Foreign Direct Investment, Input Prices, and Host Country Welfare

Kuo-Feng Kao* and Chin-Sheng Chen†

Abstract

This paper analyzes a multinational firm’s foreign direct investment decision, through either greenfield investment or cross-border merger and acquisition, into a host country with an input monopoly that adopts either uniform pricing or discriminatory pricing. The optimal foreign entry mode could differ under each pricing policy, depending on firms’ technological gap and the local market structure. In the context of foreign entry, this paper also examines the welfare effects of input price discrimination.

JEL Classification: F12; F13; F23; L13

Key words: Multinationals, Foreign direct investment, Greenfield investment, Cross-border merger and acquisition, Input price discrimination

* Department of Industrial Economics, Tamkang University, 151 Yingzhuan Road, Tamsui District, New Taipei City 25137, Taiwan. Tel.: +886-2-2621-5656 ext. 3335; Fax: +886-2-2620-9731; Email: kuofeng@mail.tku.edu.tw.
† Correspondence: Department of International Business, Soochow University, 56 Kueiyang Street, Section 1, Taipei 100, Taiwan. Tel.: +886-2-2311-1531 ext. 3692; Fax: +886-2-2375-7960; Email: cschen0709@scu.edu.tw.
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1 Introduction

Multinational firms account for most trade volume nowadays and play an important role in the globalized world. To get access to foreign markets, multinational firms undertake foreign direct investment (FDI), as witnessed by a surge in FDI in the global market over the last two decades. ¹ While capital inflows from multinationals through FDI have been considered an engine for economic growth, the entry of multinationals can also bring new implications for the host country’s industrial policy. Hence, the choice of entry mode by multinationals has received considerable attention and become an important issue in the trade realm for the last two decades.

The present paper examines a multinational firm’s FDI policy into a host country via either greenfield investment or cross-border merger and acquisition (M&A, hereafter). Through the former, the multinational builds its own establishment (a subsidiary), while via the latter it acquires an existing firm in the host country. We consider a vertically-related market in the host country, where an input monopolist produces and sells its product to downstream oligopolists which making it into a final product. Within the setting, we shall explore the relationship between input pricing policies and a multinational firm’s choice of FDI policy. We consider two pricing policies, uniform pricing and discriminatory pricing, which are commonly observed in many industries and which have been widely analyzed in the industrial organization literature.

The production procedures under production specialization always consist of many stages. The typical case is that firms must first acquire inputs from their upstream suppliers before manufacturing them into a final product to be sold to consumers. Hence, input pricing policies significantly affect downstream firms’ choices in outputs, prices, and other non-price decisions.

¹ In 1980, FDI amounts abroad accounted for only 5% of world GDP, whereas in 1998 this number almost tripled to 14%. FDI activities by multinational firms have continually grown. As reported by UNCTAD (2011), global foreign direct investment (FDI) inflows hit $1.24 trillion in 2010.
Moreover, acquiring key resources and cheaper inputs is an important reason for firms to invest and produce in foreign countries. When analyzing the choice of foreign entry mode, the consideration of the influences of input pricing policies is quite relevant.

Under each pricing regime, we find that the multinational firm’s choice between greenfield investment and cross-border M&A depends on the size of the technology gap between itself and the local firms. Under discriminatory pricing, the multinational firm is more likely to engage in cross-border M&A if the technology gap is larger. Nevertheless, this monotonic relationship does not hold under uniform pricing. It shows that an increase in the technology gap makes the multinational firm turn toward choosing greenfield investment given that the technology gap is already sufficiently large.

The difference in foreign entry mode between the two pricing policies implies that the effects of input price discrimination on consumers and local firms in the host country are ambiguous. Consumer surplus is higher under greenfield investment than under cross-border M&A. Hence, input price discrimination favors consumers if it leads to greenfield investment. The local downstream firms always pay lower input prices under discriminatory pricing versus uniform pricing. Nevertheless, we find that less efficient local downstream firms, which enjoy an input price advantage under price discrimination, can even earn higher profit under uniform pricing than under discriminatory pricing if greenfield investment arises under the latter, but not the former.

The contributions of the paper are twofold. First, by considering a vertical market structure, we explore the relationship between the choice of entry mode for a multinational firm and the input price policies adopted by an input monopolist. We identify and compare the market conditions under which the entry mode will be chosen in each pricing regime. Second, we examine the policy implications of input price discrimination for the host country in the context of FDI. To the host country, input price discrimination is unfavorable for consumers if cross-border M&A arises accordingly. Moreover, the local downstream firms may not gain from input price discrimination where they can enjoy an input price advantage. Specifically, this is the case when input price
discrimination leads to greenfield investment and the downstream market is initially less competitive.

