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Strategic Alternatives

Chwo-Ming Joseph Yu
Ming-Je Tang

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Chwo-Ming Joseph Vu, Assistant Professor
Department of Business Administration

Ming-Je Tang, Assistant Professor
Department of Business Administration

ABSTRACT

This paper examines the impact of production-related strategies to serve a market from the perspectives of foreign firms and host governments. The analysis is based on a static as well as a dynamic context. The paper shows that the optimal strategy for a foreign firm does not promote the maximum social welfare for the host country. Because of this conflict, host governments tend to impose some restrictions on foreign firms' entry strategies. Counter strategies that foreign firms may adopt in response to such restrictions are suggested.

INTRODUCTION

The internationalization of the world economy broadens the definition of the market and creates both opportunities and threats for firms. Foreign markets are opportunities for future growth and for exploiting market power. On the other hand, however, domestic firms have to compete with foreign firms in domestic as well as in foreign markets. These strategic thrusts have led more and more firms move toward internationalization either offensively or defensively. Firms have to gain a foothold in important markets in order to compete effectively with firms from other countries (Ohmae, 1985; Porter, 1986). Thus, a primary concern of the top management is to establish and operate successfully a portfolio of businesses across a number of geographic markets (Channon and Jalland, 1978). The strategy used for serving a specific country is crucial for the accomplishment of the strategic mission of internationalization.

A firm can use different strategies to serve a foreign market. These strategies can be classified into two categories: home production-related strategies and foreign production-related strategies (Terpstra, 1987). The foreign production-related strategies are gaining increasing importance nowadays for several reasons. First, host country governments encourage foreign firms to produce locally, and they provide certain incentives or impose some constraints to achieve this objective. Second, foreign firms can take advantage of the lower labor cost in the host country, especially in developing countries. Third, local production allows better interaction with local needs and thus has the potential of yielding higher profits. And finally, oligopolistic reaction research shows that once the leader invests in a foreign country, other firms in the industry will follow suit, in an attempt to maintain competitive balance (Knickerbocker, 1973; Yu and Ito, forthcoming). However, in the interest of social welfare, the host government frequently intervenes in the entry of foreign firms. In response to host government interventions, foreign firms must formulate counter entry strategies which obviously depend upon the type of government intervention.

This paper, based on an economic model, investigates the payoffs to foreign firms under different strategies in serving a market. Since the foreign firm's strategy is affected by host governments' policies, it is necessary to find out host governments' preference, which is determined by social welfare. Thus, the social welfare derived by different strategies has to be considered. The conflicts between foreign firms and host governments due to the different payoffs resulting from different strategies are demonstrated. It then discusses the foreign firms' optimal strategies both with and without government intervention. Payoffs to various strategies are examined both in a static and a dynamic context.

This paper has three distinctive features. First, it enriches previous analysis by examining four foreign production-related strategies: foreign direct investment (a wholly-owned subsidiary), licensing, joint venture (partial equity holding), and a combination of joint

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venture and licensing.[1] There are two variants for the licensing strategy, exclusive licensing, in which a foreign firm licenses its technology to a single local firm, and multiple licensing, in which the same technology is licensed to several local firms (Mirus, 1980). Economic analysis of multiple licensing is largely ignored in the literature. Second, this paper evaluates not only the payoffs to the foreign firm, but also the payoffs (social welfare) to the host government. Unlike Contractor (1985a, 1985b), the payoff to the host government in this paper is defined as the sum of consumer surplus and *local* producer surplus. We will show that the payoffs are different under different strategies used by a foreign firm. Finally, we base our analysis on a static as well as on a dynamic context. As the analysis demonstrates, the preferred strategy used by foreign firms from the host government's perspective is different in the two analyses.

Strategies to Serve a Foreign Market

The three basic strategies which international firms use to serve a foreign market are (i) exporting from the home country, (ii) licensing the technology to a foreign producer, and (iii) engaging in foreign direct investment (a wholly owned subsidiary). Since Hymer (1976) discussed the merits and concerns of licensing technologies to host country firms, researchers have devoted considerable attention to the question of why one strategy is preferred to another (Hirsch, 1976; Mirus, 1980; Buckley and Casson, 1981; Rugman, 1981; Grosse, 1985; Contractor 1985a, 1985b; Teece, 1981, 1983, 1985, 1986; Hill 1988).

