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private and collective incentive analysis

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TEPP - Institute for Labor Studies and Public Policies
TEPP - Travail, Emploi et Politiques Publiques - FR CNRS 3435

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May 2011

Abstract

The purpose of this paper is to formalize the choices of market entry strategy (Export Vs Greenfield investment Vs Cross border M&A) and the target selection (Acquisition of high-productivity firm or low-productivity one) for a foreign firm, and to delineate the relationship between foreign firm's incentive and host government's intention from an Industrial Organization (IO) perspective. It is found that cross border M&A is always the most profitable entry mode under both greenfield investment and export credible threats. If greenfield FDI is viable, entering firm prefers acquiring the low-productivity firm, when the integration ability is strong and the technological gap is sufficiently small; otherwise it prefers high-productivity one. Moreover, there is always the ambiguity between the foreign firm's preference and the government's judgment. If export entry option is viable, the variation of trade cost will alter the choice of target firm by the influence of acquisition price. The higher the trade cost, the more likely foreign firm purchases low-technology firm. In addition, the unanimity of private and collective incentive appears under certain circumstances.

Keywords: Integration ability; Cross border M&A; Export; Foreign direct investment; Technological gap; Greenfield investment

JEL classification: D21; F12; F23;

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1 Introduction

In an increasingly globalized world, the decision of how best to serve foreign markets is becoming one of the key challenges facing firms. A firm that has decided to sell its product abroad has two distinct options of serving foreign markets: exporting or producing locally by Foreign Direct investment (FDI). As well as seeing an increase in total FDI, people have also seen cross-border M&A increasing¹ in importance relative to greenfield investment. Consequently, the attention is shifted to the composition of FDI as firms can choose between different types of FDI².

Despite this increased importance of cross border M&A, the determinants underlying such activities remain unclear. Some economists have been keen to understand the factors driving the entry mode choice by foreign firm. There have been a fair number of papers written about cross border M&A versus greenfield investment, and some include a third option for a foreign firm such as exporting³. These models vary considerably in their structure and assumptions presumably largely because the modelers have different underlying questions in mind.

The existing theoretical literature on foreign firm's entry modes is separated into three important areas. One strand explores strategic aspects of the FDI/trade decision, such as tariff jumping FDI (e.g., Horstmann and Markusen, 1992; Motta, 1992; Buckley and Casson, 1998;), a second set of models analyzes the choice between FDI greenfield and acquisition (e.g., Hennart and Park, 1993; Mueller, 2001; Gorg, 2000) in the absence of trade costs, and a third category examines entry mode selection/firm's heterogeneity (e.g., Head and Ries, 2003; Helpman, Melitz and Yeaple, 2004; Nocke and Yeaple, 2007). We combine key aspects of each of the previous approaches to construct one integrated theoretical framework that allows for all three entry modes, namely Export, Greenfield investment and Cross border M&A⁴. This allows us to examine the

¹Caldéron et al., (2002) report that M&A activity almost doubled as a percentage of GDP (and increased as a share of total investment) in industrialized countries between the late 1980s and the late 1990s. Meanwhile, in developing countries, M&A is more than nine times as high as a share of GDP compared to 1987-1989. The bulk of FDI actually belongs to M&A activity, over eighty percent in 1999 according to UNCTAD (2000), or according to Head and Ries (2008) for the years between 1987 and 2001, two thirds of total FDI.

²Although FDI has received an enormous amount of attention in the literature, most of this literature has dealt exclusively with a single mode of FDI, mainly greenfield investment, and to a lesser extent with cross border M&A.

³Theoretical work starts to emphasize cross-border M&A and greenfield investment as two modes of foreign direct investment and alternatives to exporting as a way to enter foreign markets only recently (Nocke and Yeaple, 2007, 2008)

⁴In practice, world M&A have been predominantly driven by acquisitions. Cross border mergers represented only 3% of cross border M&As in 1999 (UNCTAD 2000). This is reason why we focus upon

determinants of foreign firm's entry decisions as a function of trade costs, FDI fixed costs, firm heterogeneity and market characteristics.

Apart from discussing three alternative entry modes, we regard the main contribution of this paper as being two-fold. First, while most of the existing models on cross border M&A do not focus on the target firm selection, since they simply assume domestic firms are identic. This paper considers a target choice process when several domestic firms accept the M&A proposal, this allows us to investigate how the relevant factors (i.e., the technological gap, integration ability, trade cost) affect the acquisition target. Second, we incorporate active host government judgment within our entry mode choice framework. In particular, consistent with what happens in most countries, we assume that the foreign firm must notify project (or decision) to government in host country, which can either authorize or block the foreign firm's plan. The host government decision is taken in order to authorize the entry mode which improves the most welfare of host country measured by the sum of consumer's surplus and domestic firm's profits and acquisition payment in case of M&A. In such a context, analyzing the optimal entry mode involves not only a standard firm's private incentive analysis, but also a study of the strategic interaction between the foreign firm and the host government which is regarded as a screening device to foreign firm's decision. The clash between the foreign firm's equilibrium choice and the local government's ranking of the three modes of entry can provide a rationale for some frequently observed market access restrictions.

The purpose of this paper is to formalize the choices of market entry strategy and the target selection for a foreign firm, and to delineate the relationship between foreign firm's incentive and host government's intention from an Industrial Organization (IO) perspective.

In our framework, firms with different productivity levels coexist, and the foreign entering firm is assumed to be more efficient than the firms in host country. This assumption is consistent with the common observation⁵ in Central and Eastern Europe (CEE). Empirical evidence⁶ confirms the potential entrant's super technology. In addition, Helpman et al. (2004) highlight the important role of within-sector firm productivity differences and demonstrate that only the most productive firm engages in foreign activities. This result reinforces the hypothesis on superior technology for foreign firm

the acquisition rather than mergers in this framework.

⁵See Müller (2000)

⁶Empirical evidence shows that exporters are more productive than non-exporters (see Bernard and Jensen (1999), Aw, Chung and Roberts (2000) and Clerides, Lach and Tybout (1998)), firms engaging in FDI are more productive (see Helpman (2006)) and within the group of firms choosing FDI as an option for entering the foreign market, the more productive ones are involved in FDI (see Nocke and Yeaple (2008)).

from the theoretical viewpoint. The parameter signifying the gap of productivity (or technology) is introduced and aims to measure the firm heterogeneity. It could be also used to delineate the heterogeneity of technological know-how in R&D-intensive industries and that of marketing expertise in advertising-intensive industries.

The innovative aspect of this model is how the foreign entering firm's superior technology is transferred. The new plant constructed by foreign firm via greenfield investment can fully use the foreign firm's higher technology, however, the superior technology will be partially transferred to the local acquired firm. We emphasize the word "partially" because the newly acquired firm's productivity will be inbetween the productivity of the two firms participating in the M&A. For instance, when Renault took a third ownership in Nissan in 1999, it installed one of its top managers, Carlos Ghosn, as Nissan's CEO. He restructured Nissan and brought it back to profitability. It is this transfer of expertise and technology that we model. Furthermore, the acquisition integration ability is also the relevant factor which affects the productivity of acquired firm. This integration problem stems from in general the existence of the relative disadvantage of the foreign firm to a local firm in an unfamiliar environment or arises from the different company cultures. According to Hennart (1988), the post-acquisition integration problem can be neglected for the greenfield entry mode, but should be pinpointed for the cross border M&A. Therefore, the impact of integration ability is taken into account in our entry mode analysis, in particular, in case of cross border M&A.

In addition to the effect of the market structure associated with the entry mode, the influence of an exogenous change in the competition intensity on the entry mode preference is analyzed. After the M&A of one local firm, the number of firms competing in the host market is reduced (soften competition) while both export and greenfield investment entry mode in general lead to a more competitive situation. Without loss of generality, we suppose that export implies additional trade cost, greenfield investment involves a sunk cost for installing a new plant, while cross border M&A incurs the cost for purchasing the asset of the existing firm in the host country. It is worthwhile to note that this acquisition cost depends upon not only foreign firm's target selection (namely, the acquisition of high-productivity firm is more expensive than the purchasing of low-productivity one.), but also the credibility of greenfield investment or export, which emphasizes the interdependence of three alternative entry options.

