

## MULTINATIONAL ENTERPRISES AS GUARANTORS OF PRODUCT QUALITY

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*In a market subject to producers' moral hazard arising from unobservable product quality, guaranteeing quality by individual producers may require high reputational rents when the cost of production fluctuates. Multinational enterprises (MNEs) operating in a multiple number of countries have less incentives to cheat because cheating in one country costs the MNEs the loss of reputation in other countries. Thus, MNEs may produce high quality at a lower quality premium than local independent firms in each country. This paper also shows that MNEs possessing firm-specific assets with public good nature may fully collect the rents accruing to the assets through arm's length agreement when certain conditions hold.*

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### I. INTRODUCTION

In local markets of many products, foreign brand names and trademarks often enjoy reputation for high product quality. This reputation of foreign firms is often attributed to the fact that production technologies for high quality products are available only to the foreign firms. However, this explanation is not appealing in many cases where local firms possess or can easily obtain technologies to produce high quality products. It seems that foreign firms have advantages in terms of maintaining product quality that are not attributable to physical production technologies.

In a case study of licensing by an apparel company, Contractor (1985) reports that licensees are eager to renew the contract after it has expired, even when they have already learned technical parts of the package transferred through the

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contract. It is also reported that the difference in the level of royalty payments for the entire package and for the brand name alone is not significant. These findings imply that the principal asset being licensed seems to be the firm's brand name and the licensees' benefit comes not only from using the transferred technology, but also from proclaiming that the product is produced under the license from the company.

Many Korean firms have heavily relied upon original equipment manufacturer (OEM) export arrangements where they sell their products abroad under the brand names of foreign manufacturers or retailers. In the initial stages of development of the industry, essentially OEM was the only practical option for the Korean firms to export their outputs. Recently, even with noticeable improvements in the qualities of their products, they still sell more through OEM arrangements than under their own brand names. Attempts to establish own brand names have not been successful so far. There seems to be some sort of barriers for Korean firms to establish their reputation among foreign buyers.

In this paper we suggest a source of advantage in terms of product quality enjoyed by foreign brand names. It is shown that the incentive effect of "risk pooling" provides multinational enterprises (MNEs) operating in a multiple number of countries an advantage in terms of a quality control.

In a market subject to producers' moral hazard arising from unobservable product quality, guaranteeing quality by individual producers may require high reputational rents when the cost of delivering high quality products fluctuates. MNEs have less incentives to cheat because cheating in one country costs them the loss of reputation in other countries. Thus, they may produce high quality at a lower quality premium in each country. "Risk pooling" provides the MNEs an advantage over independent local firms in terms of overcoming a moral hazard problem. As we show later, this incentive effect exists even if we assume that producers and buyers are risk neutral.

According to the recent theories<sup>1</sup> of direct foreign investment (DFI), firms go abroad and successfully compete with local firms when they possess firm-specific assets. As argued by Markusen (1984), the firm-specific assets are closely related to the concept of the economies of multi-plant operation. R & D expenditures on designing better products and/or production processes is one example. Once an innovation is made in one plant, it can be incorporated into any number of additional plants without reducing the marginal product of the innovation in the plant where the innovation originally takes place. Thus, an MNE can operate more efficiently than a group of independent firms by avoiding the duplication of R & D activities. This paper contributes to the theoretical literature on DFI by showing that even in the absence of any physical joint inputs the economies of multi-plant (multinational) operation may occur by pooling risks of losing

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<sup>1</sup> See, for example, Hymer (1960), Buckley and Casson (1976), Dunning and McQueen (1981), and Caves (1982).

long-term relationships with buyers over the national borders. MNEs enjoy the economies of multi-plant operation in terms of overcoming moral hazard, which enables firms to go abroad and successfully compete with local firms.

Firm-specific assets often show public good nature and there are obvious concerns about the appropriability of the rents accruing to those assets when they are transferred through arm's length agreement.<sup>2</sup> For example, Horstmann and Markusen (1987) argues that a firm transferring production technology opts to set up its subsidiary in the host country rather than engaging in arm's length licensing since the firm must provide a licensee with an incentive to maintain the reputation for product quality. However, this paper argues that if certain conditions hold, a firm's production technology can be transferred through arm's length licensing as efficiently as through internal transactions.

In terms of modelling, we turn to the idea of overcoming producers' moral hazard through quality premia for products of unobservable quality.<sup>3</sup> If firms cheat by selling low quality products at the price of high quality, they lose a discounted stream of future quality premia which exceeds one-time profit from cheating. In a competitive market, the expected quasi-rents from continued production of high quality are dissipated by sunk investments incurred at the time of entry.