Most of the research focuses on the costs associated with a particular strategy to serve a foreign market; the preferred strategy is the one which yields the minimum total cost. Looking at the cost of serving foreign markets by different strategies, Hirsch (1976), Rugman (1981), and Buckley and Casson (1981) specify the conditions under which a firm will choose a particular strategy. Recently, based upon a transaction costs framework, Teece (1981, 1983, 1985, 1986) and Hill (1988) evaluate the impact of governance cost on strategies in serving foreign markets. Due to different assumptions of costs, no consensus can be reached. In addition, their research, which compares three basic strategies, can be augmented by adding other strategies, such as joint venture and a combination of joint venture and licensing. Furthermore, their work implicitly assumes that the revenues generated by different market-serving strategies are the same. As Grosse (1985) pointed out, a strategic choice based on cost minimization is not necessarily the one based upon profit maximization. However, his model is too general to draw specific conclusions about

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[1] We address foreign production-related strategies only. Exporting is excluded from our analyses because of the following reasons: (i) significant government restrictions, such as tariffs and quotas; (ii) high volume of local demand; (iii) low level of economies of scale in production, and (iv) high transportation costs.

a preferred strategy. In addition, like Hirsch, Rugman, Buckley and Casson, and Teece, Grosse does not investigate the impact of these strategies from the host government's perspective and does not explicitly examine strategic reactions to the host governments' restrictions.

Recently, Contractor (1985a, 1985b) presented an algebraic model to examine the gains to a foreign firm and to the host government when the foreign firm engages in a joint venture with a firm in the host country. In the model, the foreign firm can be compensated by a package involving some return on equity investment, royalties, and margins on components or finished products traded with the joint venture firm. His model clearly demonstrates that the payoffs to the foreign firm and to the host government are different when different compensation packages are used. His model will be more comprehensive if both producer surplus and consumer surplus are included in evaluating the impact on the host country.

This paper evaluates serving a foreign market through foreign production-related strategies with and without host governments' interventions. We first present a static analysis which derives the payoffs to the foreign firm and the host government. The second section extends the static analysis to a dynamic framework and discusses the strategic implications.

The Model and the Static Analysis

We assume that the foreign firm faces a linear demand curve and that its production exhibits a constant return to scale. This firm is planning to grow through international horizontal integration (Teece, 1985,1986). Given a known linear demand curve in the host country, the foreign firm has to decide upon its strategy to serve that market. We further assume that there are no taxes and management costs abroad are minimal.[2] Based upon these assumptions, a number of foreign production-related strategies will be discussed. For each strategy, the profit of the foreign firm, the profit of the local firm(s)(local producer surplus), and the welfare of the host country will be derived. A comparison of the payoffs reveals the strategic implications for the foreign firm.

The firm's profit will be represented by $\pi_{i,j}$, where i represents either the foreign firm (f) or the local firm (l), and j describes the entry strategies; d is direct investment, el is exclusive licensing, ml is multiple licensing, j is joint venture, and jl is a combined strategy of joint venture and licensing.

Strategy 1: Foreign direct investment (a wholly-owned subsidiary).

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[2] If we include governance costs, the conclusions may not be unambiguous.

Let $P = a - bQ$ be the linear downward sloping demand curve, and c be the constant average cost.[3] It is easy to show that the maximum profit of the foreign firm is

$$\pi_{f,d} = \frac{(a-c)^2}{4b}$$

and Q, the output level, is $(a - c)/2b$, and P, the equilibrium price, is $(a + c)/2$. The consumer surplus, CS, is

$$CS = \frac{1}{2}(a - P)Q = \frac{(a-c)^2}{8b}$$

Since the foreign firm gets all the profits, the *local* producer surplus is zero. Therefore, the social welfare of the host country, which is the sum of local producer surplus and consumer surplus, is $\frac{(a-c)^2}{8b}$.

Strategy 2: Licensing.

Licensing, especially in licensing technologies, has been proposed as a strategic choice to strengthen competitive position and increase a firm's profit (Caves et.al., 1983; Galanni 1984; Katz and Shapiro 1985; Shepard 1987). Two licensing strategies, exclusive and multiple licensing, will be discussed below.

(1) Exclusive licensing

In this case, the local licensee enjoys the monopoly right and its cost becomes $c + f$, where f is the per unit royalty rate of licensing.[4] The price (P), the output (Q), and profit of the local firm $\pi_{l,el}$ are

(1)
$$P = \frac{(a + c + f)}{2}$$

(2)
$$Q = \frac{(a - c - f)}{2b}$$

(3)
$$\pi_{l,el} = \frac{(a - c - f)^2}{4b}$$

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[3] This model is commonly used in economics and has been used in the international business literature (e.g. Contractor, 1985a)

[4] If we allow a two-part tariff for licensing fees, the case will be trivial. Here we assume this trivial case does not exist. Given that host governments restrict license fees, this assumption is realistic.

