

**Determinants of Ownership Structure in Joint Ventures:  
A Study on Korean Multinational Firms\***

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This paper builds a theoretical model that shows that a joint venture is an important organizational form for a multinational firm (MNF), although the MNF cannot make ex ante complete contracts with an intermediate-input supplier. The paper shows that if the intermediate input of a supplier is important, then the MNF holds a smaller share of the supplier firm's equity to give the supplier an incentive to produce more intermediate input. To test the predictions in the theory, the paper uses a data set of South Korean MNFs. The empirical evidence shows that if an affiliate has the higher ratio of intangible assets to sales, then the parent firm is inclined to hold a smaller equity share of the supplier's firm.

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## 1. INTRODUCTION

When a firm decides to purchase intermediate inputs from foreign countries, the appropriate ownership of an intermediate-input supplier is a pressing practical question for that firm and an important issue in economic theory. A multinational firm (MNF) tries to reap benefits from technique differences and wage differences between the country where it is located and the foreign countries where the intermediate-input supplier is located. In 2000, U.S. trade in goods involving U.S. parent firms or foreign affiliates - MNFs associated with trade<sup>1)</sup> accounted for 56% of U.S. exports of goods and for 35% of U.S. imports of goods (Mataloni, 2002, p. 115). In addition, Hummels *et al.* (2001) calculated that the increase in exports associated with vertical specialization accounted for one-third of world export growth from 1970 to 1990 mainly due to global vertical production networks.

Economists have made many endeavors to explain this huge share of intra-firm trade. One of the important outcomes is a theory that concerns the boundaries of a firm. The theory demonstrates that the firm decides whether to produce inside local boundaries (self-production or integration of other firms), or outside local boundaries (outsourcing), after considering all possible costs and benefits accrued from various boundaries. Even though the firm decides to produce inside local boundaries by integrating other firms, dividing the equity share of the supplier's firm between the parent firm and the supplier remains a central issue (degree of integration). Intra-firm trade is caused when MNFs decide to produce inside internal boundaries but outside national boundaries.

Since Grossman and Hart (1986) systematically analyzed the role of ex ante incomplete contracts on the allocation of control rights (ownership), the

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<sup>1)</sup> U.S. MNFs associated U.S. trade in goods may be disaggregated into two broad categories: (1) Intra-MNFs trade (trade between U.S. parent firms and the foreign affiliates), and (2) MNF trade with others (trade between U.S. parents and foreigners other than the foreign affiliates, and trade between foreign affiliates and U.S. entities other than the parent firms). In 2000, the intra-MNFs exports accounted for 21% of U.S. exports of goods and the intra-MNFs imports of goods accounted for 15% of U.S. imports of goods.

vertical integration of firms has been actively examined based on the property rights theory.<sup>2)</sup> However, the papers that have developed the theory on the boundaries of firms (based on *ex ante* incomplete contracts) have not properly focused on a very important foreign direct investment (FDI) pattern: a joint venture (or partial ownership).<sup>3)</sup> Those papers resulted in the equilibrium of the whole ownership of suppliers, pure outsourcing (no ownership), or the coexistence of whole ownership and pure outsourcing.

Under the situation of *ex ante* incomplete contracts, this paper theoretically shows that a joint venture is one of the choices of an MNF. In contrast to other papers that concern the roles of *ex ante* incomplete contracts, the paper demonstrates that an MNF would choose an intermediate equity share (a joint venture) to give the intermediate-input supplier an incentive to produce more intermediate input. This study focuses on the entry mode of an MNF into foreign countries (among them outsourcing) joint ventures and whole ownership, under the condition that the MNF has already decided to acquire the intermediate input from a foreign country. To analyze the choice of a firm in acquiring the intermediate input from either the home country or foreign countries, other factors such as plant-level fixed costs, firm-level fixed costs, and wage differences, should be considered. Antràs and Helpman (2004) studied the determinants of the organizational mode of firms, such as outsourcing from domestic firms, integration of domestic firms, outsourcing from foreign firms, or the integration of foreign firms. However, they did not deal with joint ventures. To test the predictions of the theory, this paper uses a data set of South Korean MNFs.

There are many costs and benefits involved with joint ventures.<sup>4)</sup>

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<sup>2)</sup> According to Whinston (2003), there are two types of theory to explain the boundaries of a firm based on the fact that the contracts are incomplete: the transaction cost economics theory and the property rights theory. Whinston maintained that the property rights theory is more systematical and formal than the transaction cost economics theory.

