the mode and the size of FDI. It shows that the credibility of greenfield investment decides on the success of a joint venture or of a merger as it determines the outside option of the target firm. If greenfield investment is a credible threat and any other FDI option does not require any fixed cost, a joint venture will be agreed to by the local firm, and the foreign firm prefers a joint venture to a merger. In case of fixed costs across the board of all FDI options, a foreign firm prefers a merger to a joint venture if the efficiency of cost-reducing investments is small.
JEL-Classification: F12, F23.

Keywords: Foreign direct investment, multinational firms, merger, joint venture, greenfield investment

1 Introduction

Foreign direct investment (FDI) is well known to contribute more to globilization than international trade since aggregate sales of foreign affiliates have outnumbered world exports for two decades (see UNCTAD (2004)). Hence, FDI can be said to be the main driving force which internationalizes local factor and commodity markets. The literature dealing with this development has also reached a certain degree of maturity. Concerning greenfield investment, the literature has distinguished between horizontal and vertical FDI, and has discussed extensively the impact of FDI on market structures and welfare.[1]

However, greenfield investment, *i.e.*, the setup of a subsidiary in a foreign country completely controlled by the multinational firm, is not the only possible mode of FDI. Alternatively, firms can become multinational by acquiring or merging with a local firm or forming a joint venture with a local partner. These alternatives are empirically relevant, in particular since the global economy has witnessed unprecedented merger waves across borders. Due to the merger paradox, it is obvious that acquisitions in markets for strategic substitutes can be successful only if the merger is able to exploit substantial cost savings.[2] Hence, the scope of synergies between two existing firms is very important for any potential acquisition.

However, merger is not the only option to get hold of synergy profits. Other platforms of partial cooperation between a foreign and local firm like using jointly a production site, using jointly a distribution network or devel-

[1]Vertical FDI exploits differences in factor costs, whereas horizontal FDI saves trade costs. For the effects of FDI on welfare and market structure, see *e.g.* Horstmann and Markusen (1992), Markusen and Venables (1998), Motta (1992), De Santis and Stähler (2004), Elberfeld, Götz and Stähler (2005).

[2]The merger paradox goes back to Salant, Switzer and Reynolds (1983). They show for Cournot markets that mergers reduce profits for merging firms unless the market share of the merged firm is substantial. The reason is that a merged firm will coordinate and contract individual outputs of previously independent firms. Perry and Porter (1985) have demonstrated that the merger paradox can be overcome by merger-specific cost saving. Product differentiation and strategic complementarities can also overcome the merger paradox (see Lommerud and Sorgard, 1997, and Deneckere and Davidson, 1985, respectively).

oping jointly new products do not require complete ownership of the local firm by the foreign firm. We will refer to any kind of cooperation in this sense as a joint venture. The downside of these joint ventures is that partial cooperation is not unlikely to be subject to free rider problems, in particular if contracts are incomplete because any defection from a partial cooperation scheme is hard to monitor and/or to prove. This is the reason why we will assume for joint ventures that cost-reducing measures will not to be contractible and enforceable to a large extent.[3] Furthermore, we do not allow any side-payment between both parties for the saem reason.

Most of the previous papers on FDI have exclusively dealt with one or another mode of FDI. This paper will endogenize the FDI choice in two ways: first, the model will explain if and by which FDI mode a firm will enter a market; second, it will endogenize the size of investment in case of merger or a joint venture such that cost reductions are not exogeneously given but a result of (optimal) investment behavior. The paper will show that the credibility of greenfield investment is very important for the success of a joint venture or a merger as it determines the outside option of the target firm. Hence, even if greenfield investment will not be observed in equilibrium, it makes target firms agree to deals they would otherwise not have agreed to. If greenfield investment is a credible threat and any other FDI option comes without fixed cost, the paper shows that a joint venture will be agreed to by the local firm, and that the foreign firm prefers a joint venture to a merger. Furthermore, the foreign firm prefers a merger to a greenfield investment if the fixed cost of greenfield investment is not too small. In case of fixed costs across the board of all FDI options, the model predicts that a foreign firm prefers a merger to a joint venture if the efficiency of cost-reducing investments is small, irrespective of the productivity of the foreign firm. A joint venture becomes relatively more attractive compared to a merger with an increase in the efficiency of cost-reducing investments for any level of the foreign firm's productivity.

This paper is not the first paper which explores the interdependencies of

[3]In this sense, joint ventures are an international example of incomplete contracts.

different modes of FDI. It is closest to Bjorvatn (2004) who also considers the interaction between acquisitions, greenfield investment and trade.[4] However, the basic difference is that his paper does not consider any endogenous investment, and it also ignores the possibility of forming a joint venture. Furthermore, he assumes that firms decide on investment in the first stage which is meant to be either greenfield or acquisition, whereas this paper also allows the foreign firm to serve the foreign market by exports if a takeover or joint venture offer has been declined.