In this paper, we assume that firms produce a fixed amount of output per period and incur an exogenously determined sunk set-up cost and the recurrent production cost which fluctuates over time. Thus, a subgame-perfect competitive equilibrium exists for a certain range of cost levels where the quality premium is not too high compared to the sunk investment. This model enables us to address "risk-pooling" by MNEs operating in a multiple number of countries.

The remaining of this paper is organized as follows. In section II, we present a basic model of reputation with product quality in a single country case. In section III, we extend the model by including MNEs operating in a multiple number of countries and develop the main idea of this paper that multinationality plays the role of guaranteeing product quality. We examine the case where the firm's production technology is transferred through arm's length licensing in section VI. Finally, section V discusses policy implications and concludes the paper.

## II. A BASIC MODEL OF REPUTATION: A SINGLE COUNTRY CASE

We set up an infinitely repeated model of reputation with unobservable product quality. Consider a product that can be produced with two different qualities denoted by  $q_i$  for  $i = l, h$  with  $q_h > q_l$ . The characteristics of the

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<sup>2</sup> See Williamson (1981) for a general discussion of agent opportunism.

<sup>3</sup> This idea was developed by Klein and Leffler (1981), Allen (1984), and Shapiro (1983) among others.

product are such that neither a buyer nor a third party can discover the actual quality prior to purchase.<sup>4</sup> As a consequence, firms have incentives to produce low quality and sell it at the price of high quality. We assume that it is too costly to provide warranties for product quality due to moral hazard problems on the part of buyers such as careless use of the product. Therefore, we focus on a market mechanism through which firms' incentives to deliver low quality at the price of high quality can be overcome.

There are a continuum of infinitely-lived buyers in Country *A*. A buyer is interested in purchasing one unit of the product each period. The buyer assigns a monetary value,  $u_i$ , for consumption of one unit of the product of quality  $q_i$  for  $i=1, h$  with  $u_h > u_l$ . When the buyer does not consume the product, he obtains a reservation utility which is normalized to zero.

There are an infinite number of firms with identical production technologies. It is assumed that a firm produces a fixed amount of output, or simply one unit each period. The cost of production of quality  $q_i$  is denoted by  $\theta c_i$  for  $i=l, h$ , where  $\theta$  is a continuous random variable which is serially uncorrelated and uniformly distributed over  $[\theta_0, \theta_1]$  with  $\theta_1 > \theta > 0$ . The stochastic nature of the production cost may be attributed to the fluctuations in the prices of inputs. The realizations of  $\theta$  are firms' private information which firms do not observe each period until they undertake production. To save notations, let the expected value of  $\theta$  be equal to 1. Firms also incur a sunk cost,  $S$ , to set up production facilities at the time of entry. When a firm is not engaged in production, it obtains a reservation profit which is again normalized to zero.

Both buyers and producers are assumed to be risk neutral and maximize expected utilities and profits, respectively. We also assume that

$$u_l < c_l \text{ and } u_h \geq c_h + rS \quad (\text{A.1})$$

and

$$S > c_h - c_l \quad (\text{A.2})$$

where  $r$  is a per period interest rate. (A.1) implies that it is, on average, not socially worthwhile to produce low quality even after the sunk investment has been made while the utility from consumption of high quality at least covers the long-run expected average cost of production of high quality. According to (A.2), sunk investment is greater than the difference between the expected costs of production of two different qualities. Unless this assumption holds, firms are very likely to cheat in the initial periods and exit the market.<sup>5</sup> All payments are

<sup>4</sup> Nelson (1970) has termed this type of products as experience goods.

<sup>5</sup> The main result of this paper still holds without (A.2) but it simplifies the following exposition.

assumed to accrue at the end of each period.

The time sequence of events proceeds as follows. At the time of entry into the market, firms decide whether to invest  $S$  to set up production facilities. If they decide to do so, the following multi-stage events recur each period. First, in *Announcement stage*, firms offer a price,  $p$ , for their products with quality,  $q_h$ ,<sup>6</sup> which they promise to deliver. Buyers then decide where to shop (*Shopping Stage*). Observing the realization of  $\tilde{\theta}$ , the firms which are matched with buyers in *Shopping stage* undertake production and determine the actual quality,  $Q$  (*Production Stage*).<sup>7</sup> Finally, buyers purchase the products at the price,  $p$ , and discover the actual quality,  $Q$ .

Once the actual quality of a product is experienced by a buyer, the information on the identity of the producer and the actual quality is disseminated to all buyers instantaneously without cost. Buyers expect that the firm which has cheated before by selling low quality will cheat in the future as well. Therefore, if a firm cheats, it acquires a bad reputation and will be unable to make any future sales.

We are interested in a subgame-perfect competitive equilibrium where firms maintain their reputation only when it is profitable to do so. In order to solve for an equilibrium, we examine the last stage first given the possible decisions made in the previous stages and then move backward up to the firms' decision problem of entering the market.