Obviously, the profit of the local firm is a function of the unit royalty rate. The unit royalty rate is determined by the profit function of the foreign firm which is

(4)
$$\pi_{f,el} = f * Q = \frac{f(a-c-f)}{2b}$$

Differentiating (4) against f and setting the result to zero yield the optimal unit royalty rate for the foreign firm which is

(5)
$$f = \frac{(a-c)}{2}$$

Substituting (5) into (3) and (4) gives the profits of the local and foreign firm as follows:

$$\pi_{l,el} = \frac{(a-c)^2}{16b}$$

$$\pi_{f,el} = \frac{(a-c)^2}{8b}$$

The social welfare for the host government (W) is the sum of consumer surplus plus local producer surplus. Since the consumer surplus is $CS = \frac{(a-c-f)^2}{8b}$, the social welfare of the host country is

$$W = CS + \pi_{l,el} = \frac{3(a-c-f)^2}{8b}$$
$$= \frac{3(a-c)^2}{32b}$$

(2) Multiple licensing

Suppose that the foreign firm, either voluntarily or required by the host government, licenses its technology to a number of local firms. As shown below, if the post licensing market reaches a Cournot equilibrium, the foreign firm will license to as many local firms as possible in order to maximize its licensing income. Consequently, after multiple licensing, the market becomes competitive.

If the foreign firm licenses to n local firms, each local firm has the same constant production cost $c + f$. The total output is

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

where q_i is the output of firm i. The profit function of firm i is

$$\pi_i = pq_i - (c+f)q_i$$

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Since $p = a - bQ$, the profit of firm i is

(6)
$$\pi_i = (a - b \sum_{i=1}^{n} q_i)q_i - (c + f)q_i$$

In the Cournot equilibrium, $\frac{\partial q_i}{\partial q_j} = 0$. Thus, differentiating (6) with respect to q_i gives

(7)
$$\frac{\partial \pi_i}{\partial q_i} = a - 2bq_i - b \sum_{\substack{j=1 \\ j \neq i}} q_j - (c + f) = 0$$

In Cournot equilibrium, each local firm produces the same output, thus $q_i = q_j = Q/n$. Therefore, (7) becomes

$$\frac{\partial \pi_i}{\partial q_i} = a - 2bq_i - (n - 1)bq_i - (c + f) = 0$$

Consequently,

$$q_i = \frac{(a - c - f)}{(n + 1)b}$$

and

$$Q = nq_i = \frac{n(a - c - f)}{(n + 1)b}$$

The foreign firms's licensing income $\pi_{f,ml}$ is

(8)
$$\pi_{f,ml} = fQ = \frac{fn(a - c - f)}{(n + 1)b}$$

Differentiating (8) with respect to f and setting the result to zero gives $f = \frac{(a - c)}{2}$ and thus

$$\pi_{f,ml} = \frac{n(a - c)^2}{(n + 1)4b}$$

Obviously, $\pi_{f,ml}$ is an increasing function of n, the number of licensees. Therefore, the foreign firm would like to license to as many local firms as possible and the local market becomes competitive.

In a competitive market, the price should be equal to the cost of production. That is, $P = f + c$ and $Q = (a - c - f)/b$. Hence, the local producers earn no extra profits and the local producer surplus is zero.[5] The profit of the foreign firms is

(9)
$$\pi_{f,ml} = \frac{f(a - c - f)}{b}$$

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[5] If this is the case, there might be no incentive for local firms to obtain the license. However, local firms face a prisoner's dilemma in this case. If other firms obtain the technology, firms without it are in a disadvantageous competitive position.

Differentiating (9) with respect to f gives

(10)
$$f = \frac{(a-c)}{2}$$

Substituting (10) into (9) yields

$$\pi_{f,ml} = \frac{(a-c)^2}{4b}$$

Comparing the profits generated from FDI (Foreign Direct Investment) and multiple licensing, we find that both strategies are equally profitable to the foreign firm. Since the prices are the same in both cases, the consumer surpluses are identical in these two cases.[6] The similar outcome for the foreign firm between FDI and multiple licensing indicates that multiple licensing essentially allows the foreign firm to tax local firms and extract all the monopoly profits.

Since local producer surplus is zero, the social welfare is consumer surplus which is $(a-c)^2/8b$.

Strategy 3: Joint venture.

The foreign firm may form a joint venture with a local firm to enter the host country. This venture enjoys the monopoly position in the host country. Let E be the percentage of the equity held by the foreign firm. The profits of the foreign firm and the local firm are their respective shares of the monopolist's total profits. As shown in the direct investment case, the monopolist's profit is $(a-c)^2/4b$. Thus, the profits of the foreign firm, $\pi_{f,j}$ and the profits of the local firm, $\pi_{l,j}$, are

$$\pi_{f,j} = \frac{E(a-c)^2}{4b}$$

and

$$\pi_{l,j} = \frac{(1-E)(a-c)^2}{4b}$$

The social welfare of the host country is $CS + \pi_{l,j}$, which is $(3-2E)(a-c)^2/8b$. Because the revenue of the foreign firm is an increasing function of E, while the revenue of the local firm and the social welfare of the host country is a decreasing function of E, the interests of the host country clearly conflict with the interests of the foreign firm.