Other papers like Head and Ries (2003), Helpman, Melitz and Yeaple (2004) and Girma and Kneller (2003) emphasize the role of firm heterogeneity for explaining differences in FDI modes.[5] To a certain extent, this paper explains endogenously the heterogeneity of firms in case of merger or joint ventures. However, unlike these papers, it does not aim at explaining different FDI modes as a result of heterogeneous firms in a general equilibrium setting. Instead, it will focus on the decision of a single firm how to enter a local market in an environment of imperfect competition and strategic behavior.

2 The model

In order to keep the model as simple as possible, we assume two local firms in a country, and a single foreign firm which considers how to enter this country's market, either by a merger, a joint venture, a greenfield investment or to serve this market by exports. This firm has all the bargaining power except in the case of joint ventures for which any agreement is incomplete insofar as cost-reducing investments are not enforceable.[6] If the foreign firm proposes a merger or a joint venture, it makes a take-it-or-leave-it offer to one of the (identical) local firms. Since the local firms are *ex ante* symmetric, it does not matter which local firm will be the potential target. We will label the foreign firm as firm 1 and the potential target as firm 2, so that firm 3 is

[4]See also Horn and Persson (2001) and Horn and Levinsohn (2001).

[5]For empirical papers, see Blonigen, Davis and Head (2002), Brainard (1997) and Carr, Markusen and Maskus (2001).

[6]As the foreign firm has all the bargaining power, there is no difference between a merger and an acquisition.

the local firm which will remain independent in any case. In case of a merger, only firm 1 survives, firm 2 becomes a firm 1's division, and firm 3 is the local firm which has not been the target of the foreign firm. The structure of the game is as follows:

Stage 1: Foreign firm 1 meets local firm 2.

Stage 2: Foreign firm 1 makes either a merger or a joint venture proposal.

Stage 3: Local firm 2 either rejects or accepts.

Stage 4: **In case of rejection:** Foreign firm 1 decides on greenfield investment.

In case of an accepted merger: Foreign firm 1 determines cost-reducing investments for both divisions.

In case of an accepted joint venture: Both firms 1 and 2 determine simultaneously their individual cost-reducing investment.

Stage 5: All independent firms choose output levels.

Note carefully that the proposals of a merger and a joint venture differ substantially by nature. In case of a merger proposal, the foreign firm will offer a sales price to the target for the merger, and the target either accepts or rejects. If the proposal is accepted, the target is compensated by a sales price for giving up its independent business. In case of a joint venture proposal, the foreign firm offers the joint venture and thus a platform for (partial) cooperation and the local firm either rejects or accepts. In that case, no side-payment is agreed upon but the possibility to cooperate as far as the production process is concerned.[7] Thus, the basic difference is that the local firm remains independent in a joint venture whereas it becomes a dependent division of the foreign firm in case of a merger. Both FDI types allow to reduce marginal production costs but the efficiency of cost-reducing

[7]In this sense, joint ventures are similar to R&D cooperation or any other form of semi-collusion. For the pioneering paper in this field, see D'Aspremont and Jacquemin (1988).

investment hinges on the FDI mode. On the one hand, a merger implies that the dependent local division can no longer be that efficient in reducing costs as an independent local firm could. On the other hand, a joint venture creates a lot of positive spillovers for the other firm which can be internalized only by a merger. The crucial differences between a merger and a joint venture can thus be summarized as follows:

- In a joint venture, both firms decide on their outputs independently, whereas in case of a merger, the headquarters of the foreign country decide on production of the merged firm. This is *ceteris paribus* disadvantageous for the merger in markets for strategic substitutes due to the merger paradox.

- The local firm is superior at reducing local production costs. If it becomes a dependent division of the foreign firm in a merger, this advantage gets lost.

- In a joint venture, the contributions to cost reductions cannot be contracted to a large extent. Thus, a joint venture suffers from an incentive problem, so that the contributions to joint cost reductions will be too low.

Furthermore, we observe that the foreign firm is always able to guarantee itself the profit of greenfield investment or the trade profit by offering a zero price for a merger which will be turned down by the potential target.

