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Strategic Divisionalization, Product Differentiation and International Competition¹

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In this note we construct a simple international differentiated duopoly model that involves a divisionalization decision. It will be shown that the number of third market divisions of a parent firm with a cost advantage is relatively large. The results imply that the cost competitiveness of one country's firm will be magnified through divisionalization decisions.

Keywords: divisionalization, product differentiation, cost competitiveness

JEL Classifications: D43, F12

1. Introduction

Due to reductions in barriers to investment throughout the world, there has been a rapid increase in foreign direct investment (FDI).⁴ It has spurred a large body of literature examining the determinants and effects of FDI. In traditional FDI literature, it is argued that FDI is determined by firms to take advantage of various economic environments of the host market such as wage differentials, access to the market, and access to resources, etc.⁵

In recent years, the role of retail and distribution facilities (i.e., 'downstream divisions') is emphasized in FDI activities. In particular, many firms have shifted those facilities to countries such as China and India because of growing demand in those countries. When FDI is made in countries due to growing demand, the main purpose is to obtain a better access to those markets. Therefore, the number of retail and distribution divisions is increasingly recognized as an important variable in strategies for the international competitiveness. For example, both Korean and Japanese automobile manufactures compete in the Indian market (lured by an annual growth rate of 20%) via increasing distribution and retail divisions.⁶ In the literature, however, such kinds of strategic aspects of the number of divisions

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⁴ Empirical evidence shows that investment liberalization stimulates FDI. See, for example, Amiti and Wakelin (2003). See, also, Markusen (1995) for a survey of the literature.

⁵ Furthermore, an important accomplishment of the modern general equilibrium models of FDI is the ability to determine the market structure endogenously, that is, the existence and distribution of national and multinational firms are determined by the production functions and the distribution of endowments. See Markusen (2002).

⁶ 'Suzuki, Toyota, Honda to Strengthen Dealership Networks in India,' *The Nihon Keizai Shinbun*, February 20th, 2007.

(i.e., divisionalization decisions) have been downplayed.

In this note, we argue that in the presence of divisionalization decisions, cross-country cost differentials affect FDI outcomes because of the changed competition structure. To illustrate this point, we consider a simple international differentiated duopoly environment in which two parent firms from different countries compete in the third country's market.⁷ We assume that there are cross-country cost differentials between these two parent firms which produce differentiated products. The parent firms' choices of divisionalization are modeled as a two-stage game.⁸ It will be shown that the number of third market divisions of a parent firm with a cost advantage (i.e., lower marginal costs) is relatively large. The results imply that the cost advantage of one country's firm will be magnified through divisionalization decisions.

In these mode of competition, the number of divisions plays an important role as a strategic variable: through changing the number of its division, each parent firm can affect its strategic position in the third market. As yet, however, little attention has been paid to the implications of divisionalization in the context of competition in the international market. Since the role of divisionalization is amplified in the globalized world, it seems important to explore the relationship between cost-competitiveness and divisionalization in the open economy setting.

As its primary contribution, this note examines how comparative advantage (i.e., the cost-competitiveness of the parent firm) affects divisionalization decisions in the third country's market.

2. The Model

Consider a model with two parent firms, each of which belongs to its country (labeled Home and Foreign). Parent firms intend to make foreign direct investment (FDI) decisions in regard to a third market.⁹ We assume that output is differentiated across firms and that the inverse demand functions of Home and Foreign product in the third market are given by

$$p = \alpha - \beta(Q + \theta Q^*) \text{ and } p^* = \alpha - \beta(Q^* + \theta Q), \quad (0 \leq \theta \leq 1) \quad (1)$$

where p (p^*) and Q (Q^*) denote the price and the total output of Home (Foreign) product respectively, and θ is a parameter indicating the degree of product differentiation. A FDI game is modeled as a simultaneous-move, two-stage game among profit-maximizing parent firms. In the first stage, each parent firm chooses a number of competing units in the third country, which we will henceforth call 'divisions'. In the second stage, all of these divisions are independent Cournot-Nash players in a simultaneous-move, differentiated product oligopoly game in the third market. Let n (n^*)

⁷International (or third-market) duopoly models are popular in the context of strategic trade policy. See Brander (1995) for a survey of the literature.

⁸This paper is closely related to the recent literature on strategic divisionalization. Corchon (1991), Polasky (1992), Baye et al. (1996a, b), Yuan (1999), and Ziss (1998) analyze the strategic incentives for firms to form independent divisions. However, their analyses concentrated on the case of a closed market. The case of an open market without product differentiation is analyzed by Kobayashi et al. (2007): comparing their results with the present note, one can realize that the degree of product differentiation play a crucial role in determining strategic interaction between two parent firms (i.e., strategic substitutes and strategic complements). We would like to thank one anonymous referee for pointing this out.