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[6] The consumer surplus under licensing to n local firms is $\frac{(n^2+2n)(a-c)^2}{(n^2+2n+1)(2b)}$, which is also an increasing function of n. Therefore, host governments also prefer the foreign firm to license to as many local firms as possible.

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Strategy 4: Joint venture and licensing.

With the exception of Contractor (1985a, 1985b), previous researchers do not consider the option that foreign firms may enter the host country by using two strategies simultaneously, i.e., forming a joint venture with a local firm and charging a license fee to that venture. In this case, the venture determines the price and the output level as in the case of exclusive licensing. However, the foreign firm, with an equity interest, can change its license fee and share of equity holding to maximize its joint revenue from the licensing agreement and from equity ownership.

In this case, the profit of the foreign firm is

$$(11) \qquad \pi_{f,jl} = E * V + f * Q$$

where V is the profit of a local monopolist. From (3), V is equal to $\frac{(a-c-f)^2}{4b}$. Substituting V and Q into (11) gives

$$(12) \qquad \pi_{f,jl} = \frac{E(a-c-f)^2}{4b} + \frac{f(a-c-f)}{2b}$$

The first order condition of (12) is

$$(13) \qquad E = 1 - \frac{f}{(a-c-f)}$$

Equation (13) specifies the relationship between the share of equity holding and the unit royalty rate when the foreign firm maximizes its profits. It is shown that the equity holding is a substitute for the unit royalty rate and vice versa. In other words, if the host government restricts the unit royalty rate, the foreign firm can offset the losses from a lowering unit royalty rate by increasing the share of equity holding. As explained later, this conclusion is very important to the foreign firm's strategy to serve a market.

We substitute (13) into (12) and then differentiate equation (12) with respect to E. The result, $d\pi_{f,jl}/dE$, which is always greater than zero, indicates that the foreign firm's profit is an increasing function of the share of equity holding. Therefore, the foreign firm will try to hold as much equity as it can. Without the intervention of the host government, total equity holding, i.e., a wholly-owned subsidiary, is always preferred to licensing.

The profit of the local firm in this scenario is $\pi_{l,jl} = (1-E)(a-c-f)^2/4b$. To this we add the consumer surplus, $(1-E)(a-c-f)^2/4b$, and get the social welfare equal to $(1-E)(a-c-f)^2/4b + (a-c-f)^2/8b$.

Table 1 presents the profit of the foreign firm, and the social welfare of the host country under different strategies. This table is constructed under the assumption that

the host government does not have any restrictions on the strategy used by the foreign firm. A number of strategic implications for the foreign firm can be drawn from the table.

Insert Table 1 here

Strategic implications – static analysis

The foreign firm, as a profit maximizer, prefers the strategy which yields the highest profits. As shown in Table 1, the returns of a wholly-owned subsidiary or of multiple licensing are always higher than those of other strategies. Thus, as long as the foreign firm has the freedom to choose its strategy, a wholly-owned subsidiary or multiple licensing will be preferred. However, these are not optimal strategies for the host country. To minimize the potential losses of social welfare, host governments usually intervene in the entry decisions of foreign firms by imposing some restrictions. Japan and India are cases in point (Ozawa, 1974; UNIDO, 1978).

The objective of the host government is to maximize social welfare. As our analysis demonstrates, social welfare is different under different strategies used by foreign firms. From the host government's perspective, Table 1 indicates that (1) exclusive licensing is least preferred by the government, while joint venture with no licensing is most preferred,[7] and (2) exclusive licensing is less preferable than FDI. This is probably the reason why governments usually require local ownership as a precondition for the entry of foreign firms. For example, foreign investors are not permitted to put in more than 50% of the total capital required in Korea, although exceptions are made for some special lines of industry (UNIDO, 1978).

In responding to host governments' restrictions, foreign firms have to change their strategies to accommodate these political imperatives. Table 1 provides a basis on which to formulate counter strategies when host governments intervene.

If the host government imposes a ban on FDI, the foreign firm can choose the multiple licensing approach. In most developing countries there are no restrictions on multiple licensing, and it is felt that exclusivity is a matter of negotiation between the foreign firm and the local firm (UNIDO, 1978). Two special cases are Japan and India, with the former discouraging multiple licensing and the latter encouraging it (Contractor, 1985b; UNIDO, 1978).

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[7] For example, if foreign equity holding is limited to 50%, host country's social welfare is $\frac{(a-c)^2}{4b}$, which is the highest among different strategies.