The relevant market which we consider is the market in which the local firms reside. Due to quasi-linear preferences in this country, the inverse demand function is given by $p = a - bQ$ with p denoting the equilibrium price for an aggregate supply of Q. The marginal cost of production without any cost saving by a merger or a joint venture is equal to c with $c < a$. However, if the foreign firm serves the market by exports, an additional trade cost of size t per unit of exports arises for which $t \leq (a-c)/3$. The latter assumption will guarantee that the foreign firm has at least an incentive to export to this country. Furthermore, we assume that greenfield investment,*i.e.*, setting up a plant to serve the country's market, requires a fixed cost of size F. This

investment allows the foreign firm to produce without trade costs as it will be as close to the market as local firms are. However, greenfield investment does not allow any further marginal cost reductions. Other fixed costs of a merger or a joint venture will be addressed to in subsection 4.3.

Without any FDI, either in form of greenfield investment, merger or a joint venture, profit maximization of all three firms leads to individual production levels of

$$q_1^T = \frac{a-c-3t}{4b}, q_2^T = \frac{a-c+t}{4b}, q_3^T = \frac{a-c+t}{4b}, \tag{1}$$

and profits of

$$\Pi_1^T = \frac{(a-c-3t)^2}{16b}, \Pi_2^T = \frac{(a-c+t)^2}{16b}, \Pi_3^T = \frac{(a-c+t)^2}{16b}, \tag{2}$$

respectively. q_i and Π_i denote individual production and profits, respectively, of firm i. The superscript T denotes the trade regime.

3 Modes of foreign direct investment

This section will assume that only greenfield investment requires a fixed cost. When the foreign firm considers its FDI options, it may either decide to buy a firms, to cooperate with a firm or to enter the market by setting up a subsidiary.

3.1 Greenfield investment

With greenfield investment of the foreign firm, denoted by the superscript GF, the foreign firm is able to produce with marginal cost c in the foreign market, so that the individual production levels coincide, *i.e.*,

$$q_1^{GF} = q_2^{GF} = q_3^{GF} = \frac{a-c}{4b}, \tag{3}$$

and the profits of the foreign firm differ only by the fixed cost F from the profits of the local firms:

$$\Pi_1^{GF} = \frac{(a-c)^2}{16b} - F, \Pi_2^{GF} = \Pi_3^{GF} = \frac{(a-c)^2}{16b}. \tag{4}$$

Under the use of (2) and (4) it is straightforward to show that the foreign firm will prefer to make a greenfield investment rather than to serve the foreign market by exports if F falls short of

$$\bar{F} \equiv \frac{3(2(a-c)-3t)t}{16b}. \tag{5}$$

Note carefully that $F \leq \bar{F}$ is also the condition that the greenfield investment is a credible threat when merger or joint venture proposals are turned down. If condition (5) is fulfilled, any merger offer larger or equal to Π_2^{GF} according to (4) will be accepted by the target. If condition (5) is not fulfilled, a merger will be successful only if the sales price is larger or equal to Π_2^T according to (2) so that the credibility of a greenfield investment reduces the sales price of an acquisition. Furthermore, also the acceptance of a joint venture by the local firm depends in very much the same way on the credibility of greenfield investment.

3.2 Joint venture

In case of a joint venture, denoted by the superscript J, the market structure does not change as all firms remain independent. Both the local firm, assumed that it has agreed to a joint venture, and the foreign firm may reduce marginal costs. However, these cost-reducing investments are not contractible when agreeing on a joint venture. This may be due to imperfect monitoring of investments by the other party or to the impossibility to prove an insufficient investment in the courtroom, so that both investments are voluntary contributions to a joint cost reduction. Furthermore, since the local firm remains independent, it is more productive as it would be as a dependent division of the foreign firm in case of a merger. Let ζ^J denote the marginal cost after investments have been made. Marginal cost ζ^J is equal to

$$\zeta^J = c - \gamma(\beta I_1 + I_2), \tag{6}$$

where $I_1(I_2)$ denotes the investment of firm 1 (2). The parameter γ denotes the *general* efficiency parameter of investments, whereas $\beta, 0 < \beta \leq 1$, expresses the relative disadvantage of the foreign firm which is due to the lack

of any experience of running a business in this country. In the product market, both the local joint venture firm and the foreign firm compete against each other and the other local firm. The respective output and profit levels (without investment costs) are equal to

$$q_1^J = q_2^J = \frac{a + c - 2\zeta^J}{4b}, q_3^J = \frac{a - 3c + 2\zeta^J}{4b}, \tag{7}$$

$$\Pi_1^J = \Pi_2^J = \frac{(a + c - 2\zeta^J)^2}{16b}, \Pi_3^J = \frac{(a - 3c + 2\zeta^J)^2}{16b}. \tag{8}$$