Suppose there is a firm in *Production Stage* of a typical time period  $t$ . Given the belief and strategy on the side of buyers and an observation of  $\theta$ , the realized value of  $\tilde{\theta}$ , the firm produces high quality if it expects to gather a future stream of profits, which at least compensates the one time profit from cheating. That is,  $Q = q_h$  if

$$p - \theta c_h + \frac{V}{1+r} \geq p - \theta c_l \Rightarrow V \geq \theta(1+r)(c_h - c_l), \quad (2.1)$$

where  $V$  is the sum of discounted expected future profits from time period  $t+1$  and afterwards when the firm does not cheat in time period  $t$ . When (2.1) does not hold, the firm produces  $q_l$  and makes an exit from the market at the end of time period  $t$ .

Let  $\alpha (\geq 0)$  be probability that  $\theta$  is such that (2.1) holds and the firm produces high quality. Then, *ex ante* rationality of an equilibrium requires that

$$V = \alpha \left( p - c_h + \frac{v}{1+r} \right) + (1-\alpha)(p - c_l). \quad (2.2)$$

<sup>6</sup> Recall that it is not socially worthwhile to produce and market low quality.

<sup>7</sup> As in Esfahani(1991), we assume that the product under consideration is a perishable one. As a consequence, firms start production after they receive buyers' orders.

Using (2.2), (2.1) can be rewritten as

$$p \geq c_h + \{\alpha + \theta(1+r-\alpha) - 1\}(c_h - c_l), \quad (2.1')$$

where the second term on the right-hand side of the inequality can be interpreted as quality premium over the unit cost of production necessary to induce firms to produce high quality.

Given (2.1'), in *Shopping Stage*, a buyer selects an offer,  $(p, q_h)$ , that maximizes his expected utility, as long as the offering firm has not cheated in the past and the expected utility is nonnegative, or

$$\alpha(u_h - p) + (1-\alpha)(u_l - p) = \alpha(u_h - u_l) - (1-\alpha)p \geq 0. \quad (2.3)$$

Otherwise, the buyer chooses to stay out of the market. When there are a multiple number of equivalent offers, the buyer randomly selects one of them.

In *Announcement Stage*, competition renders firms to offer  $(p, q_h)$  such that the long-run expected profit is driven down to zero, or

$$\frac{V}{1+r} = S. \quad (2.4)$$

Using (2.2) again, we rewrite (2.4) as

$$p = c_h + rS + (1-\alpha)\{S - (c_h - c_l)\}. \quad (2.4')$$

Also, due to competition, firms offer  $(p, q_h)$  that maximizes a buyer's expected utility or that solves the following problem:

$$\max_p \alpha(u_h - p) + (1-\alpha)(u_l - p) \text{ subject to (2.1'), and (2.3), and (2.4').} \quad (2.5)$$

When a firm sets  $p$  otherwise, it will be not be able to make any sales.

Finally, firms invest  $S$  and enter the market until the market demand is fully met. Now, a subgame-perfect competitive equilibrium is characterized in the following proposition.

**Proposition 1.** Define  $\theta^* = \frac{S}{c_h - c_l}$ . When the following condition (2.6) holds, a subgame-perfect competitive equilibrium is given as: (i) If  $\theta^* \geq \theta_1$ , firms always produce  $q_h$  at the equilibrium price,  $p^* = c_h + rS$ . (ii) If  $\theta^* < \theta_1$ , firms set  $p^* = c_h + rS + (1-\alpha^*)\{S - (c_h - c_l)\}$  and produce  $q_h$  when  $\theta \leq \theta^*$  where  $\alpha^* = \frac{\theta^* - \theta_0}{\theta_1 - \theta_0}$ . When  $\theta > \theta^*$ , the firms produce  $q_l$  and get out of the market. When (2.6) does not hold, a subgame-perfect competitive equilibrium does not exist.

Proof: Using  $p$  given in (2.4), we can rewrite (2.1) as

$$\theta \leq \frac{S}{c_h - c_l}. \quad (2.1'')$$

From (2.4) we note that  $p$  is a strictly decreasing function of  $\alpha$  due to (A.2). Thus, with substitution of  $p$  from (2.4) into the objective function, we can rephrase the maximization problem as

$$\begin{aligned} & \max \alpha \{u_h - c_h - (u_l - c_l) + S\} + u_l - c_l - (1 + r)S \\ & \text{subject to (2.1'') and (2.3).} \end{aligned} \quad (2.5')$$

It is easy to see that  $u_h - c_h - (u_l - c_l) + S > 0$  due to (A.1). Therefore, it is optimal to choose the broadest range of  $\theta$  at which the firms produce  $q_h$  so that  $\alpha$  is maximized (as a consequence,  $p$  is minimized). That is, (2.1'') should be binding in equilibrium, or firms set  $p^* = c_h + rS + (1 - \alpha^*)\{S - (c_h - c_l)\}$ . Finally, since the expected utility of a buyer reaches its maximum when  $\alpha = \alpha^*$ , (2.3) must hold at  $p^*$  given above. Otherwise, a subgame-perfect competitive equilibrium does not exist. Using  $p^*$ , (2.3) can be rewritten as

$$\alpha^* u_h + (1 - \alpha^*) u_l - c_h - rS - (1 - \alpha^*) [S - (c_h - c_l)] \geq 0. \quad (2.6)$$

Q.E.D.

