Cross-border Mergers and Entry Modes of FDI Inflows

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Abstract

Two distinctive differences of FDI inflows between developed and developing economies are entry modes and evidence of government regulations. This paper investigates the incentives of FDI flows in terms of cost-saving merger, fixed cost of entry and the role of government policies. In particular it shows that, if the cost-saving effect is large and the government intervenes, the foreign firm will consider the FDI through either Greenfield or Brownfield, which corresponds to the situation for FDI flows into developing economies. Otherwise, the foreign firm will only consider Brownfield or staying outside, which stands for the developed economy case. Since one remarkable feature of the FDI flows into developing countries is the benefit of cost-saving from low labour costs and cheaper raw materials, this paper takes this effect into account and provides insights for economic "outsourcing". The multi-stage sequential game model presented in this paper provides comparable results for the pattern of the FDI flows affected by regulation and institutional factors, which are not addressed by existing literature. Finally, it reveals some intuition and feature of a developing economy where the government regulations on FDI flows are more often observed.

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Key Words: Cross-border mergers; Entry modes; FDI; Profit sharing rule; Welfare

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1 Introduction

During the past two decades Foreign Direct Investment (FDI) has become a major source of capital inflows for both developed and developing economies. These investments are often made by multinational firms which enter a local market through either the so-called Greenfield or Brownfield mode. By definition, Greenfield FDI refers to investments that create new production facilities in host countries (for example, starting a new plant), while Brownfield FDI refers to cross-border mergers and acquisitions (Cross-border M&As).

According to World Investment Report (UNCTAD, 2000, 2005), it is interesting to note that there are remarkable differences in entry modes of FDI inflows between developed and developing economies. To give some numbers, until 1999 the value ratio of cross-border mergers to total FDI inflows was nearly 100% for the former, rising from 80% in the mid-1990s. However, in developing economies the ratio was closer to 40%, with considerable variation across regions: from 20% in emerging Asia to 60% in Latin America and the Caribbean, as presented in Figure 1 and 2. From the year 2002 to 2004, the value ratio varied between 58.9% and 83.1% for developed economies, and the ratio was still 30%-40% lower on average for developing ones (see Figure 3). To summarize, as we observed, FDI inflows take mostly the form of cross-border M&As (Brownfield) in developed economies, but more frequently appear as Greenfield investments in emerging market regions, i.e. building a new local firm.

Given the difference above, the purpose of this paper is to provide theoretical arguments for the motivation and entry modes of FDI inflows in terms of cost-saving merger, fixed cost of entry and the role of government policies. It gives a model with imperfect competition and government regulation to analyze the incentives and welfare implications of different entry modes. The structure of the model is a four-stage, noncooperative sequential game with government moving first by setting up the policy, followed by the foreign firm’s decision, local firms’ response and market competition. The rational to take the role of government into consideration is that various restrictions on FDI inflows have been observed across countries. The most frequently observed policies on FDI inflows, according to World Investment Report (2000), are limits on the foreign capital share ownership. The pattern of these restrictions differs across countries as well as across sectors within the country1. For example, considering

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1World Investment Report (2000), pp. 15: "Indeed, perhaps the most common concern about cross-border M&As — in distinction to Greenfield FDI — is their impact on domestic competition...Governments therefore increasingly realize that effective competition policy is vital, and a large number of countries have
the basic telecommunication industry in Asia, Philippine has a high degree of competition co-existing with limitations on foreign equity partnership. Pakistan and Sri Lanka have allowed limited foreign equity participation in monopolies to strategic investors, and deferred the introduction of competition for several years. Korea, however, is allowing increased foreign equity participation more gradually than competition. In the banking industry, China, as one of the fastest growing emerging market economies, still requires the foreign equity share of many joint-venture entities be less than 50% to ensure that they are state-owned enterprises (SOEs). Political economy models with agents or interest groups lobbying for capital allocation may provide alternative insights for some specific policies, but we abstract them from this analysis.

The primary objective of this paper is to shed light on the economic rationale behind these policies and consider FDI inflows in different entry modes under government intervention. By assuming that the local government has incentives to direct the FDI flows in regarding to social welfare, we show that the equilibrium outcome can be either the foreign firm enters through Greenfield or Brownfield, or staying outside. Moreover, the equilibrium outcome depends very much on the cost-saving effect and marginal cost difference between local and foreign firms. This difference stands for motives of technology diffusion and production cost variations between countries. This model provides us comparable results for the FDI flows that are affected by regulation and institutional factors, which are not addressed by existing literature about cross-border mergers and FDI. Finally, it reveals some intuition and feature of a developing economy where government regulations on FDI flows are more often observed.

To link this study with other ones, recent literature can be reviewed in two streams. First, there are a few studies that consider the entry modes of FDIs. Some researchers have been focusing on the technology transfer and preferred entry mode of foreign firms\(^2\). Others tend to use bidding strategies of foreign entrants on target firms or cooperative games to adopted (or are in the process of preparing) competition laws."