2 Related Literature

Many papers have looked at multinational firms’ choices between greenfield investment and cross-border M&A. Mattoo et al. (2004) examine the choice of the two-entry mode in the context of technology transfer. In their model, there is an oligopolistic market in the host country. A multinational firm decides the quality of technology it wants to transfer to its new subsidiary. They find that cross-border M&A can be profitable when the decision of technology transfer is taken into account. They also show that the host government may restrict FDI, leading the multinational firm to adopt the socially desirable entry mode.

Norbäck and Persson (2004) investigate the entry modes of a foreign firm by considering privatization in the host country. In their model, the foreign firm can choose to acquire a state-owned asset (cross-border M&A) or undertake greenfield investment to serve consumers in the host country. They find that high greenfield costs do not necessarily imply that cross-border M&A is more profitable, because the domestic private firms also have incentives to acquire the state-owned asset. Müller (2007) studies the entry decision by allowing the acquisition price and the profits to be endogenously determined. Considering a Hotelling-type market in the host country shows that a non-monotonic relationship exists between the choice of entry mode and the degree of competition intensity. Greenfield investment is the optimal entry mode when the market is extremely competitive or less competitive; otherwise, cross-border M&A is more profitable to the multinational firm. Neary (2007) demonstrates that cross-border M&A is profitable if the multinational firm is more efficient than the local firms. In other words, there is a monotonic

\footnote{For the model dealing with the trade-off between export and greenfield FDI, see for example, Glass and Saggi (2002), Markusen (2001), Petit and Sanna-Randaccio (2000), and Siotis (1999), among others. Some studies also find that multinationals can enter a foreign country through technology licensing, e.g., Horstmann and Markusen (1987), Saggi (1996), and Saggi (1999).}

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relationship between the choice of entry mode and the cost gap between the multinational firm and the local firms.

In addition to the above-mentioned papers, the choice between the two FDI strategies has been extensively investigated in various theoretical models. For example, Klimenko and Saggi (2007) focus on products with network externalities, Nocke and Yeaple (2007) emphasize the role of firm heterogeneity, Raffand and Stähler (2009) allow for joint venture to be a possible choice of entry mode, Kim (2009) considers the impacts of regional economic integration, Fatica (2010) examines the choice by allowing the multinational firm to have partial ownership of the target firm in the host country, Karabay (2010) and Qiu (2011) both consider FDI restriction policies imposed by the government in the host country, Markusen and Stähler (2011) look at the FDI policy in the context of an endogenous market structure, Norbäck and Persson (2008) and Ray Chaudhuri (2014) both focus on the profitability of cross-border M&A, and Stepanok (2015) analyzes the optimal entry mode in monopolistic competition industries, among many others.

In contrast to those papers, the present paper examines the FDI strategy of a multinational firm in a vertically-related market and considers different input price policies. Findings show that the foreign entry mode is different between uniform pricing and discriminatory pricing under some market conditions. The degree of the cost gap between the multinational firm and the local firms and the intensity of market competitiveness are both critical for this result. Furthermore, in the context of foreign entry, we examine the possible policy implications on input price discrimination for the host country.

Some recent studies in the literature have also examined the choice of FDI strategy in vertically-related markets. Ishikawa and Horiuchi (2012) investigate the choice between exports and greenfield investment for a northern firm under a North-South model. In their model, an input monopoly located in the south can charge a discriminatory price for the northern firm in the absence of greenfield investment due to market separation. This provides an incentive, which is absent in our paper, for undertaking greenfield investment. Beladi et al. (2013) look at how vertical
integration, which yields a strategic effect on the input price, influences the incentives for cross-border M&A. Milliou (2014) focuses on the location choice of production by a multinational firm between a developed country and a developing country, where each hosts a vertically-related market. Vertical technology transfer plays a crucial role in the location decision. It worth noting that, in contrast to these papers, we allow for both greenfield investment and cross-border M&A when analyzing the choice of foreign entry mode. Hence, we shall focus on how multinational firms change their FDI strategies in response to the local input price policy.