If the foreign firm cannot find enough local firms interested in its technology, the next preferable strategy is to form a joint venture with a local firm and at the same time license its technology to the venture. As shown in equation (13), different combinations of unit royalty rate and equity holdings generate the same level of profit. For example, if the foreign firm controls 50% of the venture, it will charge a unit royalty rate of $(a - c)/3$, which is two-thirds of what it charges for exclusive licensing and multiple licensing. In this case, the foreign firm's profit is $\frac{(a-c)^2}{6b}$, which is larger than the profits of exclusive licensing and that with the joint venture less than two-thirds of the equity. One would argue that the firm does not have to officially charge a license fee in this case because the foreign firm can build the license fee into the prices of semi-finished products sold to the venture. To achieve this goal, there have to be some tie-in agreements between the foreign firm and the local firm. However, due to government restrictions, we seldom see firms adopt this practice (UNIDO,1978).[8]

According to equation (13), the reverse relationship between the equity share and the unit royalty rate is shown in Figure 1. A foreign firm can adjust both amounts to maximize its profit in the host country. If the host government sets maximum share of foreign equity holding, the foreign firm can adjust its unit royalty rate according to equation (13) to reach the highest revenue it can earn in the market. Similarly, the foreign firm can adjust its share of equity holding when the host government restricts the unit royalty rate. For example, in Figure 1, if the host government restricts foreign equity holding to E_1, the foreign firm can charge a unit royalty rate f_1 and vice versa. If the host government restricts both unit royalty rate and foreign equity holding to f_2 and E_2 respectively, the foreign firm will hold the maximum allowed equity share E_2, because the foreign firm's revenue is an increasing function of E. Then, the foreign firm charges f_3 as the unit royalty rate. Thus, only when the host government imposes restrictions on both the share of equity holding and the unit royalty rate is the foreign firm unable to maximize its profits in the local market.[9]

Insert Figure 1 here

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[8] See Contractor (1981) for cases of tie-in provisions which may be beneficial to the local firm.

[9] The host government can prohibit foreign licensing. This, however, will reduce the incentive for foreign firms to transfer technologies. A royalty rate ceiling can increase foreign firms' incentive to transfer technology and reduces the possibility of their exploitation of the host country's welfare.

The last two strategies examined in this study are joint venture and exclusive licensing. They are less preferable than other strategies for foreign firms and, not surprisingly, are encouraged in most countries. According to our analysis, exclusive licensing is the least preferable when other strategies are available to the foreign firm. This result is in line with most of the findings in the international business literature (e.g., Buckley and Casson, 1981). When local demand is large, thus warranting local production, foreign firms always switch from licensing to other local production-related strategies. In summary, the preference of strategies to serve a market by a foreign firm in a descending order would be : foreign direct investment or multiple licensing, a combination of joint venture and licensing, joint venture, and exclusive licensing. The final choice of a specific strategy may depend on the restrictions of the host government and the bargaining power of the firm (Doz and Prahalad, 1981).

The above analyses are in a static framework. The next section examines whether the above conclusions still hold in a dynamic context.

DYNAMIC ANALYSIS

The primary difference between a static and a dynamic analysis is the issue of control of the interest. Under licensing, a local firm may take several years to learn the technology from a foreign firm, but after that period, this local firm can be independent of the foreign firm. Unlike the case of licensing, a wholly-owned subsidiary (foreign direct investment) will always be controlled by a foreign firm. In the following discussion, we deal with four foreign production-related strategies in a dynamic framework: exclusive licensing, multiple licensing, FDI, and joint venture with 50 percent limitation on foreign equity holding and no licensing.[10] Base upon the results in the previous analysis, the payoffs to the foreign firm and the host government will be derived and compared.

Strategy 1: Exclusive licensing.

We assume that the exclusive agreement lasts T years and that after year T, the licensee (local firm) is able to gain control of the technology and the market either through government protection or through efficient operations. Since the profit of the foreign firm in each year is $(a - c)^2/8b$, the discounted revenue for T years is

$$\pi_{f,el} = \int_0^T \frac{(a - c)^2}{8b} e^{-rt} dt$$
$$= \frac{(a - c)^2}{8b} \left(\frac{1}{r} - \frac{e^{-rT}}{r} \right)$$

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[10] Most countries limit foreign ownership to 50% of a joint venture. India is an exception with 40% maximum ownership.

where r is the discount rate. The social welfare of the host country is composed of two parts. The first part is the discounted social welfare for the first T years when the local firm depends on the foreign firm. The social welfare in each year is the sum of the consumer surplus and the producer surplus. The second part is the discounted social welfare after year T when the local firm is no longer dependent on the foreign firm and thus does not pay license fees. Hence, the social welfare of the host government will be equal to

$$W = \int_0^T \frac{3(a-c)^2}{32b} e^{-rt} dt + \int_T^\infty \frac{3(a-c)^2}{8b} e^{-rt} dt$$
$$= \frac{3(a-c)^2}{32br} + e^{-rT} \frac{9(a-c)^2}{32br}$$

Strategy 2: Multiple licensing.