In case of a joint venture, both firms maximize their profits w.r.t. their investments independently. Investment costs are assumed to be quadratic, so that profits including investment costs are equal to

$$\tilde{\Pi}_1^J = \frac{(a - c + \gamma(\beta I_1 + I_2))^2}{16b} - \frac{\delta I_1^2}{2}, \tag{9}$$

$$\tilde{\Pi}_2^J = \frac{(a - c + \gamma(\beta I_1 + I_2))^2}{16b} - \frac{\delta I_2^2}{2}, \tag{10}$$

respectively. The parameter δ measures the marginal cost of investment. The tilde denotes equilibrium profits on the product market after optimal outputs have been determined. The first-order conditions yield the equilibrium investment levels

$$I_1^* = \frac{(a - c)\beta\gamma}{2(2b\delta - (1 + \beta^2)\gamma^2)}, I_2^* = \frac{(a - c)\gamma}{2(2b\delta - (1 + \beta^2)\gamma^2)}. \tag{11}$$

A necessary condition for an interior solution is

$$\delta > \frac{(a + c)(1 + \beta^2)\gamma^2}{4bc}. \tag{12}$$

Note that (12) and $a > c$ guarantee that

$$\delta > \frac{(1 + \beta^2)\gamma^2}{2b}. \tag{13}$$

The equilibrium investment levels imply equilibrium profits of

$$\Pi_1^{J*} = \frac{(a - c)^2\delta(2b\delta - \beta^2\gamma^2)}{8(2b\delta - (1 + \beta^2)\gamma^2)}, \Pi_2^{J*} = \frac{(a - c)^2\delta(2b\delta - \gamma^2)}{8(2b\delta - (1 + \beta^2)\gamma^2)}. \tag{14}$$

The star denotes equilibrium profits after optimal cost-reducing investments have been made. Due to

$$\frac{\partial \Pi_1^{J*}}{\partial \gamma}, \frac{\partial \Pi_1^{J*}}{\partial \beta}, \frac{\partial \Pi_2^{J*}}{\partial \gamma}, \frac{\partial \Pi_2^{J*}}{\partial \beta} > 0, \tag{15}$$

both firms' profits rise with the efficiency parameters. In particular, also the local firm is interested in forming a joint venture with a strong foreign partner.

3.3 Merger

In case of a merger, denoted by the superscript M, the foreign firm is able to determine investments for both divisions, foreign and local, where the latter has been firm 2 before. On the product market, firm 1 (*i.e.*, the parent firm) will compete only with firm 3. Within this duopoly, the respective output and profit levels (without investment costs) are equal to

$$q_1^M = \frac{a + c - 2\zeta^M}{3b}, q_3^M = \frac{a - 2c + \zeta^M}{3b}, \tag{16}$$

$$\Pi_1^M = \frac{(a + c - 2\zeta^M)^2}{9b}, \Pi_3^M = \frac{(a - 2c + \zeta^M)^2}{9b}, \tag{17}$$

where ζ^M is the marginal cost after investments have been made by the foreign parent firm. Let I_1 and I_2 now denote the investment for the foreign and the local division, respectively. The marginal cost ζ^M is equal to

$$\zeta^M = c - \gamma\beta(I_1 + I_2). \tag{18}$$

The role of the *general* efficiency parameter γ remains unchanged but β, expressing the relative disadvantage of the foreign firm which is running both divisions in case of a merger, applies to both types of investment now. Profits of the merged firm read

$$\tilde{\Pi}_1^M = \frac{(a - c + \gamma\beta(I_1 + I_2))^2}{9b} - \frac{\delta I_1^2}{2} - \frac{\delta I_2^2}{2}. \tag{19}$$

An interior solution is guaranteed if

$$\delta > \frac{(a+3c)\beta^2\gamma^2}{9bc}. \tag{20}$$

Condition (20) will be met if condition (12) is fulfilled because the difference between (20) and (12) is positive due to $a > c$ and $0 < \beta \leq 1$:

$$\frac{(a+c)(1+\beta^2)\gamma^2}{4bc} - \frac{(a+3c)\beta^2\gamma^2}{9bc} = \frac{\gamma^2}{36bc}((9+5\beta^2)a - 3(3-\beta^2)c) > 0. \tag{21}$$

The optimal investment levels are equal to

$$I_1^* = I_2^* = \frac{2(a-c)\beta\gamma}{9b\delta - 4\beta^2\gamma^2}, \tag{22}$$

which imply equilibrium profits of the merged firm of

$$\Pi_1^{M*} = \frac{(a-c)^2\delta}{9b\delta - 4\beta^2\gamma^2}. \tag{23}$$

Profits increase with the efficiency parameters γ and β and decrease with the cost parameter δ. Due to

$$\Pi_1^{M*}(I_1 = I_2 = 0) = \lim_{\delta\to\infty} \Pi_1^{M*} = \frac{(a-c)^2}{9b}, \tag{24}$$

there is a positive lower bound for the profits of the merged firm. Note also that these profits are *gross* profits, not taking into account the sales price for the target firm. The sales price, however, depends on the credibility of greenfield investment or trade, respectively.