\(^2\)For example, Mattoo et. al (2004) show the trade-off between technology transfer and market competition emerges as a key determinant of preferences. They identify the circumstances in which the government and foreign firm’s choices diverge, and domestic welfare can be improved by restrictions on FDI which induce the foreign firm to choose the socially preferred mode of entry. Lee and Shy (1992) demonstrated that restrictions on foreign ownership may adversely affect the quality of technology transferred, but the foreign firm was obliged to form a joint venture. Roy et al. (1999) examine a situation in which a foreign firm has already established in the local market and consider alternative collaborative deals between it and a local firm. They identify the degree of cost asymmetry between the foreign and local firm, and the market structure as crucial to determining the optimal choice of policy.
analyze the probability of Greenfield vs Brownfield investment. The literature on entry modes of FDI has tended to focus on the behavior of multinational firms where the foreign firm seeks to prevent the dissipation of its technological advantage (see Ethier and Markusen, 1996, Markusen, 2001, and Saggi, 1996, 1999). Yu and Tang (1992) discuss several potential motivations for international acquisition of firms. These include: cost reduction, risk sharing, and competition reduction. Some empirical studies, including Rossi and Volpin (2003) and Di Giovanni (2003), investigate the cross-country determinants of international M&As, and find that countries with strong records of investor protection and well-developed capital markets are more likely to attract cross-border M&As. Globerman and Shapiro (2005) compare entry via M&A with total FDI flows, but find little evidence of mode-specific location effects between M&A and alternative modes. Second, this paper is closely related to the literature of horizontal mergers. Among these, the first paper that concerns this problem is Salant et al. (1983), which show that the merger is not profitable unless more than 80% of the firms are involved, under Cournot competition with homogeneous good, linear demand and constant marginal costs. Some studies on merger focus on the content of domestic merger under trade liberalization. Long and Vousden (1995) show that only a unilateral tariff reduction will tend to increase the incentive to merge between domestic firms. The effect on the gain from merger depends on savings in marginal costs resulting from the merger, while a bilateral tariff reduction has the opposite effect. Gaudet and Kanouni (2001), Benchekroun and Ray-Chaudhuri (2004) give numerical examples of prohibitive tariff and non-marginal change in tariff reduction, i.e. tariff abolition.

In regarding with cross-border merger, Qiu and Zhou (2006) explain why cross-border M&A would happen under asymmetric information held between domestic and foreign firms. They assume the only difference between domestic and foreign firms is that the domestic firms hold private information about the market demand fluctuations, and information sharing between the firms tends to encourage cross-border merger. Most of studies above consider the exogenous merger problem in such a way that the necessary condition for merger to happen is the increasing joint profit after merger, while previous research provides only a few models of endogenous mergers. Important contributions have been made by Kamien and Zang (1990, 1992), Barros (1998), Gowrisankaran (1999), Fauli-Oller (2000), and Gowrisankaran

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3 Among these, Horn and Persson (2001), Norbäck and Persson (2004) show that multinational firms enter a new market by acquisitions may make a lower profit than those entering Greenfield. They find that the bidding competition between the foreign firms drives up the acquisition price to such a level that being a successful greenfield entrant is, ex post, more profitable.
and Holmes (2004). A major complexity of all such models is the multiplicity of equilibria. To deal with this problem, researchers have restricted the number of firms to three (Barros, 1998) or four (Fauli-Oller, 2000), or assumed that firms acted in a pre-determined order (Gowrisankaran, 1999; Fauli-Oller, 2000). Some researchers have used cooperative games to analyze endogenous mergers (Barros, 1998).

Different from existing literature on cross-border merger and entry modes of FDI, in this model the government in the local country plays an important role in directing FDI inflows. We assume the government sets up a profit sharing rule for the merged domestic and foreign firm in a way that this rule maximizes the domestic social welfare. This policy assumption can be viewed as the equity share restrictions applied by many countries and the foreign firm can only obtain the profit subject to its maximum equity share after merger. Also, the endogenous merger problem is partially considered in this paper such that the foreign firm has the option to propose a merger offer and the home firm has options to accept or decline it.

The rest of the paper is organized as the following. The model and its assumptions are set up in Section 2. Section 3 builds some preliminary results that are crucial in deriving Subgame Perfect Nash Equilibria (SPNEs) of the model. In Section 4, some special cases are analyzed and numerical examples are given. Section 5 concludes, followed by a discussion of policy implications and intuitions of the findings.

2 A simple model with FDI policies and entry choices

In this section, the model is described with certain assumptions. We consider an industry that consists of \( n \) identical domestic firms \((H_i, i = 1, \ldots, n)\) and one foreign firm \((FF)\), with marginal cost \( c \) and \( c_f \), respectively. Further, we assume \( c_f \neq c > 0 \) such that the foreign firm produces at a different marginal cost to the home firm. There is one representative consumer with a quadratic utility function in the home country and no foreign consumers. All firms compete in the domestic market and the market structure is Cournot competition with homogeneous goods\(^4\). Additionally, we suppose initially the foreign firm exports all its goods to the domestic market and there are no transportation costs. Now the government opens its capital account and allows for FDI inflows. Therefore the foreign firm has three

\(^4\)In Section 4 there are some arguments for the case of Bertrand competition. If firms produce differentiated goods, as long as they are substitutes and the elasticity is large enough, the main results still hold.
options, which are continuing exports (staying outside), Greenfield or Brownfield FDI. It is worth noting that the market structure is similar to Qiu and Zhou (2006), except that we don’t assume private information and product differentiation, instead here we tend to introduce cost heterogeneity, entry choices and government policies.

The market demand function is linear, which comes from the assumption that the representative consumer in the home country has quadratic utility functions,

$$P = A - Q$$

Where

$$Q = q_f + \sum_{i=1}^{n} q_i$$

$q_f$ denotes for the output of $FF$ and $q_i$ is the output of $H_i$. Also, $A$ is large enough to ensure every firm to produce a positive output under any circumstance.

Now we consider the entry modes of $FF$. The FDI is done through Greenfield or Brownfield. $FF$ may consider the option between merger with a home firm and building a new plant in the home country. Suppose $FF$ chooses to merge, it faces a given profit sharing rule set by the home government such that it gets certain part of the joint profit, and the merged home firm gets the rest. This type of policy represents the current situation that most existing FDI policies are capital share limitations, therefore the foreign firm will get the proportion of the joint-profit according to its capital share. It is important to note that $FF$ can bypass this policy by choosing staying outside or Greenfield FDI since they represent 100% ownership.

Further, we assume that if merger happens, the joint merger profit is denoted by $\pi^M$, and the marginal cost for the joint entity will be reduced to zero, which indicates a cost-saving benefit for both merged firms. To understand it, we can suppose that this is a labor-intensive industry such that $FF$ has superior production technology (or more efficient management) but higher wage cost, and $H_i$ has less advanced technology but lower wage cost, then the merger of the two firms can have even lower marginal cost than before. So the benefits of a potential merger comes from two sources. One is from more market power due to fewer number of firms in the market, and the other is the profit gain from cost-saving. However, if $FF$ chooses Greenfield investments, there is a lump-sum fixed cost $F$ and its marginal cost
will also be reduced to zero (it is the case that FF becomes a local producer in the home country by starting a new firm, it gets access to the cheaper local labor market as well).