Similarly, the discounted profit of the foreign firm under multiple licensing is

$$\pi_{f,ml} = \int_0^T \frac{(a-c)^2}{4b} e^{-rt} dt$$
$$= \frac{(a-c)^2}{4b} (\frac{1}{r} - \frac{e^{-rT}}{r})$$

The social welfare of the host government is $(a-c)^2/8b$ from time zero to T. After the license expires, the consumer surplus is the surplus of a competitive market with a price equal to c. The consumer surplus is $(a-c)^2/2b$. Therefore,

$$W = \int_0^T \frac{(a-c)^2}{8b} e^{-rt} dt + \int_T^\infty \frac{(a-c)^2}{2b} e^{-rt} dt$$
$$= \frac{(a-c)^2}{8b} (\frac{1}{r} + \frac{3e^{-rT}}{r})$$

Strategy 3: Foreign direct investment.

The foreign firm will control the local market forever under FDI. The profit of the foreign firm and the social welfare of the host country are

$$\pi_{f,d} = \int_0^\infty \frac{(a-c)^2}{4b} e^{-rt} dt = \frac{(a-c)^2}{4br}$$

and

$$W = \int_0^\infty \frac{(a-c)^2}{8b} e^{-rt} dt = \frac{(a-c)^2}{8br}$$

Strategy 4: Joint venture with 50 percent foreign ownership.

As discussed before, because foreign firms can manipulate equity ownership and licensing fees to reach their profit goals, host governments should ban the foreign licensing

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practice in order to gain a higher level of social welfare. We assume that the host government limits foreign ownership to 50%. Because the foreign firm will receive the revenue from the local venture for an unlimited time, its discounted profit is

$$
\begin{aligned}
\pi_{f,j} &= \int_0^\infty \frac{(a-c)^2}{8b} e^{-rt} dt \\
&= \frac{(a-c)^2}{8br}
\end{aligned}
$$

The social welfare of the host government will be

$$
\begin{aligned}
W &= \int_0^\infty \frac{(a-c)^2}{4b} e^{-rt} dt \\
&= \frac{(a-c)^2}{4br}
\end{aligned}
$$

Table 2 summarizes the payoff to the foreign firm and the host government under four foreign production-related strategies in a dynamic context. While the foreign firms prefers FDI, the host government apparently has a different preference. Hence, the interests of the foreign firm and the host government are in conflict.

STRATEGIC IMPLICATIONS - DYNAMIC ANALYSIS

As Table 2 demonstrates, the most preferred strategy of the foreign firm is FDI, which is consistent with the static analysis. If FDI is not possible, the foreign firm will choose either multiple licensing or 50 percent joint venture, depending upon the discount rate and the period of multiple licensing. Subtracting $\pi_{f,j}$ from $\pi_{f,ml}$ gives $((a-c)^2(1/2 - e^{-rT}))/4br$. If e^{-rT} is greater than $1/2$, the joint venture strategy is preferred. This means that as long as rT is less than 0.693, foreign firms will prefer joint venture. For example, when $r = 0.12$ and if the multiple licensing agreement will last less than 6 years, then the foreign firm should engage in joint venture because it yields more discounted profit than multiple licensing. Thus, other things being equal, the higher the discount rate, or the shorter the possible period of multiple licensing, the higher the possibility of a joint venture. Only when other strategies are not available, will a foreign firm serve a country through exclusive licensing.

Insert Table 2 here

Comparing the social welfare generated by each strategy, the preference of the host government are as follows:

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(1) FDI is less preferable than multiple licensing and joint venture.

(2) Multiple licensing is always preferred to exclusive licensing.

(3) From (1) and (2) it appears that the host government will prefer multiple licensing and joint venture because, in most cases, these two strategies of foreign firms yield a higher level of social welfare.

Because the strategy to maximize pay-offs is not the same for the foreign firm and the host government, in attempting to increase the social welfare, the host government will set up some restrictions to intervene in the foreign firm's strategy. The strategies of the foreign firm under different restrictions are discussed below.

(1) With no government restrictions on ownership, the foreign firm should own one hundred percent of the local subsidiary.

(2) Suppose the host government only restricts foreign ownership and enforces no restrictions on the period of multiple licensing agreements, then the foreign firm should weigh the gains from joint venture and multiple licensing. There are three decision variables: the allowed share of foreign ownership, the discount rate, and the possible period of the licensing agreement.

For example, if the allowed share of foreign ownership is 50 percent, and the discount rate used by the foreign firms is 10 percent, then the foreign firm could maximize its profit by adopting the strategy of joint venture when the possible period of a multiple licensing agreement is longer than 6 years.

(3) Suppose the host government regulates foreign ownership as well as the period of multiple licensing agreement, then a foreign firm has to evaluate the government's preference very carefully. Table 3 demonstrates the preferences of a host government and a foreign firm when the foreign ownership is restricted to 50 percent. For example, if the discount rate is 12 percent, the foreign firm prefers joint venture when the period of licensing is less than 5.8 years while the host government prefers the joint venture approach when the period is longer than 9.2 years. Clearly both parties have ranges of agreement and disagreement.