<sup>3)</sup> Svejnar and Smith (1984) emphasized that the proportion of joint ventures of U.S. overseas manufacturing operations has been growing.

<sup>4)</sup> For details of the benefits and costs of joint ventures, refer to Hennart (1991).

However, in order to focus on the roles of ex ante incomplete contracts in the boundaries of a firm and to test them empirically, it is assumed that the goal of the firm and that of the intermediate-input supplier are congruent when they form a joint venture.<sup>5)</sup> This study assumes that there are two countries in the world, a source country (where final-product producers are located) and a host country (where suppliers of intermediate inputs are located), and that there are  $n$  differentiated final products. To produce a final product, it is assumed that two different intermediate inputs ( $x_S, x_H$ ) are needed.

Between the two intermediate inputs ( $x_S, x_H$ ), one of the intermediate inputs ( $x_H$ ) is assumed to be produced by an intermediate-input supplier in the host country, and the other input ( $x_S$ ) is made by a final-product producer. The final-product producer must acquire the intermediate input ( $x_H$ ) from the intermediate-input supplier. To produce the intermediate inputs, both producer and supplier must use specific factors that include physical factors such as labor, and non-physical factors such as knowledge and effort. This paper assumes that the quality of intermediate inputs is non-contractible ex ante.

This paper shows that if the intermediate input made by the final-product producer is more important in production of the final product than the input made by supplier, then the producer is inclined to hold a greater equity share of the supplier's firm to take a larger fraction of total revenues. Conversely, if the intermediate input produced by the supplier is more important, then the producer is willing to lower the equity participation in the supplier's firm. The relative importance between the two intermediate inputs affects the producer's equity participation in the supplier's firm.

It is assumed that the equity ownership of the supplier's firm by one party is positively related to bargaining power of that party. With a simple model, this paper shows that the choice of the organizational mode by a producer

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<sup>5)</sup> A final-product producer represents an MNC (or parent firm) which has overseas affiliate(s) although this paper assumes that the producer makes another intermediate input to analyze a vertical relationship instead of a horizontal relationship. In addition, the affiliates in the foreign countries denote the intermediate-input suppliers.

crucially depends on the relative importance of the intermediate input of the supplier to that of the producer. The empirical tests with firm-level data partially support the predictions in the theory. If an affiliate has the higher ratio of intangible assets to sales, then the Korean parent firm tends to hold a smaller share of the equity of the affiliate.

There are many papers which show the importance of joint ventures. Joint ventures with partners located in other countries may be seen as a way of bridging cultural gaps, while joint ventures with local investors promise to reduce political complications (Gatignon and Anderson, 1988). Aghion and Tirole (1994) showed that when assets are jointly used, joint ownership can be an efficient arrangement as split property rights can encourage innovation. They ascertained that the relative importance between capital inputs and intellectual inputs determine the organizational aspects of research and development (R&D) activities. However, contrary to this paper (where a joint venture occurs continuously) a joint venture occurred at a specific point in their model.

In environments with incomplete information, joint ownership may result in efficient resource allocation (Crampton *et al.*, 1987). Svejnar and Smith (1984) analyzed important economic issues, such as resource allocation and profit distribution under various institutional scenarios, which arise in the context of joint venture operations in less developed countries. They emphasized the role of bargaining power in distributing the profits of a joint venture. Their paper implied that the relative importance of non-contractible factors between the producer and the supplier might affect the bargaining power of each party. This paper takes this implication and formally models it.

The remainder of this paper is organized as follows. Section 2 sets up the basic model with two countries, in which the final-product producers are located in the source country and intermediate-input suppliers are in the host country. The model is simplified to examine the effects of non-contractibility and relative importance of the intermediate inputs produced by both parties on the boundaries of firms. Section 3 presents an econometric specification and runs regressions to empirically test the theory. Section 4

concludes the paper.

## 2. BASIC MODEL AND RESULTS

This section describes a simple model and the results. The model of this paper is similar to Antràs and Helpman (2004), and Antràs (2003) models. However, the implications of this paper are different from those of the two studies. Antràs and Helpman, and Antràs, assumed that the bargaining power of each party (either the parent firm or the supplier) is fixed and exogenously given. As a result, they did not consider one of the most important organizational modes of a firm: joint ventures, or intermediate equity participation. In addition, neither of these papers tested the theories using firm-level data. This paper shows a joint venture is one of the optimal organizational choices of a firm and tests the theory with firm-level data.