The game structure of the model is as follows. We consider a four-stage, noncooperative game presented by Figure 4. The home government moves first by choosing the FDI policy. Specifically, it sets up a profit sharing rule, \( \alpha \), which is the profit share of the joint profits for FF, and \( 1 - \alpha \) for \( H_1 \) (without loss of generality, we assume FF makes the merger offer to \( H_1 \)). Once set, the policy will not be changed regardless that merger happens or not in following stages. In the second stage, the foreign firm makes its decisions. FF has three options: 1. it can stay outside with no action (exporting, denoted by \( N \)). 2. it can build a new plant in the home country and shift all production there (Greenfield, denoted by \( B \)). 3. it can make a merger offer to \( H_1 \) (Brownfield, denoted by \( M \)). If FF chooses M, there is a third stage that the domestic firm can either accept or decline the merger offer. If the latter happens, the foreign firm will again choose between \( B \) or \( N \). After all decision have been made, all firms engage in Cournot competition.

It is interesting to note that unlike existing literature of exogenous mergers, in this model the necessary condition for the merger to happen is no longer that the joint profits are greater than before. Now the domestic government sets up the joint profit sharing rule between the domestic firm and the foreign firm, given by,

\[
\begin{align*}
\pi_f^M &= \alpha \pi^M \\
\pi_i^M &= (1 - \alpha) \pi^M, \alpha \in [0, 1]
\end{align*}
\]  

Therefore \( H_1 \) will compare the ex ante profit obtained from accepting or declining the merger offer made by FF. In this sense, the model partially considers the endogenous merger problem that merger may not happen even if the joint profit is greater since the home firm will decline the offer as long as it is not sufficiently compensated according to the profit sharing rule.

3 Solving for subgame perfect equilibria of the game

3.1 Firms’ profits under different entry modes

To get any subgame perfect equilibrium, we need to derive the payoffs of all firms in every node of the game specified in Figure 4. Noting that there are in total three outcomes, let’s consider each case separately. The first one, which is the simplest case that FF maintains
its status as a foreign producer (staying outside). It becomes a problem of static Cournot competition with heterogeneous marginal cost. All firms’ problems are given by,

\[
\max \pi_f^N = P q_f - c_f q_f \\
\max \pi_i^N = P q_i - c_i
\]  

(4)  

(5)

FOCs for FF and any home firm are as follows,

\[
\frac{\partial}{\partial q_f} \pi_f^N = A - c_f - 2q_f - \sum_{i=1}^{n} q_i = 0
\]

\[
\frac{\partial}{\partial q_j} \pi_j^N = A - q_f - 2q_j - \sum_{i=1, i \neq j}^{n} q_i - c = 0
\]

By symmetry, \(q_i = q_j \neq q_f\) we have,

\[
\frac{\partial}{\partial q_f} \pi_f^N = A - 2q_f - nq - c_f = 0
\]

(6)  

\[
\frac{\partial}{\partial q_j} \pi_j^N = A - q_f - (n+1)q - c = 0
\]

(7)

The equilibrium quantities, market price, profits are given by,

\[
q_i^N = \frac{1}{n+2} (A - 2c + c_f)
\]

(8)  

\[
q_f^N = \frac{1}{n+2} (A - c_f - nc_f + cn)
\]

(9)  

\[
P^N = \frac{1}{n+2} (A + c_f + cn)
\]

(10)  

\[
\pi_f^N = \frac{1}{(n+2)^2} (A - c_f - nc_f + cn)^2
\]

(11)  

\[
\pi_i^N = \frac{1}{(n+2)^2} (A - 2c + c_f)^2, i = 1, 2, ..., n
\]

(12)  

Next, we consider the case that merger happens in a way that FF chooses M and \(H_1\) accepts the offer. By assumption the marginal cost will become zero for the new merged firm. The joint profit after merger is:

\[
\pi^M = P(q_f + q_1) = (A - q_f - q_1 - \sum_{i=2}^{n} q_i)(q_f + q_1)
\]

(13)  

FOC:

\[
\frac{\partial}{\partial (q_f + q_1)} \pi^M = A - 2(q_f + q_1) - \sum_{i=2}^{n} q_i = 0
\]
Since under symmetry $q_f = q_1$, we have

$$\frac{\partial}{\partial (q_f + q_1)} \pi^M = A - 4q_f - \sum_{i=2}^{n} q_i = 0$$

(14)

For domestic firm $j \neq 1$,

$$\pi_j = P_q j - c_q j = (A - q_f - q_1 - \sum_{i=2}^{n} q_i)q_j - c_q j$$

(15)

FOC:

$$\frac{\partial}{\partial q_j} \pi_j = A - q_f - q_1 - 2q_j - \sum_{i=2, i \neq j}^{n} q_i - c = 0$$

By symmetry, $q_j = q, j = 2, 3, \ldots, n$

$$\frac{\partial}{\partial q_j} \pi_j = A - 2q_f - (n + 1)q_j - c = 0$$

(16)

So equilibrium price and joint profit after merger are:

$$P^M = \frac{1}{n + 1} (A - c + cn)$$

(17)

$$\pi^M = \frac{1}{(n + 1)^2} (A - c + cn)^2$$

(18)

According to the profit sharing rule given in Section 2, we can compute the profit of $FF$ under given sharing rule:

$$\pi_f^M = \alpha \pi^M = \frac{\alpha}{(n + 1)^2} (A - c + cn)^2$$

(19)

The profit of the merged domestic firm $H_1$ is:

$$\pi_1^M = (1 - \alpha) \pi^M = \frac{1 - \alpha}{(n + 1)^2} (A - c + cn)^2$$

(20)

The profit of the rest domestic firms $j \neq 1$ is

$$\pi_j^M = Pq_j - c_q j = \frac{(A - 2c)^2}{(n + 1)^2}, j = 2, 3, \ldots, n$$

(21)