Buyers pay quality premium over the expected recurrent cost of production in order to motivate firms to overcome the incentive to market low quality. In a competitive equilibrium the stream of the premia is fully dissipated by the sunk investment.

When the sunk investment,  $S$ , is larger than the maximum possible profit from cheating,  $\theta_1(c_h - c_l)$ , that is,  $\frac{S}{c_h - c_l} > \theta_1$ , the moral hazard problem does not matter and firms always produce  $q_h$ . Otherwise, the firms produce  $q_h$  when they perceive a modest level of the recurrent production cost so that the revenue from cheating,  $\theta(c_h - c_l)$ , is held under certain level. When the production cost is above the critical level, firms produce  $q_l$  and exit the market. The firms with large initial investment, for example, on luxurious decoration of hotel rooms and hallways are more likely to keep its reputation and provide high quality services.

From (2.6), it is easy to see that a subgame-perfect competitive equilibrium is more likely to exist if the utility from consumption of the product ( $u_h$  and  $u_l$ ) is large, future revenues are less heavily discounted, and the fluctuation in the cost of production (measured by  $\theta_1 - \theta_0$  given the constant expected value of  $\theta$ ) is smaller so that the profit from cheating is not very large, when other things

being equal.

### III. THE ROLE OF MULTINATIONAL ENTERPRISES

Suppose there are two countries: Country A and Country B. We extend the model presented in the last section by allowing firms (headquarters) in Country A to become MNEs while firms in Country B are limited to operate in a national boundary for some reasons such as capital constraints. We assume that large transportation costs prohibit trade of the products between two countries. Thus, the products produced in Country A (B) are to be consumed in Country A (B), respectively. Country A and Country B are symmetric in terms of buyers' characteristics and producer's production technologies<sup>8</sup> as specified in section II. Input markets are internationally separated and, thus, cost fluctuations are country-specific. That is,  $\tilde{\theta}_A$  and  $\tilde{\theta}_B$  are independently identically distributed, where and in what follows subscripts *A* and *B* denote Country A and Country B, respectively.

Information about the identity of the producer and the actual product quality is disseminated to buyers abroad costlessly without delay as to buyers inside a national boundary. Buyers worldwide expect that the MNE which has cheated in one country will cheat in the other country as well in the future. Therefore, if an MNE undercuts the quality of its product in one of the two countries, buyers worldwide will be correctly informed of this cheating at the beginning of the next period and will boycott the product delivered by the MNE. Cheating in one country can destroy worldwide reputation of the MNE.

Once again, firms and buyers are assumed to be risk neutral and maximize expected worldwide profits and utilities, respectively. Time sequence of events proceeds in the same way as in the previous section.

Suppose there is an MNE in *Production Stage* of a typical time period *t*. Given the belief and strategy on the side of buyers in both countries, it is easy to see that if the MNE decides to cheat in one of the two countries, it is optimal to do so in the other country, too. Therefore, the MNE produces  $q_h$  if

$$p - \theta_A c_h + \frac{V_A}{1+r} + p - \theta_B c_h + \frac{V_B}{1+r} \geq p - \theta_A c_l + p - \theta_B c_l \quad (3.1)$$

$$V_A + V_B \geq (1+r)(\theta_A + \theta_B)(c_h - c_l).$$

Since Country A and B are symmetric, the equilibrium prices of the product in two countries are the same. Thus, for simplicity of exposition, we assume in the beginning that the subsidiaries and headquarters charge the same price. Let  $\beta(\geq 0)$  be probability for an MNE to keep its promise, that is, probability that

<sup>8</sup> MNEs often possess superior production technologies compared to local firms. In order to focus on the main point of this paper, we make a rather unrealistic assumption.

(3.1) holds. Then,

$$V_A + V_B = \beta \left\{ 2(p - c_h) + \frac{V_A + V_B}{1+r} \right\} + 2(1-\beta)(p - c_l). \quad (3.2)$$

Using (3.2), (3.1) can be rewritten as

$$p \geq c_h + \left\{ \beta + \frac{\theta_A + \theta_B}{2} (1+r-\beta) - 1 \right\} (c_h - c_l) \quad (3.1')$$

Comparing (3.1') with (2.1'), we note that the MNE takes the average cost of production in two countries into consideration when it decides on its product quality while an individual firm considers only the cost level in the country where the firm is operating.