It is assumed that there are two countries, a source country where the producer (the headquarters of MNF) of variety  $i$  is trying to find a partner in a host country where many intermediate-input suppliers want to be the partner of the producer. The producer can choose a share of the supplier's firm equity. In this situation with two countries, there are  $n$  differentiated final products.<sup>6)</sup> It is assumed that there are no transaction costs and no differences in scale economics between the plant-level and the firm-level.

### 2.1. Consumer Utility

In this situation, the identical utility function of consumers is represented by

$$U = \left[ \int_0^n y(i)^\alpha di \right]^{\frac{1}{\alpha}}, \quad (1)$$

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<sup>6)</sup> In this situation with two countries,  $n$  differentiated final products are made in the source country. It is assumed that there is only one producer in variety  $i$  (where  $i = 1, 2, \dots, n$ ), and many suppliers are competing to be a partner of the producer. The producer of each variety has a limited monopoly power because of the many differentiated final products.

where  $0 < \alpha < 1$ , and  $n$  is the number (measure) of varieties which is

assumed to be very large.<sup>7)</sup> Income is defined as  $Y \equiv \int_0^n p(i) \cdot y(i) di$ . This

paper defines  $\int_0^n p(j)^{\frac{\alpha}{\alpha-1}} dj$  as the price index,  $P$ .<sup>8)</sup> From the preferences of the consumer, the demand function for variety  $i$  is given by

$$y(i) = \frac{p(i)^{\frac{1}{\alpha-1}}}{\int_0^n p(j)^{\frac{\alpha}{\alpha-1}} dj} \cdot Y.$$

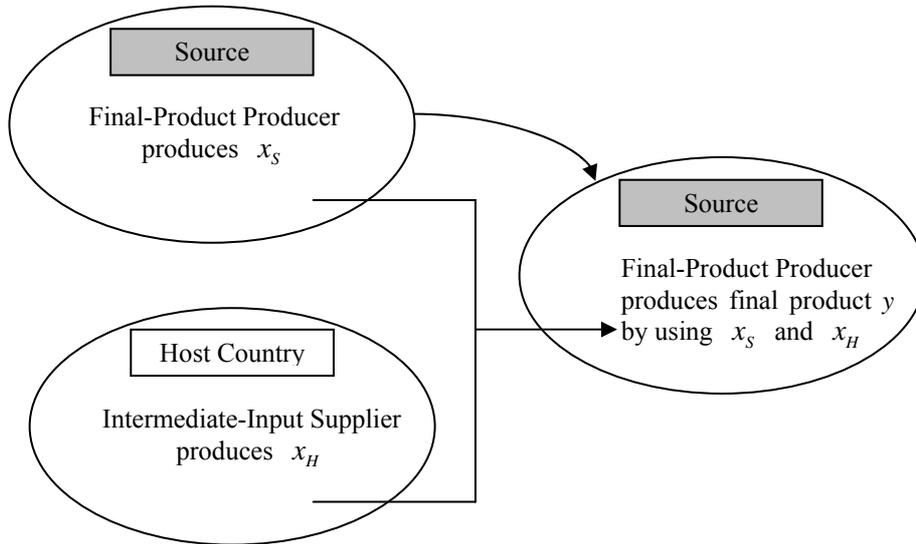
## 2.2. Production

In order to produce one unit of  $y$ , the final-product producer (MNF) needs two different intermediate inputs,  $x_S$  and  $x_H$ , where subscripts  $S$  represent the source country and  $H$  the host country. The intermediate inputs  $x_S$  and  $x_H$  are produced by the final-product producer in the source country and by the intermediate-input supplier in the host country, respectively. However, it is assumed that the producer does not require costs to produce the final product with the intermediate inputs. To produce the intermediate input  $x_S$ , the final-product producer needs specific factors, which include physical factors such as labor, as well as non-physical factors such as knowledge and effort. The intermediate-input supplier uses specific factors to produce  $x_H$  as well. Figure 1 shows the production process for the final product  $y$ .

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<sup>7)</sup> In this preference by consumers, the elasticity of substitution between two varieties is  $1/(1-\alpha)$ .