Finally, if $FF$ chooses to build a new factory (denoted by $B$) in either the second or the fourth stage (the merger offer is rejected), we need to derive the payoffs for both firms. By assumption, $FF$’s marginal cost will also become zero and there is a fixed cost of building,
denoted by $F$. The difference compared with the merger case is that the number of firms in the market in still $n+1$, not $n$ as two firms getting merged. Similarly to the calculation above, we can get the equilibrium outputs and profits as,

$$q^B_i = \frac{1}{n+2} (A - 2c)$$  \hspace{1cm} (22)

$$q^B_f = \frac{1}{n+2} (A + cn)$$  \hspace{1cm} (23)

$$P^B = \frac{1}{n+2} (A + cn)$$  \hspace{1cm} (24)

$$\pi^B_f = \frac{1}{(n+2)^2} (A + cn)^2 - F$$  \hspace{1cm} (25)

$$\pi^B_i = \frac{1}{(n+2)^2} (A - 2c)^2, \ i = 1, 2, ..., n$$  \hspace{1cm} (26)

So far all payoffs for each type of firms have been derived and we are ready to look for SPNEs in the next section.

3.2 The SPNEs of the entire sequential game

Now payoffs for all firms are known and we can solve the game through backward induction. To simplify the arguments, only pure strategy equilibrium is discussed. First, let’s consider the following proposition.

**Proposition 1** For the foreign firm, there exists a threshold value of its marginal cost, denoted by $\hat{c}_f$, such that all other things equal,

(a) if $c_f$ is above the threshold value $\hat{c}_f$, staying outside (N) is a dominated strategy to building a new firm (B).

(b) if $c_f$ is below the threshold value $\hat{c}_f$, building a new firm (B) is a dominated strategy to staying outside (N).

**Proof.** We can solve for $\hat{c}_f$ as follows:

let $\pi^N_f = \frac{1}{(n+2)^2} (A - c_f - nc_f + cn)^2 = \pi^B_f = \frac{(A + cn)^2}{(n+2)^2} - F$

So we have,

$\hat{c}_f = \frac{1}{n+1} \left( A + cn - \sqrt{(A + cn)^2 - (n + 2)^2 F} \right)$

Given that $\pi^N_f$ is monotonic decreasing in $c_f$, if $c_f$ is above the threshold value $\hat{c}_f$ which implies $\pi^B_f \geq \pi^N_f$, N is dominated by strategy B, vice versa. ■

**Remark:** the intuition behind Proposition 1 is straightforward. Without considering the merger option, the trade off between choosing staying outside and building a new firm
is the cost-saving effect \( (c_f = 0) \) versus the fixed cost \( F \). In other words, as long as the cost-saving effect is large enough and it outweights the profit loss from fixed cost, building is always more profitable than no entry.

Proposition 1 can help us sorting out the SPNEs and we consider the following two cases separately.

Case (a). \( c_f \) is above the threshold value \( \tilde{c}_f \), staying outside (N) is a dominated strategy to building a new firm (B). So FF will never choose staying outside.

Now following Figure 4, let’s go back one stage and examine the domestic firm. If accepting the merger offer is more profitable for the domestic firm, such that \( \pi^M_1 \geq \pi^P_1 \), from (20) it implies,

\[
\frac{1 - \alpha}{(n + 1)^2} (A - c + cn)^2 \geq \frac{(A - 2c)^2}{(n + 2)^2}
\]

so we have

\[
\alpha \leq 1 - \frac{(n + 1)^2 (A - 2c)^2}{(n + 2)^2 (A - c + cn)^2} = \alpha_h,
\]

Under given \( \alpha \), we conclude that \( H_1 \) will accept the merger offer if and only if \( \alpha \leq \alpha_h \).

Now moving to the second stage, and FF has only two options, B and M. We need to consider the profits of FF by choosing B or M.

Suppose \( \alpha \leq \alpha_h \), (given the assumption that \( H_1 \) accepts the merger offer), if merger is also more profitable for the foreign firm, we need, \( \pi^M_f \geq \pi^P_f \). So we have

\[
\frac{\alpha}{(n + 1)^2} (A - c + cn)^2 \geq \frac{1}{(n + 2)^2} (A + cn)^2 - F > 0
\]

which indicates

\[
\alpha \geq \frac{(n + 1)^2 [(A + cn)^2 - (n + 2)^2 F]}{(n + 2)^2 (A - c + cn)^2} = \alpha_l
\]

In this case, FF will choose to make a merger offer and it will be accepted by \( H_1 \), if \( \alpha \in [\alpha_l, \alpha_h] \). It chooses B otherwise.

Now let’s go back to the first stage of the game and consider the domestic government’s problem. It will maximize the domestic social welfare by choosing \( \alpha \). The social welfare for the home country is defined as the sum of total consumer surplus and domestic producer surplus, which are the profits of all domestic firms.

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\( \alpha_l, \alpha_h \) are values for the incentive compatible constraints for both foreign and domestic firms to agree to merge. It is not necessarily true that \( \alpha_l \) must be less than \( \alpha_h \). If \( \alpha_l \) is greater than \( \alpha_h \), merger will not happen. Additional arguments are given in Section 4.
In the above case, the representative consumer surplus is given by:

\[ CS = \int_0^{Q^*} D(Q)dQ - P^* Q^* = \frac{(c + A n - cn)^2}{2(n + 1)^2} \]  

(31)

Domestic producer surplus is the sum of the total profits of all domestic firms:

\[ PS = \sum_{i=1}^{n} \pi_i = \frac{(1 - \alpha)(A - c + cn)^2}{(n + 1)^2} + \frac{(n - 1)(A - 2c)^2}{(n + 1)^2} \]  

(32)

The social welfare is given by,

\[ SW = CS + PS = \frac{(c + A n - cn)^2}{2(n + 1)^2} + \frac{(1 - \alpha)(A - c + cn)^2}{(n + 1)^2} + \frac{(n - 1)(A - 2c)^2}{(n + 1)^2} \]  