In *Shopping Stage*, a buyer selects an offer,  $(p, q_h)$ , that maximizes his expected utility, as long as the offering firm has not cheated before in any one of the countries and acceptance of the offer ensures that

$$\beta(u_h - p) + (1-\beta)(u_l - p) \geq 0. \quad (3.3)$$

In *Announcement Stage*, competition forces the long-run expected profit of the MNEs to drop down to zero, i.e.,

$$\frac{V_A + V_B}{1+r} = 2S \Rightarrow p = c_h + rS + (1-\beta)\{S - (c_h - c_l)\}. \quad (3.4)$$

And, the MNEs offer  $(p, q_h)$  that solves the following problem:

$$\max \beta(u_h - p) + (1-\beta)(u_l - p) \text{ subject to (3.1'), (3.3) and (3.4)}. \quad (3.5)$$

Finally, firms invest  $S$  and enter the market in home and/or host country until the markets are saturated. A subgame-perfect competitive equilibrium with MNEs are characterized in Proposition 2.

**Proposition 2.** When the following condition (3.6) holds, a subgame-perfect competitive equilibrium with MNEs is given as: (i) If  $\theta^* \left( = \frac{S}{c_h - c_l} \right) \geq \theta_1$ , MNEs always produce  $q_h$  at the equilibrium price,  $p^m = c_h + rS$ . (ii) If  $\theta^* < \theta_1$ , MNEs sell  $q_h$  at the price  $p^m = c_h + rS + (1-\beta^m)\{S - (c_h - c_l)\}$  when  $\theta_A + \theta_B \leq 2\theta^*$ , where  $\beta^m = 1 - 2 \left[ \frac{\theta_1 - S/(c_h - c_l)}{\theta_1 - \theta_0} \right]^2$ . When  $\theta_A + \theta_B > 2\theta^*$ , MNEs produce  $q_l$  and go out of the market. Since  $\beta^m > \alpha^*$ , MNEs are more likely to

deliver  $q_h$  at the lower price than individual local firms and, thus, both markets are entirely served by MNEs in equilibrium. When (3.6) does not hold, a subgame-perfect competitive equilibrium does not exist.

**Proof:** Substitution of  $p$  specified in (3.4) into (3.1') gives

$$\theta_A + \theta_B \leq \frac{2S}{c_h - c_l} \tag{3.1''}$$

Now, the same course of reasoning as in the proof of Proposition 1 leads to the equilibrium price,  $p^m$ , with (3.1'') binding if

$$\beta^* u_h + (1 - \beta^*) u_l - c_h - rS - (1 - \beta^*) [S - (c - h - c_l)] \geq 0. \tag{3.6}$$

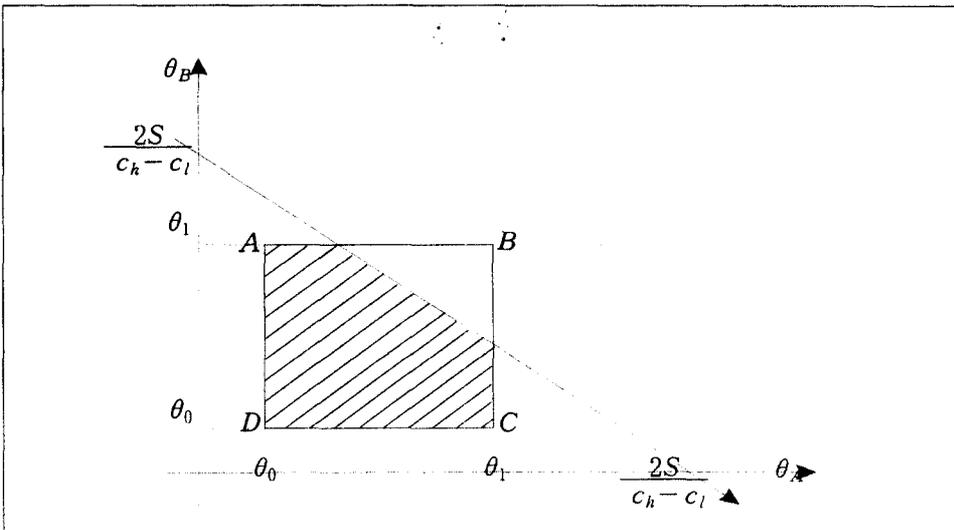
where  $\beta^m = 1 - 2 \left[ \frac{\theta_1 - S/(c_h - c_l)}{\theta_1 - \theta_0} \right]^2$  (See Figure 1.  $\beta^m$  is represented by the proportion of the shaded area over the whole square ABCD.) Also, it can be easily shown that

$$\beta^m - \alpha^* = 2 \frac{[\theta_1 - S/(c_h - c_l)][S/(c_h - c_l) - 1]}{(\theta_1 - \theta_0)^2} > 0.$$

Q.E.D.