Without taking into account the government judgment, the timing of the game is as follows: the foreign firm submits a take-it-or-leave-it offer to both high-technology firm and low-technology firm simultaneously, and these two local firms can either reject or accept this proposal. If neither firm accepts the offer, the foreign firm decides whether to engage in greenfield investment or to export. In case of one local firm accepts the pro-

posal, the foreign firm pays the amount of reservation profit of the target firm to enter the market. In case of both local firms accept, this foreign firm will select the local firm with which the foreign firm earns more profit. Finally, all independent firms compete in Cournot fashion. Notice that letting multinational firm firstly make a cross border M&A proposal doesn't restrict its ability to choose greenfield investment or export, it can simply propose an unacceptably small payment to target firm if the multinational firm prefers greenfield investment to M&A⁷.

We find that cross border M&A is always the most profitable entry mode under both greenfield investment and export credible threats. If greenfield investment is viable, the foreign firm acquires the low-productivity firm when the integration ability is strong and the technological gap is sufficiently small; in contrast, the foreign firm has interest to acquire the high-productivity firm when the integration ability is sufficiently weak and the gap is comparatively large, and this outcome can be irreversible when either the technological gap or the integration ability satisfies certain conditions. If the export entry mode is viable, I shed light on the fact that the variation of trade cost will alter the choice of target firm through the influence of acquisition price. The higher the trade cost is, the foreign firm has more incentive to purchase low-technology firm.

With incorporating the host government decision, the entry mode, which generates the harmonization of private and collective incentives, is authorized; whereas, the strategy leading to conflict will be prohibited by government. We show that cross border M&A is never the most welfare-enhancing entry strategy under greenfield investment credible threat. Accordingly, the foreign firm's preferred M&A project is blocked. Foreign firm decides not to enter the host market in the context of export strategy improving the most welfare, but he could abandon the M&A plan and choose greenfield investment under the circumstance that greenfield investment enhances the most welfare. If the export option is viable, we demonstrate that 1). The foreign firm has no chance to adopt the cross border M&A strategy to enter the host market when there is "no" integration or "medium" integration measures. 2). The host government blocks the "Acquisition of high-productivity firm" project in any case, but it authorizes the "Acquisition of low-productivity firm" plan under certain circumstance. This M&A agreement process highlights the unanimity between private incentive and collective intention, but eliminates the possibility to select the target firms. 3). Under the precondition that export is more profitable than greenfield investment, the conflict between foreign firm's preference and host government's decision induces the foreign firm to give up or to reorient towards export manner.

This paper is organized as follows. In the next section, the hypothesis and three al-

⁷See Raff, Ryan and Stähler (2009)

ternative entry modes of the game are presented. In Section 3, we analyze the sub-game of the whole game and demonstrate how to deduce the optimal entry mode under green-field investment and export credible threats respectively. Section 4 focuses on the social welfare of host country through the impacts on the entry mode choice of foreign firm, and tracks the issue of foreign market access and host government decision. Section 5 concludes this paper.

2 The Model

2.1 Hypothesis

We consider an international oligopoly model where firms with different productivity levels coexist. There are two domestic (or local) firms, H and L . They differ in their level of marginal cost, firm L attributed to the "Low marginal cost (high-productivity) enterprise" is more efficient than firm H : $c_H > c_L$. The potential entrant F is assumed to be more efficient than domestic firms, its marginal cost is given by c , where $c < c_L < c_H$. The assumption that foreign entering firm employs a superior technology than the domestic firm, is consistent with the common observation in Central and Eastern Europe (CEE). In addition, Helpman et al.(2004) highlights the important role of within-sector firm productivity differences and demonstrate that only the most productive firm engages in foreign activities. This result reinforces the hypothesis on superior technology for foreign firm from the theoretical viewpoint.

To simplify, we suppose that the gap between two closer productivity (or technology) levels is identical and equal to " s ". The relationship between single foreign firm and two local firms is established in terms of marginal cost. Namely, $c_H - c_L = c_L - c = s$. The initial marginal costs of each firm are thereby given by c , $c_L = c + s$ and $c_H = c + 2s$, respectively. The parameter s not only signifies the gap of productivity (or technology) between firms but also can measure the firm heterogeneity. The larger the gap s is, the more heterogeneous firms are. And in the extreme case where $s = 0$, the firms are homogeneous. Furthermore, the parameter s can be used to delineate the heterogeneity of technological know-how in R&D-intensive industries and that of marketing expertise in advertising-intensive industries.

Firms are producing a homogeneous good. Hence, demand is the same for all firms with the inverse demand function given by $p = a - Q$, where " a " represents the size of market and " Q " denotes the sum over all firms' sales. For firms to produce positive levels of output, we require $a > c_H \geq c_L \geq c > 0$

Firm F decides to sell its products abroad and has two distinct options of serving foreign markets: exporting or producing locally as Foreign Direct Investment (henceforth, FDI). If the multinational firm serves the market by exports, export implies additional marginal (and unit) trade cost " t ". If firm F decides to produce locally, it can choose between different types of FDI: greenfield investment and cross border M&A. The former involves a fixed cost⁸ (sunk cost) " f " in building new plant, while cross border M&A involves the cost for purchasing the asset of the existing firm (either firm H or firm L) in the host country at the amount of μ_i with $i = \{H, L\}$.

The timing of the game is as follows: firm F submits a take-it-or-leave-it offer to both local firm H and firm L , and these two local firms can either reject or accept this proposal. If neither firm accepts the offer, the multinational firm decides whether to engage in greenfield investment or to export. In case of one local firm accepts the proposal, firm F pays the acquisition price for the target firm to enter the market. In case of both local firms accept, firm F will select only one of the local firms with which the foreign firm can earn more profit. Finally, all independent firms compete in Cournot fashion. Note that letting multinational firm firstly make a cross border M&A proposal doesn't restrict its ability to choose greenfield investment or exporting, it can simply propose an unacceptably small payment to target firm if multinational firm prefers greenfield investment to M&A.

This timing allows us not only to address the question which entry mode multinational firm prefers to adopt, but also to investigate how to select the target firm in the environment where local firms are not identic.

The key feature here is that the new plant via greenfield investment can fully use the foreign firm's higher productivity, but this foreign firm's superior technology will partially "transfer" to the local acquired firm. We emphasize the word "partially" because the newly acquired firm's productivity will be inbetween the productivity of the two firms participating in the M&A. Furthermore, the acquisition integration ability is also the relevant factor which affects the productivity of acquired firm. This integration problem stems from in general the existence of the relative disadvantage of the foreign firm to a local firm in an unfamiliar environment or arises from the different company cultures. According to Hennart (1988), the post-acquisition integration problem can be neglected for the greenfield entry mode, but should be pinpointed for the cross border M&A. Therefore, the exogenous parameter $\theta \in [0, 1]$ which measures the integration ability⁹ is introduced. After the takeover target is bought, the acquired firm obtains

⁸We make the simplifying assumption that the other FDI mode do not involve fixed cost. Hence one can view " f " as the differential fixed cost of greenfield investment relative to M&A.

⁹The integration ability can be regarded as cultural and geographical proximity which is studied by Di

a new productivity level which depends not only on its productivity before M&A, the technological gap between firms but the integration ability as well. The marginal cost of new firm M arising from acquisition is expressed as:

$$c_M = \theta c + (1 - \theta)c_i$$

$$\text{with } c_i = \{c_L, c_H\}$$

2.2 Different Modes of Entry

We turn to the equilibrium analysis of this model and determine the equilibrium pattern of greenfield investment, export and cross border M&A. To derive the multinational firm's optimal entry mode, we search for sub-game perfect equilibria through backward induction.