(33)

We can easily show that \[ \frac{\partial SW}{\partial \alpha} = -\frac{1}{(n + 1)^2} (A - c + cn)^2 < 0 \]

If \( \alpha_t \leq \alpha_h \), the government will certainly choose \( \alpha = \alpha_t \). Substituting it into the social welfare, we have the social welfare under merger is:

\[ SW^M = CS^M + PS^M = \frac{(c + A n - cn)^2}{2(n + 1)^2} + \frac{(1 - \alpha_t)(A - c + cn)^2}{(n + 1)^2} + \frac{(n - 1)(A - 2c)^2}{(n + 1)^2} \]  

(34)

So the government will just choose \( \alpha_t \) to maximize domestic social welfare and make the foreign firm indifferent between \( M \) and \( B \). Since we only consider pure strategy equilibria, in this case \( FF \) will choose \( M \), \( H_1 \) will choose accept, and this is one of the SPNEs. The intuition behind this result is that the domestic firm benefits from the merger through cost-saving effect and increasing market power of fewer firms. The government tries to pay as less as possible to the foreign firm to maximize social welfare.

From the above case we know that if \( \alpha \in [0, \alpha_t) \), \( FF \) will choose \( B \) and there are only two stages of the game. Given this, the social welfare under build is derived similarly and we have,

\[ SW^B = CS^B + PS^B = \frac{(A + A n - cn)^2}{2(n + 2)^2} + \frac{n(A - 2c)^2}{(n + 2)^2} \]  

(35)

If \( \alpha \in (\alpha_h, 1] \), \( H_1 \) will decline the merger offer even if it is profitable for \( FF \). In this situation, \( FF \) will also choose \( B \), so the social welfare will be \( SW^B \).

Case (b). We consider another case that \( c_f \) is below the threshold value \( c_{f} \), i.e., building a new firm (B) is a dominated strategy to staying outside (N) for the foreign firm. In this case \( FF \) will only consider \( N \) or \( M \) in either stage. If merger is more profitable for \( FF \), such
that, $\pi_f^M \geq \pi_f^N$, the foreign firm will make a merger offer.

So we need

$$\pi_f^M = \frac{\alpha}{(n+1)^2} (A - c + cn)^2 \geq \frac{1}{(n+2)^2} (A - cf - nc_f + cn)^2 = \pi_f^N \quad (36)$$

which indicates

$$\alpha \geq \frac{(n+1)^2 (A - cf - nc_f + cn)^2}{(n+2)^2 (A - c + cn)^2} = \alpha^*_i \quad (37)$$

Recall the underlying condition for $H_1$ accepting the merger offer does not change, which is $\alpha \leq 1 - \frac{(n+1)^2 (A - 2c + cf)^2}{(n+2)^2 (A - c + cn)^2} = \alpha_h$. Therefore if $\alpha \in [\alpha^*_i, \alpha_h]$, $FF$ will choose to make a merger offer and it will be accepted by $H_1$.

From the same arguments as in previous case, the local government will also choose $\alpha^*_i$ to maximize social welfare.

The social welfare is given by,

$$SW^{M*} = CS + PS = \frac{(c + An - cn)^2}{2(n+1)^2} + \frac{(1 - \alpha^*_i) (A - c + cn)^2}{(n+1)^2} + \frac{(n-1) (A - 2c)^2}{(n+1)^2} \quad (38)$$

It is easy to show that if $\alpha \in [0, \alpha^*_i), \text{merger is not profitable for the foreign}, \pi_f^M < \pi_f^N$, and the foreign firm will choose to stand alone, $N$. The social welfare under this case will be,

$$SW^N = CS^N + PS^N = \frac{(A + An - cf - cn)^2}{2(n+2)^2} + \frac{n (A - 2c + cf)^2}{(n+2)^2} \quad (39)$$

Where $SW^N$ is derived from the situation that $FF$ chooses $N$ (stay outside as a foreign producer).

If $\alpha \in (\alpha_h, 1)$, $H_1$ will decline the merger offer. Since in this case we assume that $\pi_f^R \leq \pi_f^N$, $FF$ will choose $N$ and the social welfare will again be $SW^N$.

To summarize, we can refer to Table 1. for a complete description of all possible cases and SPNEs. It is worth noting that $\alpha_l$ or $\alpha^*_i$ is not necessarily less than $\alpha_h$. If this happens, it indicates there is a conflict on profit sharing between firms and equilibria that $FF$ chooses to merge does not exist. In that case, the FDI policy does not matter and the outcome will depend on the condition that the foreign firm’s marginal cost $c_f$ is below or above the threshold value $c_f$. 13
4 Merger conditions, welfare analysis and examples

After we describe all possible SPNEs of the game, in this section we examine several special cases and compare the results with existing studies in the literature. Specifically, we are interested in finding sufficient and necessary conditions for merger to happen. Also, in the general form of the model the social welfare is not comparable but we try to give some intuitive results.

1. The benchmark case: there is no cost-saving effect such that \( c = 0 \) and \( c_f = 0 \).

This case is identical to the one with perfect information in Qiu and Zhou (2006) except that there is no product differentiation. Their result is that merger will not happen unless the products is enoughly differentiated and the number of firms is limited. In our case, we get similar outcomes in a different mechanism in which the profit sharing rule deters merger.

**Proposition 2** If \( c = 0 \) and \( c_f = 0 \), merger never happens. The foreign firm will always choose \( N \), which is no entry. If \( n = 1 \), the government chooses \( \alpha \in [0, \frac{4}{9}) \cup (\frac{5}{9}, 1] \). If \( n > 1 \), the government chooses \( \alpha \in [0, 1] \) and the social welfare will always be \( SW^N \).

**Proof.** Since \( \pi_f^N = Pq_f - c_f q_f = \frac{A^2}{(n+2)^2} \) and \( \pi_f^B = Pq_f - F = \frac{(A + cn)^2}{(n+2)^2} - F = \frac{A^2}{(n+2)^2} - F < \pi_f^N \), the foreign firm will never choose \( B \) and it is shown in Proposition 1.