Regarding the studies of input pricing strategies, one important issue is the welfare comparison between uniform pricing and discriminatory pricing. Moreover, whether or not to allow price discrimination has been heatedly debated in the theoretical literature. Katz (1987) first examines the welfare effects of input price discrimination in a theoretical model. In the model, there is an upstream monopolist serving the downstream markets where chain stores compete with many local retailers. That study’s results show that input price discrimination reduces downstream efficiency, thereby making it socially undesirable. Considering downstream R&D investments, DeGraba (1990) finds the same welfare result that input price discrimination reduces R&D investments. Yoshida (2000) shows that the increase in output is a sufficient condition for input price discrimination to reduce welfare. Vallitti (2003) sets up a general demand model and finds that input price discrimination is adverse to both consumer surplus and total welfare. In sum, this strand of studies shows that the social undesirability of input price discrimination is mainly attributed to allocation inefficiency. Recent papers have identified other circumstances whereby input price discrimination could be socially desirable - see for example, Inderst and Shaffer (2009), Inderst and Valletti (2009), Arya and Mittendorf (2010), Herweg and Müller, Dertwinkel-Kalt et al (2016), and Chen (2016), among many others.

Moreover, around the world authorities are concerned about the behavior of price discrimination. For example, the 1936 Robinson-Patman Act in the United States attacks price discrimination. In Europe, Article 102 (c) in the Treaty on the Functioning of the European Union (TFEU) assails price input discrimination. In China, price discrimination is prohibited under its Anti-Monopoly Law.
All the above-mentioned studies on input price discrimination focus on a closed economy. In other words, they assume that the input demand facing the input monopolist only comes from the domestic downstream firms. In the age of globalization, multinational firms are running their businesses in countries around the world through FDI. One of the important reasons for engaging in FDI is the ability to acquire key production inputs. Multinational firms therefore not only sell their products to consumers in foreign markets, but also purchase inputs from local suppliers. It is therefore both theoretically and empirically relevant to take the existence of multinational firms into consideration when investigating the welfare implications of input price discrimination.

3 The Model

In the model there are two countries: a host country and a foreign country. The host country has a vertically-related market, which is composed of an input market and a final good market. In the input market, an input monopolist produces and sells an input product to downstream firms, which use the input to produce a final good product and then compete for consumers in the final good market. In the foreign country, a multinational firm also produces the final good and decides to serve the consumers in the host country.

We assume that the multinational firm will enter the market by undertaking FDI rather than exporting, which may be due to a very high trade cost. The multinational firm can choose either greenfield investment or cross-border M&A. For greenfield investment, it builds a new subsidiary with a fixed set-up cost \( F \). By contrast, for cross-border M&A, it acquires a target firm in the host country with a fixed payment. We assume that the set-up cost \( F \) is zero, which, otherwise, would obviously increase the incentive for cross-border M&A.\(^4\)

The inverse demand for the final good is assumed to have a linear form and given as: \( P = a - bQ \), where \( Q \) is the market output and \( a > 0 \) and \( b > 0 \) are parameters related to the

\(^4\) It is obvious that the incentive to engage in greenfield FDI becomes weaker if the greenfield cost increases (e.g. Qiu and Zhou, 2011). To save the parameters, we assume that the fixed cost is zero and focus on the conditions for the market structure and the efficiency gap.
intercept and slope of the demand curve. Assume that there are initially $n$ symmetric local firms that sell and produce the final good at constant marginal cost $c > 0$. The multinational firm is more cost-efficient than the local ones. 5 Without loss of generality, its marginal cost is assumed to be zero. The size of $c$ therefore represents the technology gap between the multinational firm and the local firms.

Suppose that one unit of the input is required to produce one unit of the final good. We consider two pricing policies for the input price: discriminatory pricing and uniform pricing. Under discriminatory pricing, the input monopolist charges a personalized price for each firm in the downstream market. Note that the cost difference between the multinational firm and local firms incurs input price discrimination. In this regime, let $w_m$ ($w_l$, due to symmetry) denote the input price charged to the multinational firm (local firms), where the subscripts “$m$” and “$l$” stand for multinational firm and local firms, respectively. In the regime of uniform pricing, the input monopolist charges the same price, denoted as $w$, to all firms in the downstream market.