The properties of the equilibrium with MNEs are similar to those in Propo

[Figure 1]



sition 1. When  $\theta^* > \theta_1$  so that the quality premium does not work as a binding constraint on the equilibrium price, the equilibrium with MNEs are identical to the one in section III. However, when  $\theta^* \leq \theta_1$ , the MNEs overcome the moral hazard at a smaller quality premium than independent local firms because cheating in one country results in the loss of future sales in all the countries and so only *average* cost of production is taken into account when the MNEs choose the quality of the products. Though MNEs and local firms employ the same production technology, the former has an advantage in terms of quality control than the latter by pooling risks of losing customer worldwide when firms are subject to country-specific cost fluctuations. Also, comparison of (3.6) with (2.6) shows that the equilibrium is more likely to exist with MNEs.

#### IV. AN OPTIMAL MODE OF TECHNOLOGY TRANSFER: DFI VS. INTERNATIONAL LICENSING

In this section we address the issue of an optimal mode of transferring technology for a product with unobservable quality to a firm abroad. A firm possessing the production technology may collect the rents accruing to it in a foreign country either by setting up its subsidiary in that country or by entering into a contract with a local firm. Once again exporting products abroad is not a viable solution due to large transportation costs.

There are obvious concerns about the appropriability of the rents when the technology with public good nature is transferred through an arm's length agreement. There are two potential sources causing public good nature. Firstly, the production technology is easily copiable at no cost. Therefore, once the technology is transferred to a firm in Country B, the firm has an incentive to break the licensing contract and keep the production technology in its hand without any further compensation. However, we rule out this possibility due to the result in the previous section that local independent firms cannot effectively compete with MNEs when the recurrent production cost fluctuates.

Secondly, a licensee takes into account only its own benefit when it decides whether to produce a quality contracted upon ignoring the cost imposed by its decision on the other firms sharing the reputation. In practice, we observe a tight control of the product quality by the licensor. However, the licensor cannot often perfectly monitor the quality of the licensee's product and so must provide the licensee with an incentive to maintain the licensor's reputation. However, there are cases where firm-specific assets with public good nature are safely transferred through licensing as reported in Contractor (1985). We focus on this type of public good nature in what follows.

We modify some of the specifications in the model presented in section III to deal with a firm's optimal choice of a mode of transferring production technology. First of all, we assume that the technology to produce  $q_h$  is available only

to a single firm (called Firm A) in Country A at the outset. Once a firm in Country B gets access to the technology in a time period, the firm can produce  $q_h$  as efficiently as Firm A from the next period and on without any extra cost or assistance from Firm A. Second, we remove the fluctuations in the recurrent cost of production from the previous model to simplify the exposition and focus on the main point of this section. We keep all the specifications of the previous model other than the above two modifications.

Prior to the introduction of Firm A's production technology into Country B, the product in question is not marketed in Country B. Meanwhile Firm A in Country A produces  $q_h$ , sets the profit maximizing monopoly price  $p^A = u_h$  and obtains long-run discounted profit  $\pi^A = \frac{1}{r}(u_h - c_h) - S$ . It can be easily checked that the following incentive compatibility condition ensuring Firm A to deliver  $q_h$  holds at  $p = p^A$  due to (A.1) and (A.2):<sup>9</sup>

$$\frac{1+r}{r}(p - c_h) \geq p - c_l \Rightarrow p \geq c_h + r(c_h - c_l)$$

Now Firm A considers a new business opportunity to serve a market in Country B. If Firm A opts for DFI, it invests  $S_h$ , produces  $q_h$ , sets the optimal price  $p^B = u_h$  and obtains long-run discounted profits,  $\pi^B = \frac{1}{r}(u_h - c_h) - S$ .

Alternatively, if Firm A (a licensor) enters into a licensing contract with one of the infinite number of local firms, it agrees with the licensee to transfer the production technology for  $q_h$  and the right to sell products under its protected brand name on the condition that the licensee produces  $q_h$  and abides by the agreed terms of compensations,  $(F, R)$ , where  $F$  and  $R$  represent upfront and per period royalty payment, respectively. Firm A has a chance to check the quality of the licensee's product before it is placed on the market. This occasion works as a deterrent to cheating on the side of the licensee and at the same time provides the licensor incentives to extort the licensee by threatening to publicly announce that the product quality is  $q_l$ .<sup>10</sup> Specifically, it is assumed that Firm A can detect cheating by the licensee with probability  $0 \leq \mu < 1$ .