Now consider the possibility of merger, we get,

\[
\alpha_h = 1 - \frac{(n+1)^2 (A - 2(c + c_f))^2}{(n+2)^2 (A - c + cn)^2} = 1 - \frac{(n+1)^2}{(n+2)^2},
\]

\[
\alpha_h^* = \frac{(n+1)^2 (A - c_f - n(c_f + cn))^2}{(n+2)^2 (A - c + cn)^2} = \frac{(n+1)^2}{(n+2)^2},
\]

(one can refer to the plots in Figure 4)

The government will choose \( a \) to maximize social welfare, we can show that,

\[
SW^M - SW^N = \left(-\frac{1}{2}\right) A^2 \frac{(2n + 3)}{(n+1)^2 (n+2)^2} < 0,
\]

Noting that \( n \) can only be integers, \( \alpha_h > \alpha_h^* \) when \( n = 1 \), and \( \alpha_h < \alpha_h^* \) if \( n > 1 \), the SPNE would be the following,

If \( n = 1 \), to make a subgame perfect decision, government chooses \( \left[0, \frac{4}{9}\right) \cup \left(\frac{5}{9}, 1\right] \) and FF chooses \( N \). Social welfare will be \( SW^N \). If \( n > 1 \), similarly government chooses \([0, 1]\), FF choose \( N \). Social welfare will also be \( SW^N \).

The intuition behind this result is that when there is no cost-saving in the FDI process for the foreign firm, first, the foreign firm will never consider to build directly in the home country due to the fixed cost. Second, when there is only one domestic firm, the merger of
the two firms will make them a monopoly, which decreases the domestic social welfare and
the government tries to deter it. If there are more than one domestic firms, the merger will
also not happen due to the well known results of Salant et. al.(1983), which show that with
homogeneous good and cournot competition, the merger is profitable only if it includes at
least 80% of total firms.

Obviously, if we modify this model to the one without government intervention, it be-
comes a three-stage game that FF moves first by choosing entry mode, and H1 chooses
accept or decline the merger offer. It leads to the following proposition.

**Proposition 3** If $c = 0$ and $c_f = 0$, and the government does not set up the profit sharing
rule, the foreign firm will only consider staying outside or making a merger offer. Merger
happens if and only if $n = 1$.

**Proof.** Since we have derived the profits of FF by choosing $N$ and $B$, and $\pi_f^N > \pi_f^B$, $B$
is a strictly dominated strategy by $N$. Without the profit sharing rule, the merger happens
when the joint profit of the merged firm is higher than the sum of their original profits. In
our case, it requires $\pi^M = \frac{1}{(n+1)^2} > \frac{2}{(n+2)^2} = (\pi_f^N + \pi_1)$, which gives $n < 1.414$. So if $n = 1$,
merger will happen and it will be accepted by $H_1$. This result is consistent with Salant et. al. (1983) since if $n = 2$, the number of firm involved in merger only consists 2/3 of the the
total firms. ■

2. The more general case with $c_f \neq c > 0$.

As $FF$’s marginal cost $c_f$ increases, under given fixed cost $F$, the profit $\pi_f^N$ is monotonic
decreasing. As we show in Proposition 1, if $\pi_f^B \geq \pi_f^N$, we are considering case (a) in previous
section. Under this situation, the government need to only compare $SW^B$ and $SW^M$ to
decide the profit sharing rule. In particular, recall that

$$SW^B = \frac{1}{2(n+2)^2} (A + An - cn)^2 + \frac{n(A - 2c)^2}{(n+2)^2}$$

$$SW^M = \frac{1}{2(n+1)^2} (c + An - cn)^2 + \frac{1 - \alpha_1}{(n+1)^2} (A - c + cn)^2 + (n-1)\frac{(A-2c)^2}{(n+1)^2}$$

In most cases they are not comparable given the unknown parameter values. However,
we can characterize the conditions for merger to happen in following propositions.

**Proposition 4** If $c_f$ is above the threshold value $\hat{c}_f$ which implies $\pi_f^B \geq \pi_f^N$, merger happens
if and only if two conditions holds: (1) $SW^M \geq SW^B$, such that the home government has
incentive to choose \( \alpha = \alpha_l \), and \( FF \) is willing to make a merger offer. (2) \( 0 \leq \alpha_l \leq \alpha_h \leq 1 \), such that the SPNE of merger is sustained by the ex ante profit sharing rule. Otherwise, \( FF \) will choose to build a new plant.

**Proof.** In section 3 we show that, if \( \pi_f^{B} \geq \pi_f^{N} \), the social outcome will only be either \( SW^B \) or \( SW^M \), therefore the government will choose a higher social welfare. Further, even the government has chosen \( \alpha_l \), if \( \alpha_l > \alpha_h \), \( H_1 \) will decline the merger offer so \( FF \) ends up with the profit \( \pi_f^{N} \). According to sequential rationality, \( FF \) will choose \( B \) instead to assure a higher profit. This is the rational for the second condition. In numerical simulations we show that \( \alpha_l \) can exceed \( \alpha_h \) with given parameter’s value, so it does not support the sequential rationality choice of \( FF \). 

**Remark.** This proposition can be viewed as an explanation to the FDI entry modes in developing economies. It indicates that as long as the cost-saving effect is large enough \( (c_f \geq \hat{c}_f) \), the foreign firm always chooses to enter the local market in either Greenfield or Brownfield. The entry modes will depend on the market conditions and government policies. Given various market structures and policies across developing economies, we may observe high or low ratios of Brownfield in total FDI.