4 Equilibrium FDI

4.1 Credible greenfield investment threat

In case of a credible greenfield investment threat, the sales price for the target firm in case of a merger is equal to $(a-c)^2/16b$, *i.e.*, the profits the target would realize if it faces competition by a multinational firm (and the other local firm). Furthermore, this is also the minimum profit a local firm can guarantee itself when being invited to form a joint venture. The local firm is therefore better off with a joint venture if its profits Π_2^{J*} according to (14)

are larger than its profits when rejecting the offer and facing competition by a multinational firm, *i.e.*, profits of size $(a-c)^2/16b$. Hence, the local firm will accept the joint venture if

$$\begin{aligned} \frac{(a-c)^2}{16b}\left(\frac{2\delta(2b\delta-\gamma^2)}{(2b\delta-(1+\beta^2)\gamma^2)^2}-\frac{1}{b}\right)>0 \\ \Rightarrow 2b\delta(1+2\beta^2)\delta-(1+\beta^2)\gamma^2>0 \end{aligned} \tag{25}$$

which is always true according to (13). Expression (25) proves Lemma 1:

Lemma 1 *The local firm will always agree to a joint venture if greenfield investment is a credible threat.*

Since the foreign firm can be sure that its potential target will accept a joint venture, it has the choice among all possible types of FDI. Lemma 2 has the result.

Lemma 2 *The foreign firm will always prefer a joint venture to a merger if greenfield investment is a credible threat. It will prefer a merger to a greenfield investment if the fixed cost of greenfield investment is not too small.*

Proof: Due to (24), the merger profit Π_1^{M*} reduced by the sales price will never be less than $7(a-c)^2/144b$ which is larger than the greenfield profit Π_1^G according to (4) if $F \geq (a-c)^2/72b$. Hence, the merger dominates greenfield investment for a moderate fixed cost of greenfield investment. A joint venture dominates a merger if the profits Π_1^{J*} of the foreign firm in a joint venture (see (14)) are larger than the merger profits Π_1^{M*} according to (23), reduced by the sales price:

$$\frac{(a-c)^2}{16}\left(\frac{2\delta(2b\delta-\beta^2\gamma^2)}{(2b\delta-(1+\beta^2)\gamma^2)^2}+\frac{1}{b}-\frac{16\delta}{9b\delta-4\beta^2\gamma^2}\right)>0 \tag{26}$$

The appendix proves that (26) is true. □

Note that it could well be the case that a merger dominates greenfield investment irrespective of the size of F, as long as F still supports the credibility of greenfield investment. Expression (24) gives the gross merger profit without any cost saving and is thus a lower bound for the after merger profit. Lemma 1 and Lemma 2 prove Proposition 1:

Proposition 1 *If greenfield investment is a credible threat and only greenfield investment requires a not too small fixed cost, both the foreign and a local firm will agree upon a joint venture.*

4.2 Credible trade threat

The outside options for both the potential target of a merger and a local firm invited to form a joint venture improve if greenfield investment is not a credible threat. In this case, the local firm can guarantee itself a profit Π_2^T according to (2) which is larger than Π_2^{GF} according to (4). It is no longer clear whether the local firm will accept a joint venture proposal as Lemma 3 shows.

Lemma 3 *The local firm may reject a joint venture offer if trade is a credible threat.*

Proof: The local firm is better off under trade if Π_2^T is larger than Π_2^{J*} which requires

$$\frac{(a-c-t)^2}{b} \geq \frac{2\delta(a-c)^2(2b\delta-\gamma^2)}{(2b\delta-(a+\beta^2)\gamma^2)}. \tag{27}$$

This comparison depends on the size of trade cost t. Obviously, condition (27) cannot hold for $t = 0$ as the outside options for trade and greenfield investment coincide for zero trade costs. For the upper bound $t = (a-c)/3$, condition (27) reads

$$\frac{(a-c)^2}{72}\left(\frac{8}{b} - \frac{9\delta(2b\delta-\gamma^2)}{(2b\delta-(1+\beta^2)\gamma^2)62}\right) \geq 0. \tag{28}$$

Expression (28) increases with δ and approaches $7(a-c)^2/144b$ as $\delta \to \infty$. Hence, the local firm may reject a joint venture proposal for sufficiently large δ and t. □

While it not clear whether a joint venture will be preferred unanimously, the preference of the foreign firm is obvious. The joint venture profits Π_1^{J*} do not depend on the credibility of greenfield investment, but the sales price to support a merger is larger with trade than with a credible greenfield investment threat. Hence, the net profits of a merger will be less under trade

than with a credible greenfield investment threat, and according to Lemma 2, the foreign firm prefers a joint venture to a merger already with a credible greenfield investment threat. Therefore, it will also do so if the merger profits are even smaller, which proves Lemma 4.