Greenfield Investment

Greenfield investment, denoted by the superscript "G", allows the foreign firm to produce locally in the host market. The total cost of the multinational firm is $cq_F + f$, where f is the plant specific fixed cost, and the marginal cost of the affiliated firm reflects the cost of multinational firm¹⁰ c , q_F represents the multinational firm's output sold in the host country¹¹.

The multinational's and the domestic firms' profits are then defined as follows:

$$\pi_F^G = (p - c)q_F^G - f$$

$$\pi_L^G = (p - c_L)q_L^G$$

$$\pi_H^G = (p - c_H)q_H^G$$

Giovanni (2005) and Head and Ries (2007) using respectively Tobit and Poisson Maximum Likelihood method.

¹⁰This assumption is based on the fact that the profit maximization strategy of a multinational firm drives the affiliate firm in the host country to use the same profit maximizing technology as the parent firm.

¹¹The fixed cost can be differentiated into plant specific fixed cost and firm specific fixed cost when FDI types are differentiated into vertical FDI and horizontal FDI. Markusen (2003) and Navaretti and Venables (2004) provide classic definition of horizontal FDI and vertical FDI as follows "Horizontal direct investment refers to the foreign production of products and services roughly similar to those the firm produces for its home markets. Vertical investment refers to those that geographically fragment the production by stages of production. By horizontal FDI, we refer to firms producing roughly the same final products in multiple countries even though foreign plants are supplied with headquarters services. Vertical firms generally produce outputs not produced by the parent-country operation. A parent firm may ship designs and/or intermediate inputs to a foreign assembly plants and export the final output back to the parent country market."

To simplify, we henceforth define $A = a - c$. Note that because of the lump-sum nature, fixed cost f does not affect production decisions. By solving the profit maximization problem of all three firms, the following equilibrium outputs in host country are found out:

$$\begin{aligned} q_F^G &= \frac{a - 3c + c_L + c_H}{4} = \frac{A + 3s}{4} \\ q_L^G &= \frac{a + c - 3c_L + c_H}{4} = \frac{A - s}{4} \\ q_H^G &= \frac{a + c + c_L - 3c_H}{4} = \frac{A - 5s}{4} \end{aligned}$$

Then, based on these equilibrium values of output level, the equilibrium profit of each firm are given as follows:

$$\begin{aligned} \pi_F^G &= \frac{(A + 3s)^2}{16} - f \\ \pi_L^G &= \frac{(A - s)^2}{16} \\ \pi_H^G &= \frac{(A - 5s)^2}{16} \end{aligned}$$

Note also that the technological gap s ought to be less than $\frac{1}{5}A$ in order to ensure the interior solution ($q_H^G \geq 0$). Then the lower and upper bounds of a subset s are respectively zero and $\bar{s} = \frac{1}{5}A$.

Export

There is an additional trade cost of size t per unit, when the multinational firm chooses export denoted by "E". The profit maximization by all three firms leads to individual production levels of

$$\begin{aligned} q_F^E &= \frac{a - 3c + c_L + c_H - 3t}{4} = \frac{A + 3s - 3t}{4} \\ q_L^E &= \frac{a + c - 3c_L + c_H + t}{4} = \frac{A - s + t}{4} \\ q_H^E &= \frac{a + c + c_L - 3c_H + t}{4} = \frac{A - 5s + t}{4} \end{aligned}$$

The equilibrium profit of each firm:

$$\begin{aligned} \pi_F^E &= \frac{(A + 3s - 3t)^2}{16} \\ \pi_L^E &= \frac{(A - s + t)^2}{16} \\ \pi_H^E &= \frac{(A - 5s + t)^2}{16} \end{aligned}$$

Notice that $0 < t \leq \bar{t}$ with $\bar{t} = \frac{A}{3}$. This assumption guarantees the non negativity of prices and ensures the possibility for all firms to be active.

Cross border M&A

When the foreign firm chooses to enter the host market by cross border M&A, denoted by the superscript "M", the competition in the market is reduced. The cost of M&A for foreign firm is the purchasing price of the target firm i , which should be at least same or larger than the target firm's reservation profit level, which is equivalent to this firm's profit level under greenfield investment or under export mode. The foreign firm's cost when he chooses cross border M&A will be

$$c_M q_M + \mu_i = [\theta c + (1 - \theta)c_i]q_M + \mu_i$$

with $i = \{L, H\}$, where μ_i is the acquisition price¹² for the purchase of local firm i .

Since the foreign firm can purchase either local firm L or firm H , there are two possibilities. We begin with the scenario where the firm L is acquired. Consider the newly acquired entity as firm " ML " which signifies the new entity achieved by purchasing firm L , then the model reduces to a duopoly game in which firm ML and firm H compete. The respective output and profit levels are equal to

$$q_{ML}^M = \frac{a - 2c_L + c_H + 2\theta(c_L - c)}{3} = \frac{A + 2\theta s}{3}$$

$$q_H^M = \frac{a + c_L - 2c_H + \theta(c - c_L)}{3} = \frac{A - 3s - \theta s}{3}$$

$$\pi_{ML}^M = \frac{(A + 2\theta s)^2}{9} - \mu_L$$

$$\pi_H^M = \frac{(A - 3s - \theta s)^2}{9}$$

When foreign firm F acquires the low productivity firm H , the equilibriums are given by:

$$q_{MH}^M = \frac{a + c_L - 2c_H + 2\theta(c_H - c)}{3} = \frac{A - s(3 - 4\theta)}{3}$$

$$q_L^M = \frac{a + c_H - 2c_L + \theta(c - c_H)}{3} = \frac{A - 2\theta s}{3}$$

¹²The acquisition price obviously depends on the bargaining power of the entrant and the incumbents. Other bargaining solutions, where the local firm has some bargaining power, would lead to a higher acquisition price and therefore shift preferences of the multinational firm in favor of greenfield investment or export. Assuming full bargaining power of the entrant instead, at least constitutes a lower bound for the acquisition price.

$$\pi_{MH}^M = \frac{[A - s(3 - 4\theta)]^2}{9} - \mu_H$$

$$\pi_L^M = \frac{(A - 2\theta s)^2}{9}$$

In brief, the foreign firm possesses a superior technology, but can only make use of it when entering via greenfield investment. In case of acquisition, the technological capabilities of the acquired firm are restricted. After the acquisition of the one competitor, the competition intensity is weakened, while greenfield investment and export in general lead to a competitive situation. Without loss of generality, the cost of M&A is attributed to the acquisition price for an existing domestic firm, while greenfield investment incurs the sunk cost for new plant installation. And both cases of FDI will not incur the trade cost from which foreign firm suffers by export.

In the following section, we compare the alternative entry modes and carry out the equilibrium dominance analysis.

3 Profit analysis and comparison

3.1 Credible threat: Greenfield investment Vs Export

The incentive for the shift of multinational firm's entry mode from export to greenfield investment is affected by the rise of trade cost. However, when the sunk cost for greenfield investment is relatively high, there is no incentive for the foreign firm to choose greenfield investment entry mode. By comparing foreign firm's profit in greenfield (π_F^G) option to that in export option (π_F^E), we can derive the credible threat condition.

Through $\pi_F^G = \pi_F^E$, the expression of f^* is found:

$$f^* = \frac{3t(2A + 6s - 3t)}{16}$$

It is straightforward to show that the multinational firm will prefer greenfield investment to export when the sunk cost f is less than f^* . Notice that $f \leq f^*$ is also the condition for greenfield investment to be a credible threat if the cross border M&A proposal is rejected. If the condition $f \leq f^*$ is fulfilled, the entrant can credibly commit to greenfield investment entry if its offer is rejected, then the acquisition price μ_i^G will clearly be equal to local firm i 's post-greenfield profit π_i^G , in other words, any cross border M&A proposal larger or equal to $\mu_i^G = \pi_i^G$ (with $i = \{L, H\}$) will be accepted by firm i . If this condition is not fulfilled ($f > f^*$), cross border M&A will be accepted

iif the foreign firm can afford to pay the acquisition price (μ_i^E) which is larger or equal to π_i^E . It is noticeable that the acquisition payment under greenfield investment credible threat is lower than that under export credible threat, because of $\pi_i^G < \pi_i^E$.