The game proceeds as follows. In the first stage, the multinational firm decides its entry mode by either greenfield investment or cross-border M&A. If the multinational firm takes up cross-border M&A, then it chooses one of the $n$ symmetric local firms as the target firm and offers it a take-it-or-leave-it contract, which specifies a fixed payment for the acquisition. If the target firm accepts, then the multinational firm controls 100% of the target firm and produces in the market with its superior technology. If the target firm rejects the offer, then the multinational firm turns to engage in greenfield investment. We assume that if the target firm is indifferent between accepting or rejecting the contract, then it chooses to accept the offer. In the second stage, given the chosen entry mode by the multinational firm, the input monopolist decides its input prices for the downstream firms. In the third stage of the game, the (remaining) local firms and the multinational firm choose their outputs in Cournot fashion and then the profits are realized. We shall solve the

5 The setting of the technology gap is supported by some empirical findings. Globerman et al. (1994) find that multinational firms in Canada are more productive than local firms. For developing countries, Haddad and Harrison (1993), Sjöholm (1999), and Kokko et al. (2001) present the same finding.
game by backward induction.

From the model specifications, in the third stage of the game the profit of the multinational firm is:

$$\pi_m = \left[ a - b \left( q_m + \sum_{i=1}^{n'} q_i \right) - w_m \right] q_m,$$

where $q_m$ is the output of the multinational firm, $q_i$ is the output of the local firm $i$, $i = 1, \ldots, n'$, and $n'$ is the number of remaining local firms in the market. If the multinational engages in greenfield investment (cross-border M&A), then $n'$ equals $n (n - 1)$. The profits of the remaining local firms are:

$$\pi_i = \left[ a - b \left( q_m + \sum_{i=1}^{n'} q_i \right) - w_i - c \right] q_i, \quad i = 1, 2, \ldots, n'.$$

Given the number of $n'$, with symmetry, routine calculation gives the Cournot equilibrium outputs as follows:

$$q_m = \frac{a - (n' + 1)w_m + n'(w_i + c)}{b(2 + n')}, \quad (1)$$
$$q_i = \frac{a - 2(w_i + c) + w_m}{b(2 + n')}, \quad (2)$$

Firms’ profits can then be rearranged as:

$$\pi_m = \frac{1}{b} \left[ \frac{a + n'(w_i + c) - (1 + n')w_m}{2 + n'} \right]^2, \quad (3)$$
$$\pi_i = \frac{1}{b} \left[ \frac{a + w_m - 2(w_i + c)}{2 + n'} \right]^2. \quad (4)$$

The market output is thus derivable as:

$$Q = q_m + n' q_i = \frac{(1 + n')a - n'(w_i + c) - w_m}{b(2 + n')}. \quad (5)$$

Note that eq. (5) also serves as the aggregate derived demand of the input facing the upstream monopolist under uniform pricing.
4 The Choice of Foreign Entry Mode

We examine the foreign entry mode under either pricing policy as follows.

4.1 The uniform pricing regime

Under uniform pricing, the input supplier charges a uniform monopoly price. Letting \( w_m = w_i = w \) and using (5), the input monopolist’s profit function is specified as:

\[
\Omega = wQ = \frac{w\left[(1+n')(a-w)-n'c\right]}{b(2+n')},
\]

By solving the first-order condition for profit maximization, the optimal input price is:

\[
w'' = \frac{(1+n')a-n'c}{2(1+n')}, \quad (6)
\]

where the superscript “\( u \)” represents the variables associated with uniform pricing.

From (6), we can derive that \( \frac{\partial w''}{\partial n'} = -c/\left[2(1+n')^2\right] < 0 \), i.e., the equilibrium input price is negatively related to the number of the remaining local firms. Hence, the input price is higher under cross-border M&A than under greenfield investment. This is given by the fact that the aggregate derived demand for the input is more elastic under greenfield investment than under cross-border M&A. Due to their cost disadvantage, local firms are more sensitive to changes in input price. The more local firms (i.e., the less efficient firms) there are in the market, the more elastic is the aggregate derived demand. As the number of local firms remaining in the market is larger under greenfield investment than under cross-border M&A, the aggregate derived demand is more elastic under the former. Moreover, from (6) the input price difference between greenfield investment and cross-border M&A is derivable as:

\[
\Delta w'' \equiv w''(n' = n) - w''(n' = n-1) = \frac{-c}{2n(1+n)} < 0,
\]

and \( \partial \Delta w/\partial c < 0 \) and \( \partial \Delta w/\partial n > 0 \). We summarize the above results in the following proposition.
Proposition 1 Under uniform pricing, (i) the equilibrium input price is lower under greenfield investment than under cross-border M&A, and (ii) the input price differential between the two entry modes becomes larger if the technology gap between the multinational firm increases and the number of local firms decreases, and vice versa.