<sup>8)</sup> It is assumed finite and constant.

**Figure 1 Production Process**

It is assumed that the production function for the final product  $y$  is in Cobb-Douglas form, such as

$$y = (x_S)^\phi (x_H)^{1-\phi}, \quad (2)$$

where  $\phi$  and  $1-\phi$  represent the relative intensity and importance of  $x_S$  and  $x_H$  in the final product ( $y$ ) production, respectively. Following the paper by Svejnar and Smith,  $\phi$  and  $1-\phi$  might be related to the bargaining power of the producer and the supplier.<sup>9)</sup>

It is assumed that the quality of the intermediate inputs  $x_S$  and  $x_H$  should be above a certain level to produce  $y$ .<sup>10)</sup> The quality problem is discussed

<sup>9)</sup> This statement is true in this paper because of the assumption that the bargaining power by one party is positively related to how much equity share of the supplier's firm the party holds.

<sup>10)</sup> For simplicity, it is assumed that production of any type of low quality input can be undertaken

in the following section. In order for each firm to produce high quality intermediate input ( $x_i$  where  $i = S, H$ ), the producer / the supplier must pay costs. The production cost function is assumed to be in a quadratic form.<sup>11)</sup>

$$C_i = \frac{1}{2} \gamma_i x_i^2, \text{ where } i = S, H \text{ and } \gamma_i > 0. \quad (3)$$

In this cost function,  $\gamma_i$  is inversely related to the country  $i$ 's cost effectiveness in producing the intermediate input.

### 2.3. Incomplete Contracts

It is assumed that the quality of the intermediate inputs is non-contractible ex ante.<sup>12)</sup> That is, a third party cannot verify the exact quality of the intermediate inputs. Under the ex ante incomplete contracts situation, if the producer contracts to buy a certain type of  $x_H$  for a certain price, then the supplier has an incentive to produce low quality intermediate input at a lower cost and still receive the contracted price since a third party cannot verify the quality of the input. This ex ante incomplete contractibility is identical to the fact that the outside party cannot verify the production costs of the intermediate input. Like other papers such as Antràs (2003), Antràs and Helpman (2004), and Grossman and Helpman (2002), the quality problem is dealt with through the quantity problem because it is not common to represent alphabet notation as quality of product. The lack of verifiability prevents contracts between producer and supplier that specify a given price

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at a positive but negligible cost. The most important thing in the model is that a firm should pay more costs to produce a high quality input than to produce a low quality input.

<sup>11)</sup> This has the usual characteristics of common cost functions, such as the first ( $C'_i(x_i)$ ) and the second ( $C''_i(x_i)$ ) derivatives being positive, and the curve for cost function is convex.

<sup>12)</sup> The quality of intermediate input could be considered partially non-contractible ex ante as Antràs (2003) mentioned. However, he asserted that partially non-contractible contracts do not change the results under certain conditions.

for an agreed quantity. The producer / the supplier must use more internal specific factors to produce a higher quality (or greater quantity) of the intermediate input but bear all costs. The producer cannot sign ex ante enforceable contracts with suppliers specifying the division of total revenues. Between the two parties, only the allocation of residual rights is contractible ex ante.<sup>13)</sup>

It is assumed that the producer and the supplier have to specialize intermediate inputs for the final product,  $y$ . The intermediate inputs are useful only for the specific final product<sup>14)</sup>  $y$ , and cannot be used to produce other final products (a relationship-specific problem). Because of incomplete contracts and the hold-up problem, the two parties bargain over total revenues. The fraction of total revenues which the producer / the supplier can take depends on how much bargaining power the producer / the supplier has. It is assumed that the bargaining is costless; as a result, costless bargaining yields an efficient ex post outcome. The bargaining power of one party is assumed to be positively related to the share of the supplier firm's equity which that party holds.<sup>15)</sup>

#### 2.4. Game Stages

The game in this model consists of four stages. At the first stage, the producer chooses a share of the supplier firm's equity ( $0 \leq s \leq 1$ , where  $s$  represents a share of the supplier firm's equity which the producer holds).

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<sup>13)</sup> Grossman and Hart (1986) argued that contractual rights can be divided into two types: specific rights and residual rights. When it is too costly for one party to specify a long list of the particular rights it desires over the assets of another party, it may be optimal for that party to purchase all the rights except those specifically mentioned in the contract. They emphasized that ownership is the purchase of these residual rights of control.