3.2 Greenfield investment credible threat

Under this credible threat, greenfield investment is more profitable than export, it is clear that the foreign firm prefers greenfield investment to export as the market entry mode. We will firstly investigate whether the multinational firm has interest to enter the host market by M&A. If the answer is 'yes', which one the foreign firm prefers purchasing ?

Since the acquisition price μ_i , in turn, depends upon the credibility of greenfield investment or export, the acquisition price for potential target firm L or H under greenfield investment credible threat will respectively be:

$$\begin{cases} \mu_L^G = \pi_L^G = \frac{(A-s)^2}{16} \\ \mu_H^G = \pi_H^G = \frac{(A-5s)^2}{16} \end{cases}$$

Clearly, for a cross border M&A to be profitable, the willingness to pay on the part of the acquiring firm should be equal to or exceed the reservation price of the target firm.

Result 1: The multinational firm has always the incentive to enter the host country by cross border M&A under greenfield investment credible threat.

Proof: If the foreign firm F decides to purchase the domestic firm L , the profit of the new entity is

$$\pi_{ML}^M = \frac{(A+2\theta s)^2}{9} - \mu_L^G = \frac{(A+2\theta s)^2}{9} - \frac{(A-s)^2}{16} > 0$$

If the firm F chooses the target firm H , the profit is

$$\pi_{MH}^M = \frac{[A-s(3-4\theta)]^2}{9} - \mu_H^G = \frac{[A-s(3-4\theta)]^2}{9} - \frac{(A-5s)^2}{16} > 0$$

Since both these acquisition manners of cross border M&A are profitable, the foreign firm has to decide which one he prefers. The profit of the new entity achieved by acquiring firm L and that realized by purchasing firm H are compared. Suppose $\Delta^G \pi^M$ the difference¹³ between π_{ML}^M and π_{MH}^M .

¹³Without loss of generality, the assumption $A = 1$ is henceforth taken into account for simplifying the model.

$$\Delta^G \pi^M = \pi_{ML}^M - \pi_{MH}^M = \frac{s[3 - 8\theta + 3s(3 + 16\theta - 8\theta^2)]}{18}$$

The condition $\Delta^G \pi^M > 0$ implies that the profit of the new entity by purchasing firm L exceeds that by acquiring firm H , namely, advantage of acquiring high-productivity firm L ; whereas $\Delta^G \pi^M < 0$ sheds light on the advantage of purchasing low-productivity firm H . Evidently, the foreign firm has no target preference while $\Delta^G \pi^M = 0$.

Result 2: Under greenfield investment credible threat, the foreign firm F will select the low-productivity firm H , if the technological gap is sufficiently small and the integration ability is comparatively strong; otherwise, the firm F will choose the high-productivity firm L as target.

Proof:

Firm F selects firm L ($\Delta^G \pi_M^M > 0$), if

- $0 \leq \theta \leq \frac{3}{8}$ and $0 < s < \bar{s}$
- $\frac{3}{8} < \theta \leq 1$ and $\frac{3-8\theta}{3(8\theta^2-16\theta-3)} < s < \bar{s}$

Firm F selects firm H ($\Delta^G \pi_M^M < 0$), if $\frac{3}{8} < \theta \leq 1$ and $0 < s < \frac{3-8\theta}{3(8\theta^2-16\theta-3)}$

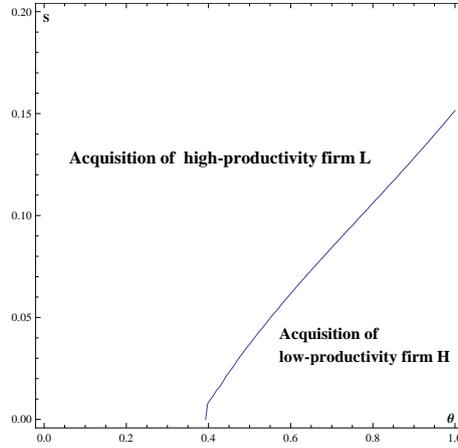


Figure 1: Acquisition target selection under greenfield investment threat

Acquisition of the low-productivity firm is explained by the following reasons: 1). the high value of θ allows large technologic transfers by which the marginal cost of

newly acquired firm MH can be tremendously reduced and be closer to the level of foreign firm's technology; 2). the small gap making firms less heterogenous lessens the impact of target firm choice; 3). the payment to acquire firm H is less than the price acquisition of firm L ($\mu_H^G < \mu_L^G$). Therefore, purchasing low-productivity firm H is more profitable in this situation. By contrary, the foreign firm has interest to acquire high-productivity firm L when the integration ability is sufficiently weak and the technological gap is comparatively large. In this circumstance, the gains arising from purchasing firm L effortlessly compensate the payout which is much higher than the outlay of purchasing firm H . This makes acquisition of firm L more beneficial.

It is worth while to note that the foreign firm is willing to acquire firm L when the integration ability θ is sufficiently weak ($\theta < \frac{3}{8}$), and this outcome is independent of the technological gap. Moreover, when the gap technological exceeds the threshold ($\frac{3-8\theta}{3(8\theta^2-16\theta-3)}$), the foreign firm has incentive to purchase firm L for all value of integration ability.

3.3 Export credible threat

Under export credible threat, the acquisition price for potential target firm L or H will respectively be

$$\begin{cases} \mu_L = \pi_L^E = \frac{(A-s+t)^2}{16} \\ \mu_H = \pi_H^E = \frac{(A-5s+t)^2}{16} \end{cases}$$

Result 3: The multinational firm has always the incentive to enter the host country by cross border M&A under export credible threat.

Proof: In case of purchasing the target firm L , the profit of the new entity is

$$\pi_{ML}^M = \frac{(A+2\theta s)^2}{9} - \mu_L^E = \frac{(A+2\theta s)^2}{9} - \frac{(A-s+t)^2}{16} > 0$$

In case of purchasing the target firm H

$$\pi_{MH}^M = \frac{[A-s(3-4\theta)]^2}{9} - \mu_H^E = \frac{[A-s(3-4\theta)]^2}{9} - \frac{(A-5s+t)^2}{16} > 0$$

Assume $\Delta^E \pi^M$ the difference between π_{ML}^M and π_{MH}^M under export credible threat.

$$\Delta^E \pi^M = \pi_{ML}^M - \pi_{MH}^M = \frac{s[3-9t-8\theta+3s(3+16\theta-8\theta^2)]}{18}$$

The multinational firm acquires firm L when the difference of profit ($\Delta^E \pi^M$) is positive; the firm H will be the target while $\Delta^E \pi^M < 0$.

Result 4: Under export credible threat, the multinational firm F will acquire the high-productivity firm L ($\Delta^E \pi^M > 0$) if

- $\theta = 0$
- $0 < \theta < \frac{1}{3}$ and $\begin{cases} 0 < s \leq \frac{1}{6-3\theta} \text{ and } 0 < t < \hat{t} \\ \frac{1}{6-3\theta} < s < \bar{s} \text{ and } 0 < t < \bar{t} \end{cases}$
- $\frac{1}{3} \leq \theta \leq \frac{3}{8}$ and $0 < s < \bar{s}$ and $0 < t < \hat{t}$
- $\frac{3}{8} < \theta \leq 1$ and $\frac{3-8\theta}{3(8\theta^2-16\theta-3)} < s < \bar{s}$ and $0 < t < \hat{t}$

otherwise, the firm F will purchase the low-productivity firm H ($\Delta^E \pi^M < 0$). Note that $\hat{t} = \frac{3+9s-8\theta+48s\theta-24s\theta^2}{9}$.