We now move to the choice of entry mode by comparing the multinational firm’s profits between greenfield investment and cross-border M&A. The profit difference is defined as follows:

\[
\Delta \pi \equiv \pi_m(n' = n) - [\pi_m(n' = n - 1) - \pi_l(n' = n)].
\]  

(7)

In the profit difference, the first term is the multinational firms’ profit under greenfield investment, and the terms in the bracket calculate the profit net of acquisition cost under cross-border M&A. If the profit difference is positive (negative), then the multinational firm chooses greenfield investment (cross-border M&A). By using (3), (4), and (6), there are two critical values of a cost gap, denoted as \( c^{u1} \) and \( c^{u2} \), which determine the sign of (7). It is negative (positive) if \( c^{u2} < c < c^{u1} \) (\( c < c^{u2} \) or \( c > c^{u1} \)). We then obtain the following proposition.\(^6\)

Proposition 2 Given the input monopolist charges a uniform price for the downstream firms, the optimal foreign entry mode is greenfield investment if the technology gap between the multinational firm and the local firms is either sufficiently large or small (\( c < c^{u2} \) or \( c > c^{u1} \)); otherwise the entry mode is cross-border M&A.

It is worth noting that Proposition 2 indicates a non-monotonic relationship between the technology gap and the foreign entry mode. If the cost difference is initially small, then the multinational firm tends to choose greenfield investment. In this case, an increase in the cost difference makes cross-border M&A more profitable. This is because the reservation profit of the

\(^6\) See Appendix A for the proof.
targeted firm is smaller when the cost difference is getting larger, implying the acquisition cost is lower to the multinational firm. Moreover, cross-border M&A is profitable by cutting market competitiveness - a benefit that is important when the multinational firm has a larger market share (i.e., the cost gap is significant). Hence, if the cost difference is large enough, then the multinational turns to choose cross-border M&A. This result is in line with the monotonic relationship demonstrated by Neary (2007) whereby cross-border M&A is more profitable than greenfield investment if the multinational firm is sufficiently more efficient than the local firms. Nevertheless, in the present paper, input prices play an important role in the choice of foreign entry.

We next find that when the cost difference is already extremely large, a further increase in the cost gap may lead the multinational firm to choose greenfield investment. The reason is as follows. As shown by Proposition 1(i), the multinational firm bears a higher input price under cross-border M&A than under greenfield investment, thereby making the former less profitable. In addition, this input price disadvantage becomes larger with an increase in the cost difference, as shown by Proposition 1(ii). Hence, when the technology gap keeps increasing and turns extremely large, the input price disadvantage becomes important, making the multinational firm choose greenfield investment.

We also note that the two critical cost gaps are increasing with the initial number of local firms, i.e., $\frac{\partial c_{n1}}{\partial n} > 0$ and $\frac{\partial c_{n2}}{\partial n} > 0$. Hence, given a cost gap, there is a critical number of local firms that determines the choice of entry mode. There are two cases. First, if the given cost gap is small enough, there shall exist a critical $n^*$ such that the multinational firm chooses cross-border M&A if $n < n^*$, but chooses greenfield investment if $n > n^*$. Second, if the given cost gap is large enough, then the multinational firm chooses greenfield investment for relatively small $n$, but chooses cross-border M&A if $n$ is sufficient large.

### 4.2 The discriminatory pricing regime
If the upstream monopolist adopts discriminatory pricing, then it charges different prices to the multinational firm and the local firms to maximize its profit, which is as follows:

\[ \Omega = w_m q_m + w_i n^i q_i = w_m \frac{a - (n^i + 1)w_m + n^i (w_i + c)}{b(2 + n^i)} + w_i n^i \frac{a - 2(w_i + c) + w_m}{b(2 + n^i)}. \]  

(8)

By differentiating (8) with respect to \( w_m \) and \( w_i \) and solving the first-order conditions of the profit maximization problem, we obtain the equilibrium discriminatory input prices as follows:

\[ w_m^d = \frac{a}{2} \quad \text{and} \quad w_i^d = \frac{a - c}{2}, \]  

(9)

where superscript “\( d \)” represents the variables that are associated with discriminatory pricing. From (9), we obtain the next proposition.

**Proposition 3** Under discriminatory pricing, the input monopolist charges a higher input price for the multinational firm than that for the local firms and the discriminatory input prices are not sensitive to the foreign entry modes.

This proposition’s result is in line with the findings in the existing literature on input price discrimination, whereby a monopolist engaging in discriminatory pricing tends to charge higher prices to more efficient downstream firms, e.g., Katz (1987), Degraba (1990), and Yishida (2000). In our model, the multinational firm enjoys a productivity advantage over the local firms. Hence, it pays a higher input price versus the local firms.