If \( c_f \) is below the threshold value \( \hat{c}_f \), which implies \( \pi_f^{B} < \pi_f^{N} \). \( B \) becomes a strictly dominated strategy for \( FF \) and it will never consider building a new plant. Back to the government’s problem, it now only need to compare \( SW^N \) and \( SW^M^* \) when choosing \( \alpha \). Recall that,

\[
SW^M^* = \frac{1}{2(n+1)^2} (c + An - cn)^2 + \frac{1 - \alpha_1^l}{(n+1)^2} (A - c + cn)^2 + (n - 1) \frac{(A - 2c)^2}{(n+1)^2}
\]

\[
SW^N = \frac{1}{2(n+2)^2} (A + An - c_f - cn)^2 + \frac{n (A - 2c + c_f)^2}{(n+2)^2}
\]

**Proposition 5** if \( c_f \) is below the threshold value \( \hat{c}_f \) which implies \( \pi_f^{B} < \pi_f^{N} \), merger happens if and only if the following two conditions holds: (1) \( SW^M^* \geq SW^N \) such that the home government has incentive to choose \( \alpha = \alpha_l^* \), under which \( FF \) is willing to make a merger offer. (2) \( 0 \leq \alpha_l^1 \leq \alpha_h \leq 1 \), such that the SPNE of merger is sustained by the ex ante profit sharing rule. Otherwise, \( FF \) will choose to \( N \), which implies staying outside.

**Proof.** Similar to Proposition 4. 

**Remark.** This proposition, combined with proposition 3, can provide some intuition for the FDI entry modes in developed economies. That is, in developed economies with similar
technology progress and production costs, the cost saving effect is small. Therefore building a new firm or outsourcing is seldom considered. If the foreign firm enters the home market or FDI ever happens, it will take the form of cross-border merger. In most developed economies government policies in regulating FDI do not involve capital share limitations directly and most them are anti-trust policies.

3. Degree of competition and the market structure.

In the above analysis we assume that the fixed cost and number of firms are given and only consider the effect of cost-saving on the entry modes of the firms. The welfare of each cases are not comparable due to unknown parameter values. Now suppose the number of firms in the home country varies, we have the following results.

**Proposition 6** If the number of domestic firms is large and $0 < c_f < 2c$, the social welfare with merger is always greater than those that the foreign firm stays outside or builds a new plant.

**Proof.** If $n \to \infty$, we have
\[
SW^M = \frac{1}{2} (A - c)^2 + F \\
SW^{M*} = \frac{1}{2} (A - c)^2 + c_f(2c - c_f) \\
SW^N = \frac{1}{2} (A - c)^2 \\
SW^B = \frac{1}{2} (A - c)^2
\]

From the above equations, we can easily get the results. ■

**Remark.** The intuition behind it is that if market is very competitive (number of firms is large), then firm’s profit are nearly zero. In the merged case, at least one domestic firm benefits from cost-saving effect since its marginal cost becomes zero after merger and this effect will dominate. However if the foreign firm chooses to build or stay outside, there is no benefit to the domestic firms at all. Certainly, it is worth noting that given proposition 4 and 5, the government can not always achieve the greatest social welfare due to the conditions for profit sharing rules. If the number of firms is finite, the results are ambiguous since it depends on the scale of cost-saving and fixed costs.

Finally, what would happen if we have Bertrand competition instead? Since under the profit sharing rule set by the government, even if the merger would always be beneficial to both firms under Bertrand competition (Deneckere and Davidson 1985), it may not happen due to the conflicts of interests between domestic firms and foreign firms. Again, the government would compare the social welfare to decide the optimal sharing rule. Also, if we
choose Bertrand competition, we need to introduce heterogeneous goods which adds to the complexity of the model. We expect that the general results will still hold except changes of some equilibria conditions, i.e., the elasticity of substitution between differentiated products being large enough.

### 4.1 Numerical examples

We present some numerical examples in order to show that in general there exist multiple equilibria of the game. So the outcome varies according to different marginal costs, fixed costs and number of firms.

**Example** \( A = 200, c = 3, c_f = 5, F = 100 \)

<table>
<thead>
<tr>
<th></th>
<th>( n = 1 )</th>
<th>( n = 2 )</th>
<th>( n = 3 )</th>
<th>( n = 10 )</th>
<th>( n = 11 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \alpha_h )</td>
<td>0.559</td>
<td>0.459</td>
<td>0.402</td>
<td>0.354</td>
<td>0.362</td>
</tr>
<tr>
<td>( \alpha_l )</td>
<td>0.447</td>
<td>0.557</td>
<td>0.621</td>
<td>0.627</td>
<td>0.602</td>
</tr>
<tr>
<td>( SW^M )</td>
<td>10521.</td>
<td>14964.</td>
<td>16736.</td>
<td>19044.</td>
<td>19110.0</td>
</tr>
<tr>
<td>( SW^N )</td>
<td>12937.</td>
<td>15791.</td>
<td>17108.</td>
<td>19025.</td>
<td>19084.</td>
</tr>
<tr>
<td>( SW^B )</td>
<td>12938.</td>
<td>15731.</td>
<td>17030.</td>
<td>18964.</td>
<td>19026.</td>
</tr>
<tr>
<td>( \pi_f^N )</td>
<td>4138.8</td>
<td>2280.1</td>
<td>1428.8</td>
<td>212.67</td>
<td>177.09</td>
</tr>
<tr>
<td>( \pi_f^B )</td>
<td>4478.8</td>
<td>2552.3</td>
<td>1647.2</td>
<td>267.36</td>
<td>221.24</td>
</tr>
<tr>
<td>( SPNEs )</td>
<td>([0, \alpha_l) \cup (\alpha_h, 1], B)</td>
<td>([0, 1], B, )</td>
<td>([0, 1], B, )</td>
<td>([0, 1], B, )</td>
<td>([0, 1], B, )</td>
</tr>
<tr>
<td><strong>Outcome</strong></td>
<td>( SW^B )</td>
<td>( SW^B )</td>
<td>( SW^B )</td>
<td>( SW^B )</td>
<td>( SW^B )</td>
</tr>
</tbody>
</table>

From the above example we can find that sometimes government policies are irrelevant (i.e., \( n = 2, 3, 10, 11 \)) since the foreign firm will choose Greenfield investment anyway when it is more profitable than staying outside and \( \alpha_l > \alpha_h \), which indicates that the conflict of participating constraints deters merger.
5 Concluding remarks