<sup>14)</sup> This assumption could be relaxed from perfect specialization to partial specialization. The supplier can choose the degree of specificity of the intermediate input, considering the value within the relationship and value outside. As a result, the degree of specificity can be determined endogenously. For more detail, refer to Grossman and Helpman (2002).

<sup>15)</sup> It can be shown that the two parties do not choose socially optimal output levels of the intermediate inputs.

When the entry mode is decided, the allocation of residual rights is made. At the second stage, the producer and the supplier produce the intermediate inputs  $x_s$  and  $x_H$ , by using specific factors. At the third stage, as the quantity / quality of the intermediate inputs is validated by the two parties, bargaining between the two parties is then carried out. An agreement results in dividing the fractions of total revenues the producer and the supplier can take. The next subsection explains the bargaining processes. Finally, the producer makes the final product without incurring any costs, and sells the product in the market. The fourth stage does not play any role in this paper.

## 2.5. Bargaining over and Splitting the Revenues

Since the intermediate inputs are assumed to be relationship-specific, neither party can sell the inputs  $x_s$  and  $x_H$  to outside parties. After bearing the costs for the production of intermediate inputs, both parties bargain over total revenues. The total revenues are represented as

$$R = p \cdot y = Y^{1-\alpha} P^{\alpha-1} y^\alpha = Y^{1-\alpha} P^{\alpha-1} (x_s)^{\alpha\phi} (x_H)^{\alpha(1-\phi)}. \quad (4)$$

There are many factors that affect the bargaining power of each party. Bargaining power may determine the distribution of benefits / revenues between the producer and the supplier. Bargaining power might enable one party to gain control of a joint venture which is likely to manifest into a larger equity share. Behrman and Grosse (1990) explained that bargaining theory can be applied to the relations of both parties, focusing on the key strengths of producer and supplier that enable each to obtain more favorable results.

For example, if a local supplier has comparatively advanced technologies, then the supplier can be expected to have the upper hand in bargaining and to obtain favorable results, such as a high degree of local ownership and control. Svejnar and Smith (1984) showed that the bargaining power determines the

division of the profits of a joint venture. Fagre and Wells (1982) emphasized that equity ownership is seen as an outcome of negotiation: a representation of relative power between two parties. They found that the degree of MNF ownership of Latin American affiliates was based on the technology and advertising intensity by a firm.

Lecraw (1984) also found that the level of equity participation of MNFs is influenced by the bargaining position. He showed the greater ability of MNFs to obtain higher equity ownership and to acquire more control over affiliates as the technology and advertising intensity of a firm increased. Kobrin (1987) studied the bargaining model using data from 563 affiliates of U.S. manufacturing firms in forty-nine developing countries. He explained that bargaining power is a function of either firm-specific assets or ownership advantages and imperfect markets that allow the firm to contain the advantages. He demonstrated that MNFs have advantages or firm-specific assets, and the possession of those results by a firm in a preference for ordering economic transactions through internal administrative hierarchies (vertical or horizontal integration) rather than the external market (p. 609). In addition, he demonstrated by giving a few examples that firm-specific assets can be exploited more efficiently through internalization with definite control. He found that the degree of MNF ownership of affiliates was a function of bargaining strengths.

Based on these findings, it is assumed that the bargaining power of producers is positively related to the share of the supplier firm's equity. However, the bargaining power of the supplier is assumed to be negatively related to the equity ownership of the producer. From the bargaining, it is assumed that the producer receives a fraction  $\eta(s) \in (0, 1)$  of the ex post gains from the relationship and this fraction increases with respect to equity share which the producer holds ( $\eta'(s) > 0$ , where  $s$  represents a share of the supplier firm's equity which the producer has).