Lemma 4 *The foreign firm will always prefer a joint venture to a merger if trade is a credible threat.*

However, if the local firm will not accept the joint venture proposal, the foreign firm has to decide whether it would like to merge with the local firm or whether it would like to serve the foreign market by exports. The advantage of a merger rests upon Π_1^{M*} and the aggregate profits of both firms under trade:

$$\Pi_1^T + \Pi_2^T = \frac{(a-c)^2 + 5t^2 - 2t(a-c)}{8b}. \tag{29}$$

If Π_1^{M*} is larger than (29), the after merger profit will be larger than the sales price for the merger and the trade profit of the foreign firm. Due to (24), a necessary condition for a preference for trade is

$$\frac{(a-c)^2 + 5t^2 - 2t(a-c)}{8b} \geq \frac{(a-c)^2}{9b} \Rightarrow t \leq \frac{a-c}{15}. \tag{30}$$

According to (30), trade may be preferred to a merger for sufficiently *low* levels of trade cost t.[8] Note that $t \leq (a-c)/15$ does not necessarily violate the assumption that the local firm rejects any joint venture proposal. For $t = (a-c)/15$, condition condition (27) reads

$$\frac{(a-c)^2}{1900}\left(\frac{128}{b} - \frac{225\delta(2b\delta - \gamma^2)}{(2b\delta - (1+\beta^2)\gamma^2)62}\right) \geq 0. \tag{31}$$

Expression (28) increases with δ and approaches $31(a-c)^2/3600b$ as $\delta \to \infty$. Hence, if the local firm rejects any proposal to form a joint venture, the preference of the foreign firm can be summarized by Lemma 5.

[8]Condition (30) is also fulfilled for $t \geq (a-c)/3$ which is excluded as the foreign firm cannot profitably export to the local market if $t \geq (a-c)/3$.

Lemma 5 *If the local firm does not agree to a joint venture, a* $\bar{t}$ *with* $0 \leq \bar{t} < (a-c)/15$ *exists, such that*

- *the foreign firm prefers a merger to trade if* $t \geq \bar{t}$*,*
- *the foreign firm prefers trade to a merger if* $t < \bar{t}$*.*

Note carefully that $\bar{t}$ may well be zero as condition (31) uses the minimum profits a merged firm can achieve and is thus only necessary and not sufficient. Furthermore, this result holds only as long as the joint venture is not accepted by the local firm. As the outside options for the local firms for zero trade costs are the same with trade and with greenfield investment without any trade cost, Remark 1 is obvious.

Remark 1 *If trade costs are zero, both firms will agree on a joint venture.*

4.3 Including fixed costs of mergers and joint ventures

So far, we have assumed that both merger and joint ventures do not require any fixed costs. This assumption has led to very clear results, in particular that both firms will agree upon a joint venture irrespective of parameter values if greenfield investment is a credible threat and its fixed cost is not too small. In some cases, however, the total cost of a merger may exceed the sales price and cost-reducing investments because the two divisions are able to collaborate efficiently only after an effort is made which requires some fixed costs and has not yet led to cost reductions. Furthermore, a similar effort may be necessary in order to launch a joint venture.[9]

Let $G, G \geq 0$, denote the fixed cost of a merger, to be borne by the foreign firm. In case of joint venture, however, both the foreign and the local firm may have to cover fixed costs. Let $H_1(H_2), H_1(H_2) \geq 0$, denote the fixed costs which the foreign (local) firm has to bear in a joint venture. These fixed costs can also be thought of as the *contractible* and *enforceable* part of the joint venture agreement, whereas the investments I_1 and I_2 continue to be

[9]We will keep the assumption that trade is without any fixed cost which is reasonable since we may assume that the foreign firm is already active in other markets.