Time sequence of events proceed as follows. First, Firm A chooses an optimal mode of serving Country B. If it chooses DFI, it simply invests  $S$  to set up production facilities in Country B and undertakes production. If Firm A picks up licensing, then the following subgame proceeds. In Contracting Stage, Firm A offers a licensing contract,  $(F, R)$  and a local firm which accepts the contract pays  $F$  to Firm A and invests  $S$ . In Production Stage, the licensee chooses the quality of its product and undertakes production. In Screening Stage,

<sup>9</sup> Since the cost fluctuations are assumed away, (A.1) and (A.2) should be reinterpreted.

<sup>10</sup> Milgrom and Weingast (1990) deals with law merchant's incentives to extort traders.

the licensee pays  $R$  to Firm A, which examines the product and reports on the product quality. The licensee may offer a bribe to the licensor in this stage. Finally, a buyer purchases the product and discovers the actual quality.

Buyers worldwide expect that if Firm A or its licensee cheats in a period, the firms sharing the brand name will cheat in the future as well. As before, we use backward induction to solve for a stationary subgame-perfect equilibrium where firms produce  $q_h$  each period.

It is easy to see that a local firm which has entered into a licensing contract with Firm A sets the profit maximizing price  $p^B = u_h$ . In Screening Stage, when the licensor finds that  $q_l$  is produced, it always reports this to the public if

$$\frac{u_h - c_h}{r} \geq u_h, \quad (4.2)$$

where the term on the left-hand side of the inequality represents the discounted future profits to be obtained in Country A while the term on the other side of the inequality implies the maximum bribe the licensor can solicit from the licensee by covering up its deceit.<sup>11</sup> Note that if the licensor overlooks the cheating by the licensee, it loses its reputation worldwide. On the other hand, when the licensor finds that  $q_h$  is produced, it does not extort the licensee if the discounted royalty revenues exceed the sum of maximum possible bribe and discounted future revenues from setting up its production facilities in Country B, or

$$\frac{R}{r} \geq u_h + \frac{u_h - c_h}{r} - S. \quad (4.3)$$

Given (4.2) and (4.3), in Production Stage, the licensee produces  $q_h$  if the expected revenue from continued production exceeds the expected one time profit from cheating, or

$$\frac{1+r}{r}(u_h - c_h - R) \geq \mu(-c_l - R) + (1-\mu)(u_h - c_l - R). \quad (4.4)$$

Here we assume that  $u_l = 0$  so that the firm cannot sell a low quality product if buyers are aware of it.

Since there is an infinite number of local firms in Country B, in Contracting Stage, Firm A offers a licensing contract,  $(F, R)$ , that leaves the licensee a reservation profit which is zero, or

<sup>11</sup> As pointed out by an anonymous referee, the maximum bribe the licensor can solicit is  $u_h$  since  $R$  is sunk payment.

$$\frac{u_h - c_h - R}{r} - F - S = 0. \quad (4.5)$$

Now Firm A's optimal choice of the mode of transferring the production technology is characterized in the following proposition.

**Proposition 3.** When the following condition (4.6) holds, a range of stationary equilibrium licensing contracts,  $(F^*, R^*)$ , exists, where  $(1+r)u_h - c_h - rS \leq R^* \leq (1+r\mu)u_h - c_h - r(c_h - c_l)$  and  $F^* = \frac{u_h - c_h - R^*}{r} - S$ . Firm A's long-run discounted profit from transferring the technology is the same under DFI and licensing.

**Proof:** Comparing with (4.1), we can easily check that (4.2) always holds. From (4.3) and (4.4), there exists  $(1+r)u_h - c_h - rS \leq R^* \leq (1+r\mu)u_h - c_h - r(c_h - c_l)$  such that the licensor does not solicit a bribe and the licensee produces  $q^h$ .  $R^*$  is nonempty if

$$S \geq (1-\mu)u_h + (c_h - c_l). \quad (4.6)$$

Due to competition among potential licensees in Country B, the licensor offers  $F^*$  that satisfies (4.5) for any  $R^*$ . Q.E.D.

In equilibrium,  $R^*$  is set to a level at which the licensee has an incentive to produce  $q_h$  and at the same time the licensor still can collect all the surplus from production<sup>12</sup> through  $F^*$ . It is often argued that the firm possessing the production technology rather sets up its own subsidiary and undertakes production itself than engage in arm's length licensing with a local firm. However, according to Proposition 3, arm's length licensing can be an equally efficient way of collecting rents accruing to the technology in the face of licensee's opportunistic behavior even when the licensor cannot perfectly monitor the quality of the licensee's product. This result holds when  $S$  is sufficiently large that building its own plant after breaking the existing contract with a local in Country B is much costly for Firm A.