In order to show the above-mentioned result more visually, we illustrate it with the Figure 2 assuming the discrete value for trade cost $t = \{0, \frac{\bar{t}}{4}, \frac{\bar{t}}{2}, \frac{3\bar{t}}{4}, \bar{t}\}$. This assumption allows us to explain how a reduction (or an increase) in trade costs can trigger two channels of cross border M&A (either F_L or F_H).

Using the similar *quomodo*, we draw the the curve $\Delta^E \pi^M$ with discrete value for integration ability $\theta = \{0, \frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1\}$ in the pattern (Figure 3) where the horizontal axis represents the trade cost and the vertical axis delineates the technological gap.

According to Figure 2, the higher the trade cost is, the larger the surface where multinational firm has incentive to purchase firm H is. The variation of trade cost can alter the choice of target firm through the influence of acquisition price. Although the increase of trade cost augments both the payments of purchasing firm L and firm H , the magnitude of the ascending payment (or the sensibility relative to trade cost) is not the same. Precisely,

$$\frac{\partial \mu_L^E}{\partial t} > \frac{\partial \mu_H^E}{\partial t} > 0$$

Following an increase of t , the M&A cost of acquiring firm L augments more rapidly than the cost for purchasing firm H . This could make the acquisition of firm L less beneficial and give rise to the diminution of the area where acquiring firm L prevails over the acquisition of firm H .

Figure 3 describes the foreign firm's selection propensity with respect to the integration ability. In particular, when $\theta = 0$, there is no productivity adaption effect,

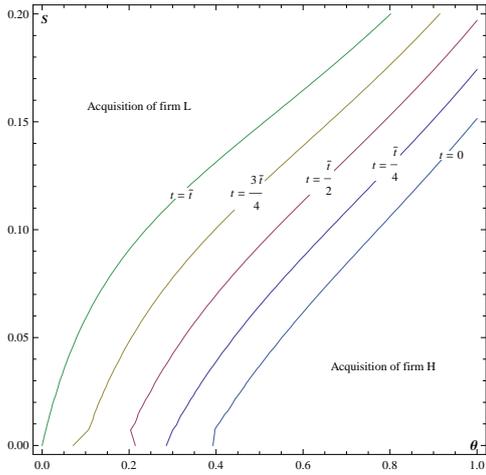


Figure 2: Choice of acquisition target under export threat (θ, s)

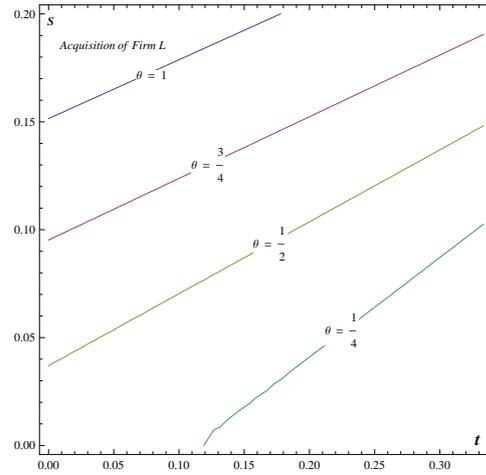


Figure 3: Choice of acquisition target under export threat (t, s)

the marginal cost of newly acquired firm M reflects its own initial productivity level, therefore, the foreign firm looking for a takeover target would want to acquire the more efficient domestic firm without ambiguity. However, following an increase of integration ability (or cultural geographical proximity), the advantage of taking over the less efficient domestic firm is emphasized, in virtue of large scale of technologic transfer and comparatively lower acquisition price.

To sum up, in the private profit analysis, the foreign firm is always willing to enter the host market by cross border M&A under both greenfield investment credible threat and export credible threat. The technological gap and firm's integration ability evidently affect the selection of target firm. In addition, the trade cost could alter this selection decision under export credible threat. In the following section, we will continue the in-depth analysis from the viewpoint of social welfare, find out the welfare dominant entry mode for the host country, and try to systematically combine the issue of foreign market access and the (host) government judgement.

4 Social welfare analysis and host government judgment

Drawing on the traditions of both industrial organization and international trade theories, permits a game-theoretic approach to explaining FDI and export activities. At the same time, it is a completely specified general equilibrium model, making it possible to track

the issue of foreign market access and host country decision. In this current section, we incorporate active host government judgement within our entry mode choice framework. In particular, consistent with what happens in most countries, we assume that the foreign firm must notify entry project (or decision) to the government in the host country, which can either authorize or block the foreign firm's plan. The host government decision is taken in order to approve of the entry strategy enhancing the most welfare of host country and to prevent the entry modes less welfare-improving. The social welfare of host country is affected by the consumer surplus and the producer surplus defined by the sum of domestic firms' profits and acquisition payment in case of cross border M&A manner. In such a context, analyzing the optimal entry mode involves not only a standard firm's private incentive analysis, but also a study of the interaction between the foreign firm and the host government which is regarded as a screening device to foreign firm's entry choice. The clash between the foreign firm's equilibrium choice and the host government's ranking of the three modes of entry in terms of host country welfare can provide a rationale for some frequently observed market access restrictions.

The structure of the game is outlined in Figure 4. The government considers the host country welfare as criterion. As we have demonstrated, in the previous profit analysis section, that the foreign firm has always incentive to enter the host market by cross border M&A, the interaction of foreign firm and host government can be described as follows:

- *Under greenfield investment credible threat*, in case of cross border M&A enhancing the most welfare, M&A is authorized by government, then the foreign firm chooses cross border M&A; in case of greenfield investment improving the most welfare, government blocks the M&A projet but approval of greenfield FDI, then the foreign firm abandons M&A and chooses greenfield investment; in case of export enhancing the most welfare, the foreign firm decides not to serve the host market because of the conflict between the private incentive and the social intention.
- *Under export credible threat*, in case of cross border M&A enhancing the most welfare, M&A is authorized, then foreign firm chooses cross border M&A; in case of greenfield investment improving the most welfare, the foreign firm decides not to serve the host market; in case of export enhancing the most welfare, the government blocks the M&A projet but approval of export, thereby the foreign firm abandons M&A and chooses export.

The equilibrium social welfare levels of the host country under greenfield investment, export and cross border M&A options are given as follows:

$$W^j = PS^j + CS^j \quad \text{with } j = \{E, G, M\}$$

Greenfield investment ($j = G$):

$$W^G = \pi_H^G + \pi_L^G + \frac{1}{2}(q_F^G + q_H^G + q_L^G)^2$$

Export ($j = E$):

$$W^E = \pi_H^E + \pi_L^E + \frac{1}{2}(q_F^E + q_H^E + q_L^E)^2$$

Cross border M&A ($j = M$):

- Under Greenfield investment credible threat:

- In case of acquiring FL : $W_{G,L}^M = \mu_L^G + \pi_H^M + \frac{1}{2}(q_{ML}^M + q_H^M)^2$

– In case of acquiring F_H : $W_{G,H}^M = \mu_H^G + \pi_L^M + \frac{1}{2}(q_{MH}^M + q_L^M)^2$

• Under Export credible threat:

– In case of acquiring F_L : $W_{E,L}^M = \mu_L^E + \pi_H^M + \frac{1}{2}(q_{ML}^M + q_H^M)^2$

– In case of acquiring F_H : $W_{E,H}^M = \mu_H^E + \pi_L^M + \frac{1}{2}(q_{MH}^M + q_L^M)^2$

Notice that the subscripts ‘G’ and ‘E’ of welfare signify the greenfield credible threat and the export credible threat respectively. See the expressions of social welfare in *Appendix A*.