voluntary contributions. We are now able to deal with the cases in which a merger or a joint venture is not possible because the respective fixed cost is prohibitively large. We will denote the critical values of these fixed costs by $\bar{G}$, $\bar{H}_1$ and $\bar{H}_2$, respectively:

$$\begin{aligned} \bar{G} &= \Pi_1^{M*} - \Pi_2^{GF} (\geq \Pi_1^{M*} - \Pi_2^{T}), \\ \bar{H}_1 &= \Pi_1^{J*} - \Pi_1^{M*} + \Pi_2^{T} (\geq \Pi_1^{J*} - \Pi_1^{M*} + \Pi_2^{GF}), \\ \bar{H}_2 &= \Pi_2^{J*} - \Pi_2^{GF} (\geq \Pi_2^{J*} - \Pi_2^{T}). \end{aligned} \tag{32}$$

Definition (32) guarantees that no ambiguity can arise such that the outcome depends on the credibility of greenfield investment or trade. From our previous discussion which found that at least the foreign firm has a clear preference for forming a joint venture in case of no fixed cost of a joint venture and a not too small fixed cost of greenfield investment, we are now able to derive

Remark 2 *If $H_1 > \bar{H}_1$ or $H_2 > \bar{H}_2$, the equilibrium market structure will be*

- *merger or trade if $F > \bar{F}$ and $G < \bar{G}$,*
- *merger if $F < \bar{F}$ and $G < \bar{G}$,*
- *greenfield investment if $F < \bar{F}$ and $G > \bar{G}$.*

Generally, fixed costs of joint ventures and mergers do not allow to rank the preferences of the foreign firm as we could do it in particular in subsection 4.1. Including fixed costs may imply that the foreign firm has a preference for a merger even with a credible greenfield investment threat, either because its fixed cost of forming a joint venture are substantially larger than those of a merger or its potential partner's fixed cost of forming a joint venture are too large. Although we cannot say more on the ranking of all options, we are able to explore how the *relative* advantage of a joint venture compared to a merger changes both with the efficiency parameter of the foreign firm, β, and the general efficiency parameter, γ, if greenfield investment is a credible threat. Let

$$\Delta(\beta,\gamma) = \frac{2\delta(2b\delta - \beta^2\gamma^2)}{(2b\delta - (1+\beta^2)\gamma^2)^2} + \frac{1}{b} - \frac{16\delta}{9b\delta - 4\beta^2\gamma^2} \tag{33}$$

denote the relative advantage of the joint venture compared to a merger for the foreign firm according to (26).[10] The larger (smaller) Δ, the larger (smaller) is the relative advantage of a joint venture compared to a merger. We already know that the local firm is interested in forming a joint venture with a strong foreign partner (see (15)), so that acceptance of a joint venture will increase with β. We will now explore the trade-off between β and γ. From expression (33), we observe that $\Delta(\beta, 0) = -2/9b < 0$. Furthermore,

$$\Delta(0,\gamma) = \frac{4b\delta^2}{(2b\delta - \gamma^2)^2} + \frac{1}{b} - \frac{16\delta}{9b\delta} > (<)0 \tag{34}$$

if $\gamma > (<)\ \bar{\gamma}$ with $\bar{\gamma} = \sqrt{(2 + 6/\sqrt{7})b\delta} = 2.06586\sqrt{b\delta}$. Hence, a merger becomes relatively more attractive for low values of the general efficiency parameter γ, irrespective of the productivity of the foreign firm, measured by β. For low values of β, joint ventures become more attractive with an increase in the general efficiency parameter.

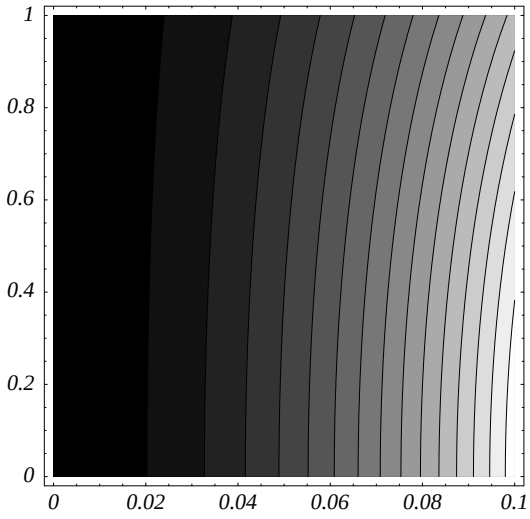

Figure 1: Indifference curves for $\gamma \in [0, 0.1]$

[10] Definition (33) differs from (26) only by the positive factor $(a-c)^2/16$.