Insert Table 3 here

When the licensing period is between 5.8 and 9.2 years, both the foreign firm and the host government prefer multiple licensing. However, if the licensing period is longer than 9.2 years, or less than 5.8 years, the foreign firm and the host government have different preferences. Due to this difference, again, final resolution may depend upon the nature of technology involved, the capabilities of the local firm to learn the technology, and the

bargaining power of the two parties (Balasubramanyam 1973; Ozawa 1974, Mytelka 1978, Doz and Prahalad 1981)

(4) In any situation, joint ventures and exclusive licensing are still available to foreign firms. Clearly the deciding factors are the share of foreign ownership allowed and the period of licensing. Comparing the payoffs to these strategies reveals that, the higher the share of ownership, and the shorter the possible period of an exclusive licensing, the higher the payoffs to a joint venture strategy.

CONCLUSION

We have investigated the impact of different foreign production-related market-serving strategies on foreign firms. Our analysis includes both static and dynamic contexts. As we have demonstrated, the interests of foreign firms and host governments are in conflict in both contexts.

The optimal strategies for foreign firms and host governments are different under these two contexts. In both the static and the dynamic framework, with no government restriction, FDI is preferred by foreign firms. However, host governments usually enforce some restrictions on the strategies used by foreign firms. Given these restrictions, foreign firms must formulate counter strategies. If total ownership is not allowed, as is the case in many countries, foreign firms may be able to extract more profits by using other strategies, such as a strategy of combining joint venture and licensing as described in Figure 1.

Due to the conflicting positions of these two parties, the ultimate outcome is partially determined by the relative bargaining position of the foreign firm with respect to the host government. However, host governments usually give more leeway to foreign firms to encourage them to operate in these markets. For example, host governments may allow equity ownership and license at the same time but impose limits on license fees and ownerships (UNIDO 1978; UNCYAD 1978).

This paper has a number of limitations. First, many advanced technologies do exhibit significant economies of scale. This may not be a problem for exclusive licensing, joint venture, and FDI for large economies such as Japan and China. However, this could be a problem in the case of multiple licensing, because multiple licensees may not be available. Second, transaction costs and taxes are not included in the model.[11] It is not difficult to incorporate these variables into the model, but adding more parameters in the model may lead to nonconclusive results. Finally, in our dynamic analysis, the size of local market

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[11] Without considering transaction costs, our model demonstrates the superiority of FDI. Incorporating transaction costs as discussed in Teece (1981, 1983, 1985, 1986), our results continue to favor FDI, especially for sophisticated technologies.

is assumed to be constant. Some markets, especially in developing countries, grow at a phenomenal rate which may change our conclusions.

This paper opens many research avenues, both theoretical and empirical. Theoretically, many assumptions can be relaxed and more complicated models can be constructed to explore differences in market-serving strategies between industries such as the semiconductor and pharmaceutical industries. Empirically, this paper can be used to explain foreign entry behavior in countries with different host government restrictions. For example, one may compare the difference in entry behavior between countries with almost no regulations (e.g. U.S.) and heavily regulated countries (e.g. Japan). This model can also be modified to examine the switch of strategies in serving a market when the local market grows. Finally, the role of local firms in influencing foreign entries requires more analysis.

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TABLE 1

PAYOFFS WITH NO GOVERNMENT RESTRICTIONS

	FOREIGN DIRECT INVESTMENT	EXCLUSIVE LICENSING	MULTIPLE LICENSING	JOINT VENTURE	JOINT VENTURE AND LICENSING*
Entering Firm	$\dfrac{(a-c)^2}{4b}$	$\dfrac{(a-c)^2}{8b}$	$\dfrac{(a-c)^2}{4b}$	$\dfrac{E(a-c)^2}{4b}$	$\dfrac{E(a-c-f)^2}{4b} + \dfrac{f(a-c-f)}{2b}$
Local Firm	0	$\dfrac{(a-c)^2}{16b}$	0	$\dfrac{(1-E)(a-c)^2}{4b}$	$\dfrac{(1-E)(a-c-f)^2}{4b}$
Host Government	$\dfrac{(a-c)^2}{8b}$	$\dfrac{3(a-c)^2}{32b}$	$\dfrac{(a-c)^2}{8b}$	$\dfrac{(3-2E)(a-c)^2}{8b}$	$\dfrac{(1-E)(a-c-f)^2}{4b} + \dfrac{(a-c-f)^2}{8b}$