In this paper many factors influencing the optimal choice between DFI and licensing are ignored in order to focus on the argument of this paper. If we allow for some advantages possessed by local firms such as superior knowledge about local customers, Firm A would choose licensing over DFI.

<sup>12</sup> In Horstmann and Markusen (1987),  $F=0$  in the equilibrium licensing contract, since if  $F=0$ , the licensor changes its licensor each period and, thus, the licensee always produces  $q_l$ . We do not follow this line of reasoning since when (4.2) and (4.3) hold, if Firm A changes its licensee, local firms will be informed of this and will refuse to enter into a licensing contract in the future.

## V. CONCLUDING REMARKS

This paper shows that MNEs supply high quality at the lower price than local independent firms when firms are subject to country-specific cost fluctuations. This advantage stems from the multinationality of the MNEs, which relaxes moral hazard problem on the part of producers when the product quality is unobservable.

This study suggests some implications for firms and policymakers. First, DFI is typically subject to implicit and explicit expropriation of sunk investments by host governments.<sup>13</sup> However, the government may not take over foreign investments since the host country firms can hardly build global reputation and competitiveness. A superior quality control provided by the MNEs may make DFI more attractive to host countries and deter opportunistic policies of host government. Second, reputation seems to work as an entry barrier for firms without international presence. Deregulation of DFI by domestic firms may help them to establish reputation for product quality worldwide.

In this paper, only high quality products are produced in equilibrium due to the specifications of the model. It might be an interesting future research agenda to explore models explaining the often observed fact that MNEs produce high quality products while local firms produce low quality ones.

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<sup>13</sup> See Choi and Esfahani (1998) for a quick survey of the literature on expropriation problems associated with DFI.

## REFERENCES

- Allen, F. (1984), "Reputation and Product Quality," *RAND Journal of Economics*, 15, 311-327.
- Bagwell, K., and R.W. Staiger (1989), "The Role of Export Subsidies When Product Quality is Unknown," *Journal of International Economics*, 27, 67-89.
- Bardhan, P., and K. Kletzer (1984), "Quality Variations and the Choice between Foreign and Indigenous Goods or Technology," *Journal of Development Economics*, 14, 323-330.
- Buckley, P.J., and M. Casson (1976), *The Future of the Multinational Enterprise*, London, Macmillan.
- Caves, R.E., and W.F. Murphy (1976), "Franchising: Firms, Markets, and Intangible Assets," *Southern Economic Journal*, 42(4), 572-586.
- Choi, Y., and H.S. Esfahani (1998), "Direct Foreign Investment and Expropriation Incentives: A Mitigating Role for Match-Specific Capital," *The Quarterly Review of Economics and Finance*, 38(1), 47-59.
- Contractor, F.J. (1985), *Licensing in International Strategy: A Guide for Negotiations and Planning*, Westport CT, Quorum Books.
- Dunning, J.H., and M. McQueen (1981), "The Eclectic Theory of International Production: A Case Study of the International Hotel Industry," *Managerial and Decision Economics*, 2(4), 197-210.
- Esfahani, H.S. (1991), "Reputation and Uncertainty: Toward an Explanation of Quality Problems in Competitive LDC Markets," *Journal of Development Economics*, 35, 1-32.
- Horstmann, I., and J.R. Markusen (1987), "Licensing versus Direct Investment: A Model of Internalization by the Multinational Enterprise," *Canadian Journal of Economics*, 20, 464-481.
- Hymer, S.H. (1960), "The International Operations of National Firms: A Study of Direct Foreign Investment," Ph.D. Dissertation, M.I.T.
- Klein, B., and K.B. Leffler (1981), "The Role of Market Forces in Assuring Contractual Performance," *Journal of Political Economy*, 89, 615-641.
- Lall, S. (1985), *Multinationals, Technology and Exports*, London, Macmillan.
- Markusen, J.R. (1984), "Multinationals, Multi-Plant Economies, and the Gains from Trade," *Journal of International Economics*, 16, 205-226.
- Milgrom, P.R. and B.R. Weingast (1990), "The Role of Institutions in the Revival of Trade: The Law Merchant, Private Judges, and the Champagne Fairs," *Economics and Politics*, 2(1), 1-23.
- Nelson, P. (1970), "Information and Consumer Behavior," *Journal of Political Economy*, 78(2), 311-29.
- Shapiro, C. (1983), "Premiums for High Quality Products as Returns on Reputation," *Quarterly Journal of Economics*, 98, 659-680.
- Williamson, O.E. (1981), "The Modern Corporation: Origins, Evolution, Attitudes," *Journal of Economic Literature*, 19, 1537-68.