The welfare dominant entry mode can be determined by the comparison of the host country’s equilibrium social welfare with three alternative entry options. Let us begin with the simple comparison between W^G and W^E .

Result 5: The greenfield investment can improve more welfare than the export entry mode, when the technological gap is strong and the trade cost is comparatively small. Precisely,

- $W^G > W^E$, if $t \in (0, \frac{8}{25})$ and $s \in (\frac{2+5t}{18}, \bar{s})$
- $W^G < W^E$, otherwise

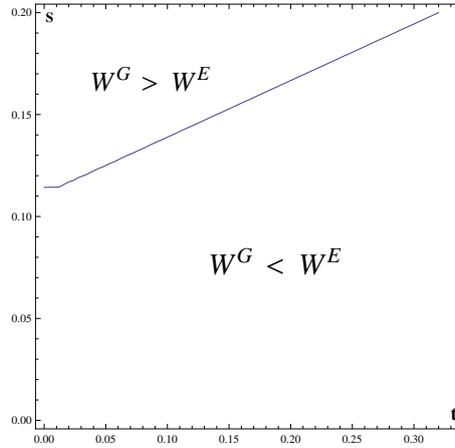


Figure 5: Social welfare: Greenfield investment Vs Export

As demonstrated in the previous section, the sum of the local firms’ profits (producer surplus) in export option is higher¹⁴ compared to greenfield investment option.

$$^{14} \pi_L^E + \pi_H^E = \frac{(A-s+t)^2}{16} + \frac{(A-5s+t)^2}{16} > \pi_L^G + \pi_H^G = \frac{(A-s)^2}{16} + \frac{(A-5s)^2}{16}$$

However, the aggregate outputs in option E in the presence of the trade cost are always less¹⁵ than the aggregate quantities in greenfield investment option, it means that greenfield investment generates more consumer surplus. Consequently, whether greenfield investment or export could improve more host welfare, depends on the tradeoff of producer and consumer surplus.

According to Figure 5, it is clear that the social welfare level within greenfield investment is higher than that within export as long as the technological gap among firms is higher than a critical value. Moreover, this critical value ($\frac{2+5t}{18}$) depends on the trade cost and it augments following an increase of trade cost. In contrast, when the trade cost is sufficiently large ($t > \frac{8}{25}$), this critical threshold attains the maximum value of technological gap, the export option unambiguously enhances more the host country's welfare than greenfield investment entry mode. The rise of trade cost improves the local firms' profits, but reduces the aggregate outputs and then decreases the consumer surplus. In case of high trade cost, the gains from product surplus adequately compensate the losses from the consumer surplus. Therefore, export option generates the higher level of social welfare.

In case of weak technological gap, the competition in the host market is more intensive, three less dissimilar firms will produce more in total so that the consumer surplus increases under both entry modes. In fact, the sensibilities of consumer surplus to technological gap are different. The derivative of $CS = \frac{1}{2}Q^2$ with respect to s is

$$\frac{\partial CS^E}{\partial s} < \frac{\partial CS^G}{\partial s} < 0$$

It demonstrates that a reduce of technological gap improves both CS^E and CS^G , and CS^E is more sensitive to the shrink of gap. On the other hand, there is a same extent of rise in terms of host country's producer surplus. Thus, the export entry mode could generate more aggregate surplus.

4.1 Welfare under greenfield investment credible threat

Under greenfield investment credible threat, the welfare level of the host country W^j with $j = \{E, G, M\}$ are compared. It is easy to find that, for all values of $s \in (0, \bar{s}]$, $t \in (0, \bar{t}]$ and $\theta \in [0, 1]$

$$\max\{W_{G,L}^M, W_{G,H}^M\} < \max\{W^G, W^E\}$$

¹⁵ $Q^G = \frac{3(A-s)}{4}$ and $Q^E = \frac{3(A-s)-t}{4}$

Lemma 1: Cross border M&A is never the most welfare-enhancing entry strategy under greenfield investment credible threat. Accordingly, the foreign firm's preferred M&A project is blocked by government. The foreign firm decides not to enter the host market in the context of export strategy improving the most welfare, whereas he could abandon the M&A plan and choose greenfield investment under the circumstance that greenfield investment enhances the most welfare.

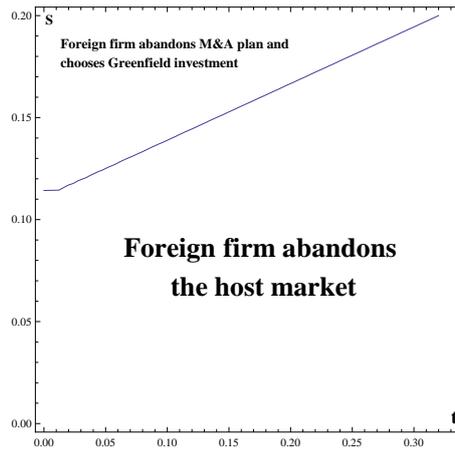


Figure 6: Foreign firm's decision with government supervision under G credible threat

On the basis of equilibrium welfare ranking, cross border M&A is never the most welfare-improving access strategy. The hierarchy amongst three alternative entry modes in terms of welfare hence reduces to the greenfield-export comparison which refers to Figure 5 and 6. Under greenfield investment credible threat, even the government blocks the M&A project, the foreign firm could reorient towards greenfield FDI in case of greenfield investment improving the most welfare, both the government authorization and the foreign firm's preference (because greenfield investment is more profitable than export) urge foreign firm to choose greenfield FDI; otherwise, the foreign firm has to decide not to serve the host market because of the conflict between private incentive and government's intention.

4.2 Welfare under export credible threat

Under export credible threat, the complexity of the solutions referring to social welfare makes it difficult to perform analytical comparisons. Therefore, in this subsection, we assume discrete values for the ability of integration parameter θ . This enables us to gain

insights into the qualitative features of the optimal entry mode in terms of social welfare.

The ability of integration parameter θ is restricted to values from the set $\{0, \frac{1}{4}, \frac{1}{2}, \frac{3}{4}, 1\}$. By this assumption, it is possible to investigate the extreme cases of "no" integration ($\theta = 0$) and "maximum" integration ability ($\theta = 1$), and also to consider the cases of "small", "medium", and "large" integration ability. See *Appendix B*. Each figure represents combinations of trade cost (horizontal axis) and technological gap (vertical axis).

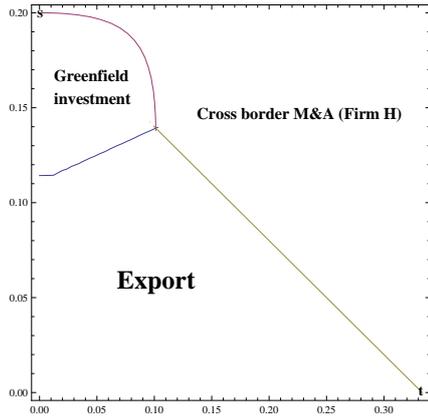


Figure 7: No integration ability ($\theta = 0$)

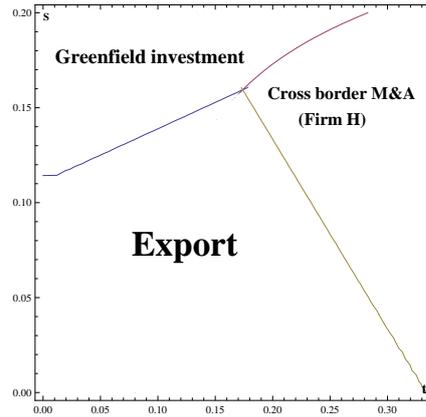


Figure 8: Small (or large) integration ability ($\theta = \frac{1}{4}$ or $\frac{3}{4}$)