By using (9) and (7), we can also find a critical cost gap, denoted as \( c^d \), that determines the optimal entry mode under discriminatory pricing and give the following proposition.7

**Proposition 4** If the monopolist charges discriminatory input prices, then the optimal foreign entry mode is cross-border M&A when the technology gap is sufficiently large (\( c > c^d \)); otherwise,

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7 See Appendix B for the proof.
In contrast to uniform pricing, under discriminatory pricing each firm pays the same input price regardless of the entry modes. In other words, the input price disadvantage caused by cross-border M&A no longer exists under discriminatory pricing. As proposed by Neary (2007), the multinational prefers cross-border M&A to greenfield investment if the technology gap is sufficiently large. Hence, a monotonic relationship between the optimal entry mode and the technology gap arises. Moreover, $\partial c^d/\partial n > 0$, such that the multinational firm is more likely to choose greenfield investment when the local market becomes more competitive.

4.3 A comparison of the optimal entry modes

We compare the optimal foreign entry modes under the two input pricing regimes by Figure 1, where the horizontal axis represents the initial number of local firms and the vertical axis represents the technology gap.\(^8\) Note that we set up an upper bound of the cost difference by $\bar{c}$ to secure positive quantities in equilibrium.\(^9\) In the figure, we refer to “G” (“M&A”) as greenfield investment (cross-border M&A). In each parenthesis the first and second arguments indicate the optimal entry mode under uniform pricing and discriminatory pricing, respectively.

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\(^8\) In Figure 1, we assume that $a = 1$, $b = 1$, and $n \geq 2$.

\(^9\) Note that that for more realistic results, in Figure 1 we restrict our attention to the situations that all the domestic firms are active in the market. In other words, we assume that $c < \bar{c} = an/(3n+1)$. This upper bound of the cost gap is derived by ensuring that the domestic (less efficient) firms can always produce positive outputs under either pricing policy and entry mode. In other words, from (2), we can solve for the domestic output level for four cases by substituting the corresponding equilibrium input prices and the number of remaining domestic firms. The most severe condition for the upper cost difference is obtained by ensuring that the domestic firms produces positive output when the foreign entry mode is cross-border M&A and the monopolist charges a uniform price.
We summarize the findings for optimal foreign entry mode as follows.

**Proposition 5** The foreign entry mode is determined by the technology gap and the input pricing policies. (i) If \( c < c^{u^2} \), then the optimal entry mode is greenfield investment under both pricing policies. (ii) If \( c^{u^2} < c < c^d \), then the optimal entry mode is greenfield investment under discriminatory pricing, but it is cross-border M&A under uniform pricing. (iii) If \( c^d < c < c^{u^1} \), then the optimal entry mode is cross-border M&A under both pricing policies. (v) If \( c^{u^1} < c < \bar{c} \), then the optimal entry mode is greenfield investment under uniform pricing, but it is cross-border M&A under discriminatory pricing.

Proposition 5 implies that the input price policy is critical to the choice of foreign entry mode. It shows that the foreign entry mode is the same in Regions II and V, but not in Regions I and III. The reasons are as follows. In region III, i.e., \( c^{u^2} < c < c^d \), the multinational firm prefers cross-border M&A to greenfield investment under uniform pricing, whereas the ranking is reversed.
under discriminatory pricing since discriminatory input prices reduce the difference in effective cost (input price plus marginal cost) between the multinational firm and the local firms. Hence, the critical cost gap that ensures the profitability of cross-border M&A is higher under discriminatory pricing than under uniform pricing, i.e., \( c^d > c^u^2 \). As mentioned before, the entry mode differs in Region I, because of the non-monotonic relationship under uniform pricing. The relationship between foreign entry mode and input price policy in the host country gives rise to possible policy implications for input price discrimination, which will be discussed in a later section.

5 Policy Implications of Input Price Regulation in the Host Country

Based on the choice of foreign entry mode, we now turn to examine the effects of price discrimination on consumer surplus and firms’ profits in order to derive the policy implications for input price regulation in the host country.