Under the agreement situation, it is easily derived<sup>16)</sup> that the fraction of

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<sup>16)</sup> See the Appendix A1.

revenues which the producer obtains is an increasing function of the equity share,  $s$ .<sup>17)</sup> The differentiation of the fraction which the producer can obtain with respect to  $s$  is<sup>18)</sup>

$$\partial[\delta^{\alpha(1-\phi)} + \eta(s)(1 - \delta^{\alpha(1-\phi)})]/\partial s > 0, \text{ when } 0.5 < s \leq 1.$$

$$\partial[\eta(s)]/\partial s > 0, \text{ when } 0 \leq s \leq 0.5.$$

For simplicity, this paper defines  $\beta(s)$  as the fraction of revenues that the producer can obtain, over the whole range of the equity share ( $s \in [0, 1]$ ).

$$\beta(s) \equiv \delta^{\alpha(1-\phi)} + \eta(s)(1 - \delta^{\alpha(1-\phi)}), \text{ when } 0.5 < s \leq 1.$$

$$\beta(s) \equiv \eta(s), \text{ when } 0 \leq s \leq 0.5.$$

This paper defines  $\underline{\beta}$  and  $\bar{\beta}$  as the fraction of revenues which the producer obtains when it outsources intermediate input ( $x_H$ ) through arms-length arrangement ( $s = 0$ ) and wholly owns the supplier's firm ( $s = 1$ ), respectively.

$$\underline{\beta} \equiv \eta(0),$$

<sup>17)</sup> The residual rights (ownership) affect the distribution of ex post revenues through the effect on the outside option in this model. If it is assumed that the residual rights are decided by an unanimous vote, then the producer cannot have the residual rights when it partially owns the supplier firm's equity ( $0 \leq s < 1$ ) because the supplier can exercise a veto. That is, the producer has the residual rights only if it wholly owns an equity share. In this case, there is no discontinuous point when  $s$  is in the range of  $[0, 1]$ . However, there is a jump when  $s = 1$ . As a result, only the bargaining power plays an important role in splitting the revenues under an assumption that the residual rights are decided by an unanimous vote.

<sup>18)</sup> Another thing is that the fraction of revenues the producer can obtain is increasing in  $\phi$ , the relative importance of  $x_S$ , given the equity share  $\bar{s}$ , when the producer has an equity share majority.  $\partial[\delta^{\alpha(1-\phi)} + \eta(\bar{s})(1 - \delta^{\alpha(1-\phi)})]/\partial \phi > 0$  where  $\bar{s}$  is the given equity share ( $0.5 < \bar{s} \leq 1$ ).

$$\bar{\beta} \equiv \eta(1)(1 - \delta^{\alpha(1-\phi)}) + \delta^{\alpha(1-\phi)}.$$

This paper showed that  $\beta$  is monotonically increasing with respect to  $s$  in the range of  $\beta(s) \in [\underline{\beta}, \bar{\beta}]$ . It is assumed that the explicit formula of  $\beta(s)$  is known. The equity share  $s$  can be easily obtained for a given  $\beta$ . At the first stage, the producer decides the mode of entry by choosing an equity share  $s$ . This paper now focus on the optimal fraction of revenues ( $\beta^o$ ) because solving for an optimal  $\beta^o$  is easier than finding  $s^o$ . Based on the assumption that the explicit formula of  $\beta(s)$  is known, if the optimal  $\beta^o$  is chosen, then the optimal equity share  $s^o$  can be obtained without any difficulties.

## 2.6. The Optimal Equity Share

This model is solved by backwards induction, from stage four to stage one. For simple denotation,  $s$  is omitted from now on.  $\beta$  represents  $\beta(s)$ . As the producer can obtain only the fraction  $\beta$  of revenues, it maximizes profits to choose the intermediate input  $x_s$  at the second stage. From equations (3) and (4), the problem of the producer is

$$\max_{x_s} \beta Y^{1-\alpha} P^{\alpha-1} (x_s)^{\alpha\phi} (x_H)^{\alpha(1-\phi)} - \frac{1}{2} \gamma_s x_s^2. \quad (5)$$

Similarly, the supplier chooses  $x_H$  to maximize profits

$$\max_{x_H} (1-\beta) Y^{1-\alpha} P^{\alpha-1} (x_s)^{\alpha\phi} (x_H)^{\alpha(1-\phi)} - \frac{1}{2} \gamma_H x_H^2. \quad (6)$$

The producer decides the boundaries of the firm by choosing an equity share  $s$ . This paper focuses on the optimal  $\beta^o(s)$ , because if the optimal