⁹We assume away the possibility of export from each country to the third market.

denote the number of divisions chosen by the Home (Foreign) parent firm in the first stage and let x (y) be the output of each division of the Home (Foreign) firm. The cost of adding another division, $f > 0$, is constant and identical for both parent firms. It is assumed that there are cross-country cost differentials between two countries' divisions. We normalize the Home divisions' marginal cost zero, while c^* ($c^* > 0$) represents the Foreign divisions' marginal costs.

We can solve for the second-stage Cournot equilibrium outputs as a function of the number of divisions chosen in the first stage. Given the number of divisions, the equilibrium output of each division and the equilibrium prices become¹⁰

$$x = \frac{\alpha + n^* [(1-\theta)\alpha + \theta c^*]}{\beta \varphi(-n, -n^*)}, (2)$$

$$y = \frac{\alpha - c^* + n[(1-\theta)(\alpha - c^*) - \theta c^*]}{\beta \varphi(-n, -n^*)}, (3)$$

$$p = \frac{\alpha + n^* [(1-\theta)\alpha + \theta c^*]}{\varphi(-n, -n^*)}, (4)$$

$$p^* = \frac{\alpha - c^* + n[(1-\theta)(\alpha - c^*) - \theta c^*]}{\varphi(-n, -n^*)} + c^*, (5)$$

where $\varphi(u, v) \equiv 1 - u - v + uv(1-\theta)(1+\theta)$. Note that, due to cross-country cost differentials, each Home division produces more than each Foreign division (i.e., $x > y$), as long as $\alpha > c^*/(1-\theta)$.

We can write the profit for the Home (Foreign) parent firm as

$$\Pi = \frac{n\{\alpha + n^* [(1-\theta)\alpha + \theta c^*]\}^2}{\beta[\varphi(-n, -n^*)]^2} - nf, (6)$$

$$\Pi^* = \frac{n^*\{\alpha - c^* + n[(1-\theta)(\alpha - c^*) - \theta c^*]\}^2}{\beta[\varphi(-n, -n^*)]^2} - n^*f. (7)$$

In the first stage, each parent firm chooses the number of divisions in the third market, taking as given the divisionalization decisions of its rival. Differentiating (6) and (7) with respect to the number of divisions, setting the result to zero yields the following reaction functions for each parent firm.¹¹

¹⁰ Note that each Home division's profit is $x[\alpha - \beta(Q + \theta Q^*)]$ while each Foreign division's profit is $y[\alpha - \beta(Q^* + \theta Q) - c^*]$, where $Q = \sum x$ and $Q^* = \sum y$, respectively.

¹¹ Subscripts denote partial derivatives throughout. It is straightforward to check that the second-order conditions are met.

$$\Pi_n = \frac{\{\alpha + n^*[(1-\theta)\alpha + \theta c^*]\}^2 \varphi(n, -n^*)}{\beta[\varphi(-n, -n^*)]^3} - f = 0, (8)$$

$$\Pi_{n^*} = \frac{\{\alpha - c^* + n[(1-\theta)(\alpha - c^*) - \theta c^*]\}^2 \varphi(-n, n^*)}{\beta[\varphi(-n, -n^*)]^3} - f = 0. (9)$$

The comparative statics effects (dn/dc^*) and (dn^*/dc^*) can be obtained by totally differentiating these conditions with respect to n , n^* , and c^* as follows:

$$\Pi_{nn} dn + \Pi_{nn^*} dn^* + \Pi_{nc^*} dc^* = 0, (10)$$

$$\Pi_{n^*n}^* dn + \Pi_{n^*n^*}^* dn^* + \Pi_{n^*c^*}^* dc^* = 0. (11)$$

These equations can be solved as

$$dn/dc^* = (\Pi_{n^*c^*}^* \Pi_{nn^*} - \Pi_{nc^*} \Pi_{n^*n^*}^*) / D, (12)$$

$$dn^*/dc^* = (\Pi_{n^*n}^* \Pi_{nc^*} - \Pi_{nn} \Pi_{n^*c^*}^*) / D, (13)$$

where $D = \Pi_{nn} \Pi_{n^*n^*}^* - \Pi_{nn^*} \Pi_{n^*n}^*$. Given the assumption that n and n^* are strategic substitutes (i.e., $\Pi_{nn^*} < 0$ and $\Pi_{n^*n}^* < 0$) as defined by Bulow et al. (1985), we can obtain that $(dn/dc^*) > 0$ and $(dn^*/dc^*) < 0$.¹²