Under the specification of linear demand, the consumer surplus is as follows:

\[
CS = \int_0^Q P(t)dt - P(Q)Q = bQ^2/2 ,
\]

which depends on the aggregate output in the market. From (5), if the foreign entry mode is greenfield investment, then the aggregate outputs under the two pricing regimes are derivable as follows:

\[
Q^d = Q^u = \frac{(n+1)a - nc}{2b(2+n)} .
\]

If cross-border M&A arises, then the aggregate outputs are:

\[
Q^d = Q^u = \frac{na - (n-1)c}{2b(1+n)} .
\]

This shows that the aggregate output is sensitive to foreign entry mode, but not to the input price policy. Hence, the impact on consumer surplus of input price discrimination depends on the entry mode thereof. From Figure 1, in Regimes I and III the foreign entry mode differs under the two pricing regimes. Under such circumstances, the effect of input price discrimination on consumer surplus is thus ambiguous, giving rise to the following proposition.
Proposition 6  If the objective of the government in the host country is to maximize consumer surplus, then it shall allow price discrimination in the input market if the cost gap is in the middle \((c^{a_2} < c < c^d)\), but not if the gap is sufficiently large \((c > c^{a_1})\).

The intuition is as follows. In our model, firms compete in Cournot fashion and the demand of the homogeneous good has a linear form; both pricing policies then lead to the same aggregate market output provided that the number of firms is the same. This is because the average effective marginal cost of downstream firms remains unchanged when the input price policy shifts from uniform pricing to discriminatory pricing. Hence, the aggregate output depends only on the multinational firm’s entry choice, which affects the number of active firms in the downstream market. Intuitively, the aggregate output is greater under greenfield investment versus cross-border M&A as the former accommodates more downstream firms.

Proposition 6 also proposes a contrary result to the relationship between the downstream market structure and input price discrimination when the cost gap is sufficiently large. In the existing IO literature, when considering the entry decision by a less efficient firm, input price discrimination usually tends to accommodate the less efficient firms such that the aggregate market output is larger compared with uniform pricing. In contrast, when considering the choice of foreign entry mode by an efficient multinational firm, we find that uniform pricing may encourage the multinational firm to engage in greenfield investment. This leads to a more competitive market structure and increases the aggregate output.

We now move to discuss the effects on downstream firms’ profits from input price discrimination. By comparing (6) and (13), each local firm can enjoy an input price discount under discriminatory pricing. The targeted downstream firm, which is merged by the multinational firm, always receives the profit it would earn under greenfield investment no matter which entry mode is chosen. Hence, price discrimination favors the targeted firm due to the compensating input price.
Nevertheless, the remaining local downstream firms’ profits are affected not only by the input prices, but also the resulting market structure from FDI. If the foreign entry mode is the same, then input price discrimination favors the remaining local firms due to the input price advantage. If greenfield investment arises under discriminatory pricing but not under uniform pricing (Proposition 5 (ii)), then the market, nevertheless, is more intense and the local firms may be hurt by price discrimination. More specifically, if the initial number of local firms \(n\) is small enough, then the loss from intensive competition becomes significant. In this case, uniform pricing is more desirable than discriminatory pricing in terms of downstream profits. The following proposition is thus obtained.\(^{10}\)

**Proposition 7** Assume that the initial market is less competitive in the host country. The downstream profit is lower under discriminatory pricing than under uniform pricing if greenfield investment arises only under the former.

For the input monopolist, it is straightforward that discriminatory pricing is always more profitable than uniform pricing, because it allows the monopolist to extract more rents from the more efficient multinational firm. This result still holds even under the circumstances whereby uniform pricing induces greenfield investment and produces larger market outputs.

From the previous analysis, input price discrimination has different effects on the three parties in the host country. Hence, whether input price discrimination should be banned or not depends on the objective of the government in the host country. In what follows, we discuss the policy implications on input price discrimination if the government aims to maximize social welfare, which is defined as the summation of consumer surplus, local downstream firms’ profits, and the input monopolist’s profit.

Consider the cases that the entry mode is the same under the two pricing policies. When the

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\(^{10}\) See Appendix C for the proof.
input pricing policy moves from uniform to discriminatory pricing, the input monopolist can extract more rent from the efficient multinational firm. On the other hand, at the same time the local downstream firms will receive an input price discount and produce more outputs, and thereby the aggregate industry profit increases. However, consumer surplus remains unchanged. Under such a circumstance, input price discrimination enhances social welfare. It is worth noting that the benefit of price discrimination can be further enlarged if the multinational firm engages in greenfield investment under discriminatory pricing, but not under uniform pricing. For such a circumstance, every party in the host country (including the consumers) becomes better off. From Proposition 7, this will be the case when $c^u < c < c^d$ and $n$ is not too small. We summarize the above result into a proposition.