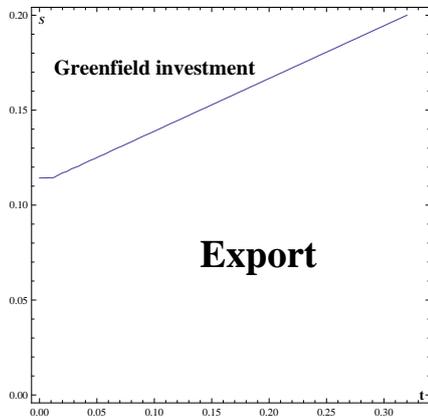


Figure 9: Medium integration ability ($\theta = \frac{1}{2}$)

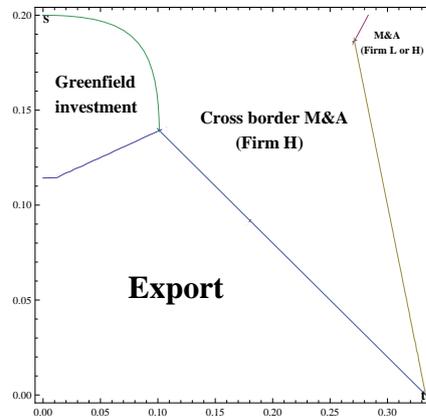


Figure 10: Maximum integration ability ($\theta = 1$)

The figures show clear trends. Beginning with Figure 7, when there is no integration

ability¹⁶, we find that under certain situations, cross border M&A can more effectively improve the social welfare compared to other entry modes. When the multinational firm acquires the local firm H ¹⁷, the profit of outsider (firm L) reaches to the highest level, and it results in the rise of producer surplus which can easily compensate the decrease of consumer surplus caused by the low competition intensity. Following a decrease of trade cost, there is no change on consumer and producer surplus in greenfield investment option, but the producer surplus within cross border M&A option will decrease, because the payment for purchasing target firm depends on the trade cost under export credible threat. Thus, the welfare in M&A option could be less than the one in greenfield investment option when the trade cost attains to a certain level. If the technological gap is weak, firms will be less heterogeneous, the level of aggregate outputs will be higher, and it will generate more consumer surplus. However, the magnitude of this rise is not identical, the consumer surplus in export option augments more rapidly following a decrease of technological gap; furthermore, the trade cost abatement leads to the fall of acquisition price which generates the decrease of producer surplus in the host country. Therefore, it is shown that the export entry mode gives rise to the highest level of social welfare in Export zone.

Based on the *Appendix B*, it is straightforward that

$$\frac{\partial W_{E,H}^M}{\partial \theta} = \frac{s^2(64\theta - 32)}{48}$$

$$W_{E,H}^M(\theta = 0) > W_{E,H}^M(\theta = \frac{1}{4} \text{ or } \frac{3}{4})$$

Consequently, on the one hand, the pattern for the "small" integration ability is the same to the one for "large" integration ability; on the other hand, the surface of zone, where cross border M&A entry mode is better off, diminishes. Whereas, the surface of both Export and Greenfield investment zones aggrandize (Figure 8).

In Figure 9 where there is a "medium" integration ability ($\theta = \frac{1}{2}$), Cross border M&A zone disappears. This is also the case in which the acquisition of local firm leads to the lowest level of welfare among all potential degree of integration ability aforementioned. Due to the disappear of M&A zone, the pattern is consistent with the Figure 5 in which we compare just the welfare in export option to that in greenfield investment option.

When the integration ability is maximum, the productivity of newly acquired entity is the same as the multinational firm's. Figure 10 reveals that not only the acquisition

¹⁶Cross border M&A can not change the acquired firm for the better, reduce its marginal cost.

¹⁷ W_{MH}^E is always higher than W_{ML}^E regardless of integration ability (θ), trade cost (t) and technological gap (s). See *Appendix A*.

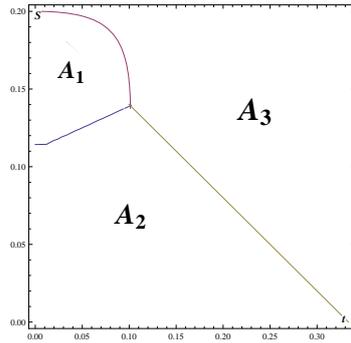


Figure 11: Export credible threat with $\theta = 0$

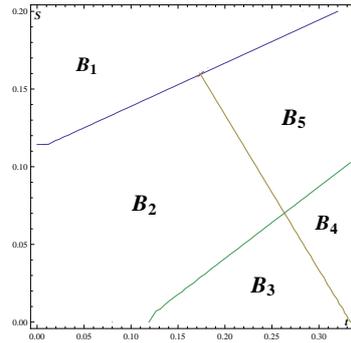


Figure 12: Export credible threat with $\theta = \frac{1}{4}$

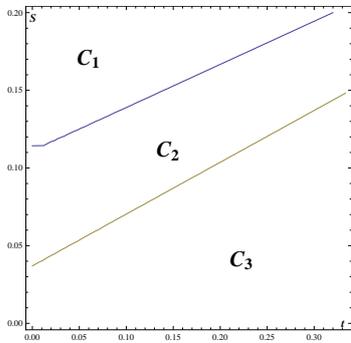


Figure 13: Export credible threat with $\theta = \frac{1}{2}$

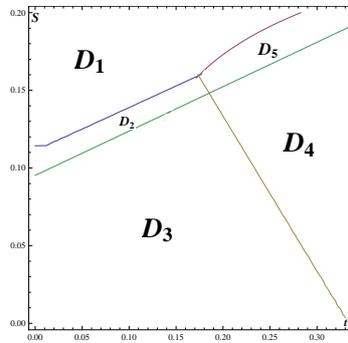


Figure 14: Export credible threat with $\theta = \frac{3}{4}$

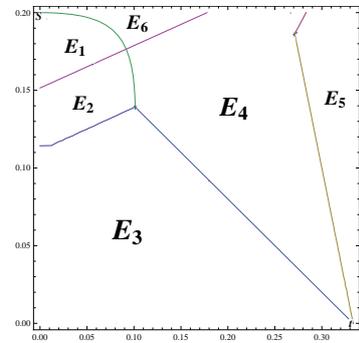


Figure 15: Export credible threat with $\theta = 1$

of firm H but also the purchase of firm L are better off. This outcome discloses the distinctness between greenfield investment credible threat and export credible threat in terms of social welfare. It is because the local firm's expected profit is higher under export credible threat, this gives rise to the higher acquisition price which positively acts on aggregate profits in the host country, indirectly improves the social welfare of host country. Specially, when export threat (trade cost) is strong, the acquisition of high-productivity firm can also be better off.

We now combine the foreign firm's preferred entry mode shown in Figure 3 with the government judgment (which regards the host country's welfare as yardstick). The following graphics (Figure 11, 12, 13, 14 and 15) permit us to analyze the interaction between the foreign firm and the host government.

Figure 11 is divided into different regions which reveal the possible combination of

foreign firm's incentive and active government's intention. As shown in Fig 3, in the absence of integration ability ($\theta = 0$), foreign firm has always interest to acquire firm L, thereupon he notifies "Acquisition of firm L" project to government. Based on the equilibrium welfare (shown in Fig 7), the government approves of the entry strategy enhancing the most welfare and prevents the other entry modes. For instance, in region A_1 , since the greenfield investment generates the highest level of welfare, the government blocks the M&A of firm L, the foreign firm is finally obliged to abandon the entry plan and decides not to serve the host market. In region A_2 , export is welfare dominant entry mode, notice also that export is the credible and viable entry mode here, therefore, the host government authorizes the export entry mode and persuades the foreign firm to choose export as entry fashion. In region A_3 , it is cross border M&A of firm H that improves the most host welfare, thus the project of "Acquisition of firm L" is prohibited, the foreign firm has to give up.