$\beta^o$  is chosen, then the optimal equity share  $s^o$  can be easily obtained.<sup>19)</sup>  
The producer chooses  $x_s$  to maximize profit

$$\begin{aligned}\max_{x_s} \pi &= \beta \cdot R - \frac{1}{2} \gamma_s x_s^2 = \beta \cdot p \cdot y - \frac{1}{2} \gamma_s x_s^2 \\ &= \beta Y^{1-\alpha} P^{\alpha-1} x_s^{\alpha\phi} x_H^{\alpha(1-\phi)} - \frac{1}{2} \gamma_s x_s^2.\end{aligned}$$

The first order condition is

$$\beta \alpha \phi Y^{1-\alpha} P^{\alpha-1} x_s^{\alpha\phi-1} x_H^{\alpha(1-\phi)} - \gamma_s x_s = 0.$$

That is

$$\begin{aligned}\gamma_s x_s^2 &= \beta \alpha \phi Y^{1-\alpha} P^{\alpha-1} x_s^{\alpha\phi} x_H^{\alpha(1-\phi)} \\ \Rightarrow \frac{1}{2} \gamma_s x_s^2 &= \frac{1}{2} \beta \alpha \phi R.\end{aligned}$$

At the next stage, the producer picks  $\beta$

$$\begin{aligned}\pi_f &= \beta \cdot R - \frac{1}{2} \gamma_s x_s^2 \\ &= \left(1 - \frac{1}{2} \alpha \phi\right) \beta Y^{\frac{2(1-\alpha)}{2-\alpha}} P^{\frac{2(\alpha-1)}{2-\alpha}} \left[ \alpha \left(\frac{\phi \beta}{\gamma_s}\right)^\phi \left(\frac{(1-\phi)(1-\beta)}{\gamma_H}\right)^{1-\phi} \right]^{\frac{\alpha}{2-\alpha}}.\end{aligned}\quad (7)$$

It is important to maximize equation (7) with respect to  $\beta$ . The solution of the above problem is identical to that of the problem below

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<sup>19)</sup> See Appendix A2 for more details.

$$\max_{\beta} \ln \beta + \frac{\alpha}{2-\alpha} [\phi \ln \beta + (1-\phi) \ln(1-\beta)].$$

The first order condition<sup>20)</sup> is

$$\frac{1}{\beta} + \frac{\alpha}{2-\alpha} \left( \frac{\phi}{\beta} - \frac{(1-\phi)}{(1-\beta)} \right) = 0.$$

When this equation is rearranged, then

$$\beta^o = \frac{2-\alpha(1-\phi)}{2}. \quad (8)$$

There is a unique  $s^o$  for given  $\alpha$  and  $\phi$ . If we differentiate (8) with respect to  $\phi$ , then

$$\frac{\partial \beta^o}{\partial \phi} = \frac{\alpha}{2} > 0.$$

That is

$$\frac{\partial \beta^o}{\partial \phi} > 0 \Rightarrow \frac{\partial s^o}{\partial \phi} > 0.$$

This result means that depending on the relative importance of the intermediate inputs, the producer chooses the share of the supplier firm's equity to raise profits. If the intermediate input of the supplier is very important, then the producer gives the supplier a larger fraction of the total

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<sup>20)</sup> The second order condition is satisfied:  $-\left[ \frac{1}{\beta^2} + \frac{\alpha}{2-\alpha} \left( \frac{\phi}{\beta^2} + \frac{(1-\phi)}{(1-\beta)^2} \right) \right] < 0.$

revenues to induce the supplier to produce a more intermediate input. In that case, although the fraction of revenues of a producer decreases as it lowers the equity ownership, the net revenues of the producer increase since the total revenues grow more rapidly. As a result, the producer can make a greater profit in spite of the smaller fraction of revenues.

The result implies there might be some reasons that the producer in the source country holds an intermediate share of equity, although the technologies in the source country are more advanced than those in the host country. It is possible that the producer would choose a joint venture if the supplier makes important intermediate input whose quality is *ex ante* non-contractible, although the intermediate-input supplier is located in a less developed country.

### 3. ECONOMETRIC TESTS

This section uses the South Korean firm-level data set to test the hypothesis of the previous section. The hypothesis is that if the intermediate input of an affiliate (supplier) is important, then the parent firm (producer) of that affiliate holds a smaller share of the equity of an affiliate. Conversely, if the intermediate input of a parent firm is important, then it owns a greater equity share. The ordinary least squares method is applied to test this hypothesis.