**Proposition 8**  If the multinational firm chooses the same entry mode under either input pricing policy, then allowing input price discrimination is socially desirable in the host countries. Furthermore, if greenfield investment arises only under discriminatory pricing and the downstream industry is sufficiently competitive, then input price discrimination even benefits all parties in the host country.

6 Conclusions

In this research we have examined the optimal entry modes of a multinational firm in the presence of an input monopolist. It is shown that the size of the technology gap between the multinational firm and the local firms plays an important role in determining the choice between the two FDI modes: greenfield investment and cross-border M&A. Cross-border M&A arises only if the technology gap is not too small. If the technology gap is sufficiently large, then uniform pricing is more likely to induce greenfield investment as compared with discriminatory pricing. If the technology gap is at a medium, then discriminatory pricing is more likely to induce greenfield FDI. In the context of foreign entry, input price discrimination favors the input supplier, but has
ambiguous effects on downstream local firms and consumers in the host country. Hence, under some circumstances, input price discrimination is beneficial to all parties and thus is socially desirable to the host country.

Appendix

A. Proof of Proposition 2

By substituting (6) into (3) and (4), the downstream firms’ profits are derivable as:

\[ \pi_m = \frac{1}{4b} \left[ \frac{(1 + n')a + n'(3 + 2n')c}{(1 + n')(2 + n')} \right]^2, \quad \pi_i = \frac{1}{4b} \left[ \frac{(1 + n')a - (3n' - 4)c}{(1 + n')(2 + n')} \right]^2. \]

According to the above profits, substituting the corresponding profits into (7) yields:

\[ \Delta \pi = \frac{\Gamma a^2 - \Upsilon ac + \Psi c^2}{4b[n(n + 1)(n + 2)]}, \]

where \( \Gamma = (n^4 - 2n^2), \ \Upsilon = (10n^4 + 14n^3 - 8n^2 - 8n), \ \Psi = (21n^4 + 50n^3 + 19n^2 - 12n - 4) \). Letting \( \Delta \pi \) equal zero and solving for the critical values of \( c \), at which the two entry modes are indifferent in terms of the multinational firm’s profits, we obtain:

\[ c^{\nu_1} = \frac{an \left( 5n^3 + 7n^2 - 4n - 4 + \sqrt{4n^6 + 20n^5 + 32n^4 + 16n^3 + 2n^2 + 8n + 8} \right)}{21n^4 + 50n^3 + 19n^2 - 12n - 4}, \]

\[ c^{\nu_2} = \frac{an \left( 5n^3 + 7n^2 - 4n - 4 - \sqrt{4n^6 + 20n^5 + 32n^4 + 16n^3 + 2n^2 + 8n + 8} \right)}{21n^4 + 50n^3 + 19n^2 - 12n - 4}, \]

and \( c^{\nu_2} < c^{\nu_1} \). Q.E.D.

B. Proof of Proposition 4

By substituting (9) into (3) and (4), the downstream firms’ profits are derivable as:

\[ \pi_m = \frac{1}{4b} \left( \frac{a + n'c}{2 + n'} \right)^2, \quad \pi_i = \frac{1}{4b} \left( \frac{a - c}{2 + n'} \right)^2. \]
Based on the above profits, substituting the corresponding profits into (7) and rearranging yield:

\[ \Delta \pi = \frac{(a-2c)(an^2 - 2a - 4n^2c - 6nc)}{4b(1+n)(2+n)^2}. \]

Letting \( \Delta \pi \) be zero and solving for the critical value yield:

\[ c^d = \frac{n^2 - 2 - a}{n(3+2n)2}. \]

If \( c < c^d \) (\( c > c^d \)), then the sign of the profit difference is positive (negative). The proof of Proposition 4 is thus complete. \textit{Q.E.D.}

C. Proof of Proposition 7

If \( c^{u2} < c < c^d \), then from (4) a downstream firm’s profit under the two pricing policies is as follows:

\[ \pi_i^d = \frac{1}{4b} \left( \frac{a-2c}{n+2} \right)^2, \quad \pi_i^u = \frac{1}{4b} \left( \frac{a-3nc-c}{n(n+1)} \right)^2. \]

By comparison, \( \pi_i^u > \pi_i^d \) if \( c < c' = an/(n^2 + 5n + 2) \). If \( n \) is sufficiently small, then \( c' \) falls in the interval \([c^{u2}, c^d]\), in which greenfield investment arises only under discriminatory pricing. Hence, Proposition 7 holds true if the local market is initially less competitive (i.e. \( n \) is sufficiently small). \textit{Q.D.E.}

Reference