Two distinctive differences of FDI inflows between developed and developing economies are entry modes and evidence of government regulations. To address these differences, in this paper we have investigated the incentives of FDI flows in terms of cost-saving merger, fixed cost of entry and the role of government policies. In particular we show that, if the cost-saving effect is large \( (c_f \geq \hat{c}_f) \) and the government sets up the profit sharing rule for mergers, the foreign firm will consider the FDI investment through either Greenfield or Brownfield, which corresponds to the situation for FDI flows into developing countries (See proposition 4). Otherwise, the foreign firm will only consider merger or staying outside (See proposition 3 and 5), which stands for the developed economy case. Since we know that one distinctive feature of the FDI flows into developing countries is the benefit of cost-saving from low labour costs and cheaper raw materials, this paper takes this effect into account and provides some insights for economic "outsourcing". The results from this model can generate some testing hypothesis for future empirical analysis. Clearly one of them is that the greater the cost-saving effect (or equivalently the lower the fixed cost), the more frequently FDI enters as Brownfield.

This paper provides certain explanation, together with some numerical examples, for the entry mode of FDI and the incentive for the government intervention in directing the FDI flows. In the analysis we do not consider product differentiation or asymmetric information between producers, as Qiu and Zhou (2006) did. One reason is that we want to focus on the entry mode choice, the cost synergy and the difference between developed and developing economies; another reason is that more parameters introduced will result in even more multiple equilibria and unanalytical solutions. Certainly all those factors not considered may also be determinants of the FDI flows and are subject to further research.

References


Figure 1: Value of cross-border M&As in relation to the value of FDI inflows, world and by group of economies, 1987-1999, World Investment Report 2000 (in percentage)

Figure 2: Value of cross-border M&As in relation to the value of FDI flows in developing countries, by region, 1987-1999, World Investment Report 2000 (in percentage)
Figure 3: Ratio of cross-border M&A sales to FDI inflows, 2002-04, World Investment Report 2005

Figure 4: The structure of the game
Figure 5: Incentive compatible constraints for profit sharing rules
Table 1. Subgame perfect equilibria of the game

<table>
<thead>
<tr>
<th>Stage 4: foreign firm</th>
<th>Stage 3: home firm</th>
<th>Stage 2: foreign firm</th>
<th>Stage 1: government</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$\alpha \leq \alpha_n$, home firm chooses &quot;Accept&quot;</td>
<td>$\alpha \geq \alpha_i$, foreign firm chooses &quot;M&quot;</td>
<td>If $\alpha_i \leq \alpha_n$, government chooses $\alpha = \alpha_i$. $SW = SW^A$</td>
</tr>
<tr>
<td></td>
<td>$\alpha &lt; \alpha_i$, foreign firm chooses &quot;B&quot;</td>
<td>$\alpha \geq \alpha_i$, foreign firm chooses &quot;M&quot;</td>
<td>If $\alpha_i \leq \alpha_n$ and $SW^{M*} \geq SW^B$, government chooses $\alpha$, $SW = SW^A$</td>
</tr>
<tr>
<td></td>
<td>$\alpha &gt; \alpha_i$, $SW = SW^B$</td>
<td>$\alpha \geq \alpha_i$, foreign firm chooses &quot;M&quot;</td>
<td>If $\alpha_i &gt; \alpha_n$, government chooses $\alpha \in [0,1]$. $SW = SW^B$</td>
</tr>
<tr>
<td>$\alpha &gt; \alpha_n$, home firm chooses &quot;Decline&quot;</td>
<td>$\alpha &lt; \alpha_i$, foreign firm chooses &quot;B&quot;</td>
<td>$\alpha \geq \alpha_i$, foreign firm chooses &quot;M&quot;</td>
<td>If $\alpha_i \leq \alpha_n$ and $SW^{M*} &lt; SW^B$, government chooses $\alpha$, $SW = SW^A$</td>
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<td></td>
<td>$\alpha &gt; \alpha_i$, $SW = SW^B$</td>
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<td>If $\alpha_i &gt; \alpha_n$, government chooses $\alpha \in [0,1]$. $SW = SW^B$</td>
</tr>
</tbody>
</table>

Case (b):

$c_f \leq \hat{c}_f$, $B$ is dominated by $N$. Foreign firm chooses "N".

<table>
<thead>
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<td>$\alpha \leq \alpha_n$, home firm chooses &quot;Accept&quot;</td>
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<td>If $\alpha_i' \leq \alpha_n$ and $SW^{M*} \geq SW^N$, government chooses $\alpha = \alpha_i'$. $SW = SW^A$</td>
</tr>
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<td>$\alpha &lt; \alpha_i'$, foreign firm chooses &quot;N&quot;</td>
<td>$\alpha \geq \alpha_i'$, foreign firm chooses &quot;M&quot;</td>
<td>If $\alpha_i' \leq \alpha_n$ and $SW^{M*} &lt; SW^N$, government chooses $\alpha$, $SW = SW^A$</td>
</tr>
<tr>
<td></td>
<td>$\alpha &gt; \alpha_i'$, $SW = SW^N$</td>
<td>$\alpha \geq \alpha_i'$, foreign firm chooses &quot;M&quot;</td>
<td>If $\alpha_i' &gt; \alpha_n$, government chooses $\alpha \in [0,1]$. $SW = SW^N$</td>
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<td>$\alpha &gt; \alpha_n$, home firm chooses &quot;Decline&quot;</td>
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<td>$\alpha \geq \alpha_i'$, foreign firm chooses &quot;M&quot;</td>
<td>If $\alpha_i' \leq \alpha_n$ and $SW^{M*} \geq SW^N$, government chooses $\alpha - \alpha_i'$. $SW = SW^A$</td>
</tr>
<tr>
<td></td>
<td>$\alpha &gt; \alpha_i'$, $SW = SW^N$</td>
<td>$\alpha &lt; \alpha_i'$, foreign firm chooses &quot;N&quot;</td>
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