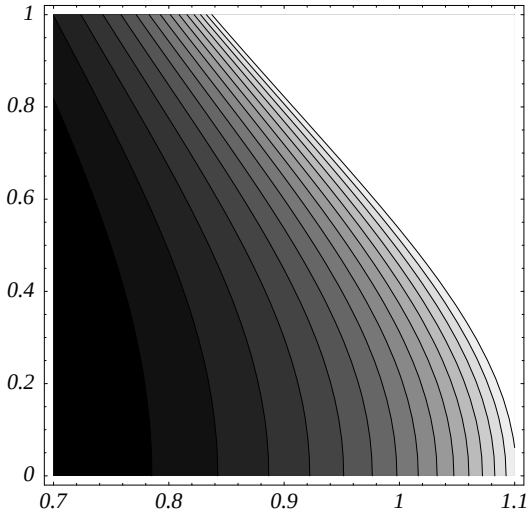

Figure 2: Indifference curves for $\gamma \in [0.7, 1.1]$

Based on (33), we may discuss the slopes of indifference curves, *i.e.*, β–γ–combinations for which the difference in foreign profits between joint venture and merger remains constant. If we pick any feasible β–γ–combination and consider changes such that $\beta^2\gamma^2$ remains constant, *i.e.*, if β and γ are changed such that $d\beta/d\gamma = -\beta/\gamma$, only the denominator of the first Δ–term will decrease with the general efficiency parameter γ. Thus, joint ventures become more attractive along an increase of γ with $d\beta/d\gamma = -\beta/\gamma$, and the increase in γ has to be less to keep Δ constant. This exercise shows that the indifference curves must have a slope of less than $-\beta/\gamma$ or even a positive slope (*i.e.*, γ has to be reduced in order to keep Δ constant). Figure 1 shows the result of a simulation for relatively low values of γ. In this case, indifference curves are positively sloped.[11] Figure 2 shows a simulation for a relatively high values of the general efficiency parameter which implies negatively sloped indifference curves. Given these findings, we may conclude the comparison of joint ventures and mergers as follows:

Remark 3 *Joint ventures (mergers) are relatively more attractive for the*

[11]Parameter specification in both simulations is $b = \delta = 1$. The ranges for the general efficiency parameter γ do not violate condition (13). The relative advantage of joint ventures compared to mergers increases with brighter areas in both figures.

foreign firm, the more (less) efficient cost-reducing investments are. For a low productivity of the foreign firm, merger profits are relatively larger (smaller) for low (high) levels of general efficiency.

5 Concluding remark

This paper has demonstrated the interdependencies of the different modes of FDI. It has shown that a credible threat of greenfield investment is likely to support a joint venture agreement. Furthermore, it has endogenized the investment levels for the cases of mergers and joint ventures so that heterogeneity of firms is a result of optimal investment behavior. Despite this interdependency among these modes of FDI, the model has arrived at some clear predictions. A strong potential for cost-reducing investments favors joint venturer, whereas a weak potential together with a relatively weak productivity of the potential multinational firm favors a merger.

The paper has adopted the simplest possible setup of three firms in a homogeneous commodity market. The assumption of a triopoly has made the effects of the merger paradox very strong so that a merger can be profitable only with substantial cost savings. It should be clear that increasing the number of rivals in this market will weaken the merger paradox and will increase the profitability of a merger. Furthermore, only a single foreign firm has been assumed to decide on FDI. It is left to future research whether and which modes of FDI can co-exist in oligopolistic markets if more than just one multinational firm is allowed to enter the market.

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Appendix: Proof of Lemma 2

Condition (26) can be written as

$$\begin{aligned} f(\delta) := (2b\delta(2b\delta - \beta^2\gamma^2))(9b\delta - 4\beta^2\gamma^2) \\ -16b\delta(2b\delta - (1+\beta^2)\gamma^2)^2 \\ +(2b\delta - (1+\beta^2)\gamma^2)^2(9b\delta - 4\beta^2\gamma^2). \end{aligned} \tag{A.1}$$

Note that

$$f(\delta = \frac{(1+\beta^2)\gamma^2}{2b}) = (9 + 10\beta^2 + \beta^4)\gamma^6/2 \tag{A.2}$$

and

$$\frac{df}{d\delta} = b\left(4b(14 - 11\beta^2)\delta\gamma^2 + 24b^2\delta^2 + (2\beta^2 + 17\beta^4 - 7)\gamma^4\right) > 0 \tag{A.3}$$

because $(2\beta^2 + 17\beta^4 - 7)\gamma^4 > -7\gamma^4$, $4b(14 - 11\beta^2)\delta\gamma^2 > 12b\delta\gamma^2 > 6(1 + \beta^2)\gamma^2 > 6\gamma^2$ and $24b^2\delta^2 > 6(1 + \beta^2)\gamma^2 > 6\gamma^2$ due to $\beta \leq 1$. Hence $f(\delta)$ is positive in the relevant range which proves that the foreign firm will always prefer a joint venture. □