*$0 < E < 1$

PAYOFFS IN THE DYNAMIC CONTEXT

	EXCLUSIVE LICENSING	MULTIPLE LICENSING	FOREIGN DIRECT INVESTMENT	50% JOINT VENTURE
Entering Firm	$\dfrac{4(a-c)^2}{32br}(1-e^{-rt})$	$\dfrac{8(a-c)^2}{32br}(1-e^{-rt})$	$\dfrac{8(a-c)^2}{32br}$	$\dfrac{4(a-c)^2}{32br}$
Host Government	$\dfrac{3(a-c)^2}{32br}(1+3e^{-rt})$	$\dfrac{4(a-c)^2}{32br}(1+3e^{-rt})$	$\dfrac{4(a-c)^2}{32br}$	$\dfrac{8(a-c)^2}{32br}$

Table 3

COMPARISON OF PREFERENCES

DISCOUNT RATE	HOST GOVERNMENT Favor ML* when T <	ENTERING FIRM Favor ML* when T <
.10	11.0	6.9
.12	9.2	5.8
.15	7.3	4.6
.20	5.5	3.5

*ML = Multiple Licensing
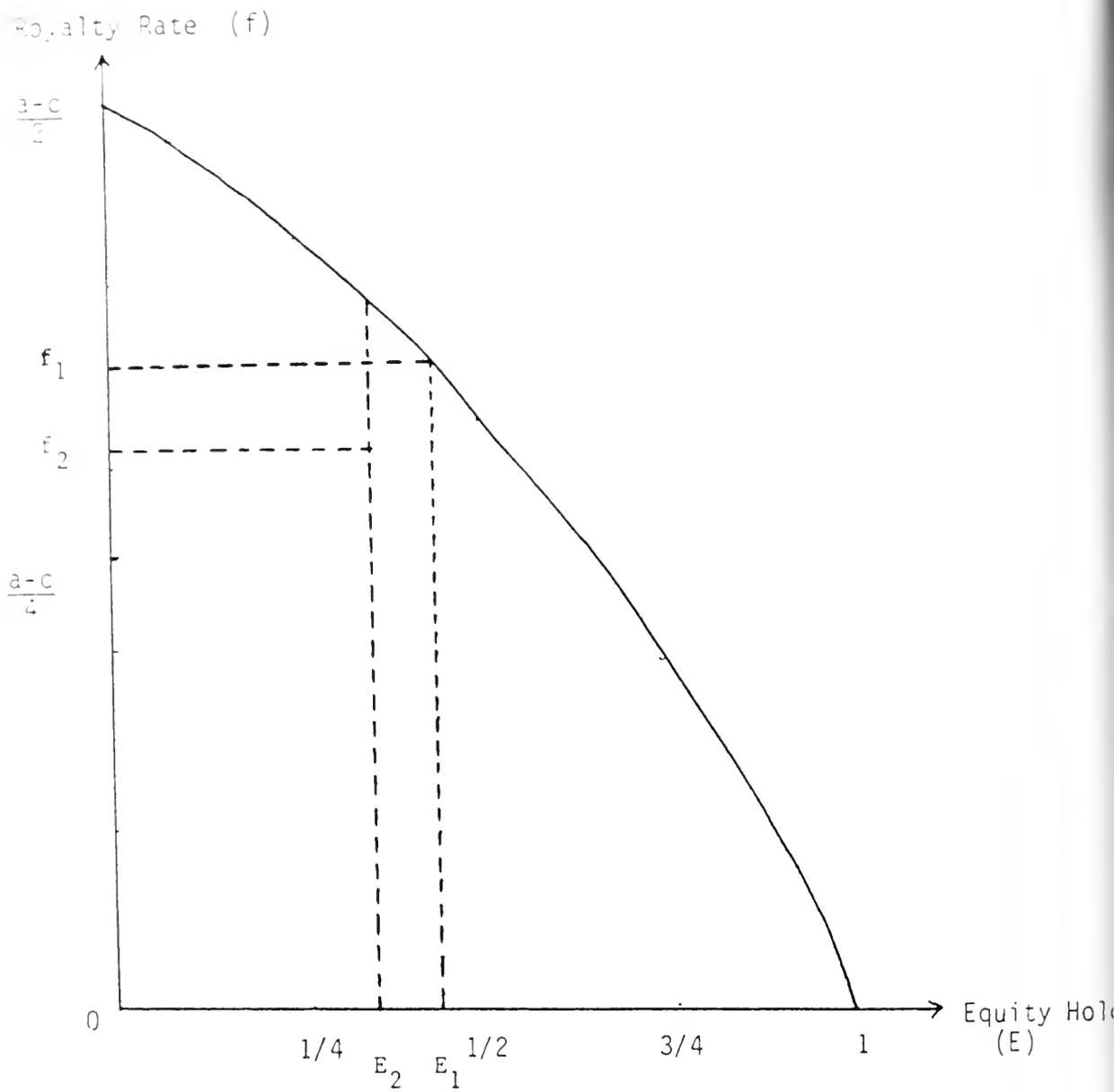
Royalty Rate (f)

Figure 1   Relationship between royalty rates and share of
equity holding