In order to interpret these graphics more clearly, we construct the tables which embody "Foreign firm's preference", "Host government's judgment" and the final "Entry mode".

| Export credible threat with $\theta = 0$ | | | |
|--|---------------------------|----------------------------|------------|
| Region | Foreign firm's preference | Host government's judgment | Entry mode |
| A_1 | M&A (firm L) | Greenfield investment | Abandon |
| A_2 | M&A (firm L) | Export | Export |
| A_3 | M&A (firm L) | Cross border M&A (firm H) | Abandon |

| Export credible threat with $\theta = \frac{1}{4}$ | | | |
|--|---------------------------|----------------------------|-------------|
| Region | Foreign firm's preference | Host government's judgment | Entry mode |
| B_1 | M&A (firm L) | Greenfield investment | Abandon |
| B_2 | M&A (firm L) | Export | Export |
| B_3 | M&A (firm H) | Export | Export |
| B_4 | M&A (firm H) | Cross border M&A (firm H) | M&A(firm H) |
| B_5 | M&A (firm L) | Cross border M&A (firm H) | Abandon |

| Export credible threat with $\theta = \frac{1}{2}$ | | | |
|--|---------------------------|----------------------------|------------|
| Region | Foreign firm's preference | Host government's judgment | Entry mode |
| C_1 | M&A (firm L) | Greenfield investment | Abandon |
| C_2 | M&A (firm L) | Export | Export |
| C_3 | M&A (firm H) | Export | Export |

| Export credible threat with $\theta = \frac{3}{4}$ | | | |
|--|---------------------------|----------------------------|-------------|
| Region | Foreign firm's preference | Host government's judgment | Entry mode |
| D_1 | M&A (firm L) | Greenfield investment | Abandon |
| D_2 | M&A (firm L) | Export | Export |
| D_3 | M&A (firm H) | Export | Export |
| D_4 | M&A (firm H) | Cross border M&A (firm H) | M&A(firm H) |
| D_5 | M&A (firm L) | Cross border M&A (firm H) | Abandon |

| Export credible threat with $\theta = 1$ | | | |
|--|---------------------------|----------------------------|-------------|
| Region | Foreign firm's preference | Host government's judgment | Entry mode |
| E_1 | M&A (firm L) | Greenfield investment | Abandon |
| E_2 | M&A (firm H) | Greenfield investment | Abandon |
| E_3 | M&A (firm H) | Export | Export |
| E_4 | M&A (firm H) | Cross border M&A (firm H) | M&A(firm H) |
| E_5 | M&A (firm H) | Cross border M&A (H or L) | M&A(firm H) |
| E_6 | M&A (firm L) | Cross border M&A (firm H) | Abandon |

The insights from these tables can be summarized as follows: 1). If the host government judgement is taken into account, the foreign firm has no chance to adopt the cross border M&A strategy to enter the host market when there is "no" integration or "medium" integration measures. 2). The host government blocks the "Acquisition of high-productivity firm" project in any case, but it authorizes the "Acquisition of low-productivity firm" plan under certain circumstance. This M&A agreement process highlights the unanimity between private incentive and collective intention, but eliminates the possibility to select the target firms. 3). Under the precondition that export is more profitable than greenfield investment, the conflict between foreign firm's preference and host government's decision induces the foreign firm to give up or to reorient towards export manner.

5 Concluding remarks

The choice of foreign entry mode is one of the core topics in international trade research (Werner, 2002), with many studies examining the *ex ante* determinants or the *ex post* performance implications of a firm's choice among certain modes. This paper draws on the traditions of both industrial organization and international trade theories. By developing a simple international oligopoly model, we provide a game-theoretic approach to explaining FDI and export activities, analyze both the "entry mode choice" and "target firm selection" decisions. Furthermore, the issue of foreign firm's preference and host

government's judgment is tracked. In such a context, analyzing the optimal entry mode involves not only a standard firm's private incentive study, but also an analysis of the strategic interaction between the foreign firm and the host government which is regarded as a screening device to foreign firm's entry mode decision. The clash between the foreign firm's equilibrium choice and the host government's ranking of the three modes of entry can provide a rationale for some frequently observed market access restrictions.

A main result of our analysis is the foreign firm being technologically advantaged has a stronger incentive to choose cross border M&A, rather than greenfield investment or export, moreover, he prefers acquiring the low-productivity firm when the integration ability is strong and the technological gap is sufficiently small; otherwise he prefers high-productivity one, under the precondition that greenfield investment is more profitable than export. If the export entry mode is viable, the variation of trade cost will alter the choice of target firm through the influence of acquisition price. The higher the trade cost is, the more likely foreign firm purchases low-technology firm. Our analysis has also highlighted the ambiguity between the foreign firm's preference and the government's judgment under greenfield investment threat, and the unanimity under export threat in certain situations. This private-collective conflict may be fruitful to inform government policies toward international trade.

There are certainly a number of interesting issues related to this framework, that are not explored in the present paper. What will be the optimal entry mode, if firms produce the differentiated goods? How the results change if the trade cost here refers to the tariff designed by government, *etc.*

Appendix

Appendix A:

$$\begin{aligned} W^G &= \pi_H^G + \pi_L^G + \frac{1}{2}(q_F^G + q_H^G + q_L^G)^2 \\ &= \frac{61s^2 - 42s + 13}{32} \end{aligned}$$

$$\begin{aligned} W^E &= \pi_H^E + \pi_L^E + \frac{1}{2}(q_F^E + q_H^E + q_L^E)^2 \\ &= \frac{13 - 42s + 61s^2 + 2t - 18st + 5t^2}{32} \end{aligned}$$

$$\begin{aligned} W_{G,L}^M &= \pi_L^G + \pi_H^M + \frac{1}{2}(q_{ML}^M + q_H^M)^2 \\ &= \frac{19 - 70s + s^2(75 + 16\theta + 8\theta^2)}{48} \end{aligned}$$

$$\begin{aligned} W_{G,H}^M &= \pi_H^G + \pi_L^M + \frac{1}{2}(q_{MH}^M + q_L^M)^2 \\ &= \frac{19 - 62s + s^2(99 - 32\theta + 32\theta^2)}{48} \end{aligned}$$

$$\begin{aligned} W_{E,L}^M &= \pi_L^E + \pi_H^M + \frac{1}{2}(q_{ML}^M + q_H^M)^2 \\ &= \frac{19 - 6st + 3t^2 + 6t - 70s + s^2(75 + 16\theta + 8\theta^2)}{48} \end{aligned}$$

$$\begin{aligned} W_{E,H}^M &= \pi_H^E + \pi_L^M + \frac{1}{2}(q_{MH}^M + q_L^M)^2 \\ &= \frac{19 - 30st + 3t^2 + 6t - 62s + s^2(99 - 32\theta + 32\theta^2)}{48} \end{aligned}$$

Appendix B:

| Ability of integration | $W_{E,L}^M$ | $W_{E,H}^M$ |
|---|---|--|
| No integration ability ($\theta = 0$) | $\frac{19+75s^2+6t+3t^2-2s(35+3t)}{48}$ | $\frac{19+99s^2+6t+3t^2-2s(31+15t)}{48}$ |
| Small ability ($\theta = \frac{1}{4}$) | $\frac{38+159s^2+12t+6t^2-4s(35+3t)}{96}$ | $\frac{19+93s^2+6t+3t^2-2s(31+15t)}{48}$ |
| Medium ability ($\theta = \frac{1}{2}$) | $\frac{19+85s^2+6t+3t^2-2s(35+3t)}{48}$ | $\frac{19+91s^2+6t+3t^2-2s(31+15t)}{48}$ |
| Large ability ($\theta = \frac{3}{4}$) | $\frac{38+183s^2+12t+6t^2-4s(35+3t)}{96}$ | $\frac{19+93s^2+6t+3t^2-2s(31+15t)}{48}$ |
| Maximum ability ($\theta = 1$) | $\frac{19+99s^2+6t+3t^2-2s(35+3t)}{48}$ | $\frac{19+99s^2+6t+3t^2-2s(31+15t)}{48}$ |

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