Figure 1 illustrates a generic equilibrium for this model. RF (RF^*) denotes Home (Foreign) parent firm's reaction curves: equilibrium numbers of divisions are obtained at the intersection of these curves. Note that an increase in c^* shifts RF (RF^*) outward (inward), as indicated by dotted curves. This leads to the following proposition:

Proposition: *In the differentiated duopoly game in the international (third) market, the parent firm with the lowest marginal costs will have the largest number of divisions.*

This implies that the cost-advantaged firm's divisions will dominate in the third market: not only does each division with a cost advantage produce a larger output ($x > y$), but also the number of such divisions becomes larger in the third market ($n > n^*$). The principle involved is that, since the motivation for divisionalization is to commit to a higher output level in the product market, a cost-advantaged Home parent firm (which has a higher incentive to shift profits) will choose a larger

¹²This assumption holds and a stable equilibrium with $D > 0$ exists when (i) c^* is sufficiently small, (ii) θ is close to 1, and (iii) $(\beta f)^{1/2} + c^* < \alpha < (3\sqrt{3}/2)(\beta f)^{1/2}$ is satisfied. Regarding condition (iii), we add some comments. This can be viewed as conditions on the size of market. Firstly, if the former inequality doesn't hold the market is so small that Foreign firm with a cost disadvantage is impossible to enter this market, even if there is no Home firm's division in the market. Secondly, the later inequality doesn't hold the market is not so small that Home firm with a cost advantage increases their divisions in response to an increase in the number of Foreign firm's division when it is sufficiently small: The slope of RF becomes positive close to the horizontal axis (Figure 1). Indeed, the later one is not necessary to obtain our result, since we only need to assume that n and n^* becomes strategic substitutes around a generic equilibrium.

number of divisions in the first stage.¹³

3. Conclusion

In a two-stage differentiated duopoly game with divisionalization, it has been shown that a cost advantage for a country's parent firm will result in a relatively large number of divisions in the third market. In other words, given that FDI is liberalized, an initial cost-advantage of one country will be magnified through divisionalization decisions.

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¹³A related argument can be found in the strategic trade policy literature. See, for example, Collie and de Meza (2003).

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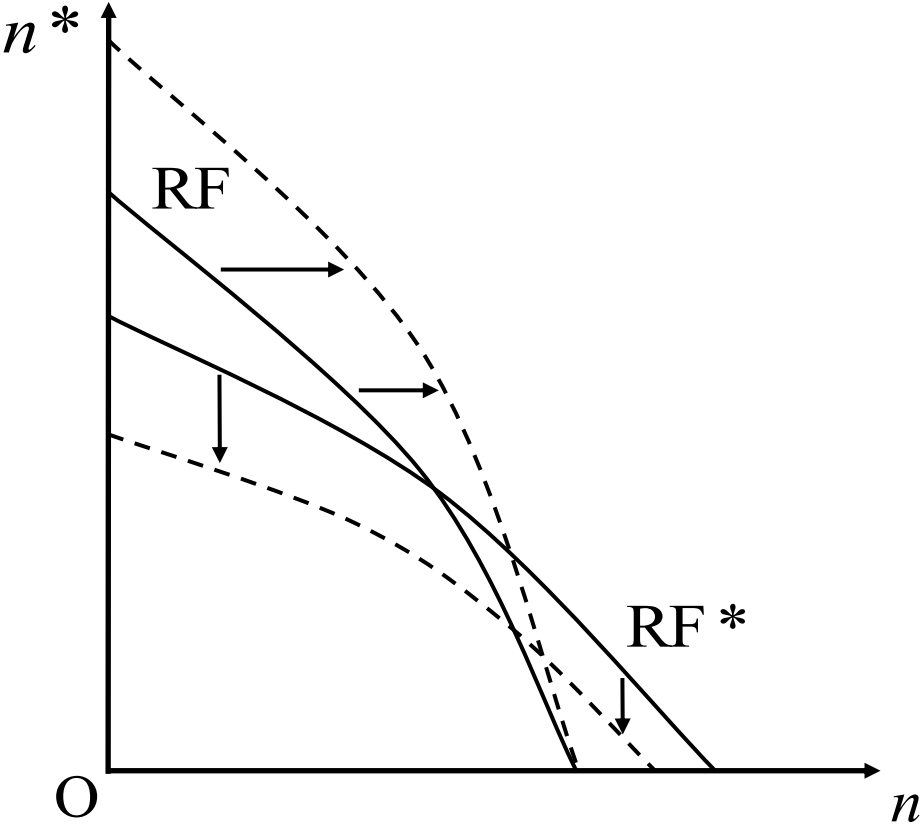


Figure 1