#### 3.1. Specification

It is assumed in the theoretical part that the parent firm and the affiliate use specific factors to make intermediate inputs  $x_S$  and  $x_H$ , respectively. The importance of the intermediate input of the affiliate (parent firm) is revealed by how much the affiliate (the parent firm) has specific factors to make an intermediate input. As examined in the previous section, if a supplier has more specific factors and uses the factors to produce a higher

quality (larger quantity) of intermediate input, then the producer holds a smaller share of the supplier firm's equity to give the supplier a larger fraction of revenues. This incentive scheme is used to induce the supplier to use more specific factors to produce a higher quality (larger quantity) of intermediate input under the ex ante incomplete contracts situation.

For empirical tests, the independent variable should be decided, which represents specific factors used to make an intermediate input. To measure the specific factors of each party, this paper uses the intangible assets of a firm that are available in the data set. Kimura and Pugel (1995) emphasized that intangible assets are considered a major source of competitive advantage that can influence FDI decisions.<sup>21)</sup> The intangible assets are defined as something of value that cannot be physically touched, such as a brand, franchise, trademark, or patent. The intangible assets usually incur non negligible costs. This paper uses the ratio of intangible assets to sales as the independent variable.

The following specification is made to test the hypothesis

$$\log(\text{equity}_i) = \nu + \zeta_1 \log(\text{pit}_i) + \zeta_2 \log(\text{sit}_{ij}) + \psi'_{ij} \theta_3 + \varepsilon_{ij}, \quad (9)$$

where subscript  $i$  represents a parent firm  $i$ , and  $\log(\text{equity}_i)$  is the logarithm value of share (%) of affiliate's equity which a parent firm  $i$  holds. The  $\text{pit}_i$  is the ratio of the intangible assets to sales of the parent firm, and  $\text{sit}_{ij}$  is the ratio of intangible assets to sales of  $i$  parent firm's affiliate  $j$ . The  $\psi'_{ij}$  is a vector control, and  $\varepsilon_{ij}$  is an error term. At this specification, the theory expects a positive sign of  $\zeta_1$ , and a negative sign of  $\zeta_2$ .

For the control variables, the size measured by total sales of a parent firm size and an affiliate are added to control the possibility of the resource

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<sup>21)</sup> They used R&D-intensity and advertising-intensity to reflect the development of technological intangible assets and important aspects of overall marketing intangible assets, respectively. This paper does not have those intensities in the data set, but the intangible assets of the parent firm and the affiliate are available.

constraints of a parent firm. For example, if the parent firm cannot wholly own the equity of an affiliate because the affiliate is too big to acquire, then the parent firm might prefer partial ownership to whole ownership. In addition, dummy variables are added in order to control the differences in the location and industry of an affiliate. This paper classifies the host countries on the basis of the origin of initial laws to control the possibility that the variation of laws protecting investors matters for ownership patterns of parent firms around the world,<sup>22)</sup> and also adds an institutional variable to control the effects of the characteristics of the host country on equity ownership.

### 3.2. Data

The Korean firm-level data are found in the Korea Investors Services Financial System and Korea Investors Services Stock Market Analysis Tool database of the Korea Investors Services Co., Ltd., which contains the balance sheets and the profit and loss statements for the parent firms in 2002. The summarizing information on the Korean MNC overseas affiliates is published by the Export-Import Bank of Korea. Limited information on the overseas affiliates has been received from the Export-Import Bank of Korea.<sup>23)</sup> This paper uses the 2002 financial statements for Korean parent firms and overseas affiliates.

Among 15,655 overseas affiliates in 2002, the data set includes 318 overseas affiliates and 129 Korean parent firms of these affiliates across all industries. The Export-Import Bank of Korea has the right to collect the balance sheets and profit & loss statements of overseas affiliates annually from any Korean parent firm which has invested over 10 million dollars to acquire a share of the equity of an overseas affiliate. This paper has information on the overseas affiliates of Korean firms in which over 10 million dollars has been invested by any Korean firm.<sup>24)</sup> In the data set, the

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<sup>22)</sup> La Porta *et al.* (1998).

<sup>23)</sup> The author thanks Junghwa Seo and James Kim of the Export-Import Bank of Korea for helping with refining the data set.

<sup>24)</sup> This paper has a sample selection based on the investment amount, but it may not cause a

first overseas affiliate of a Korean firm started to run a business in 1973. However, the majority of the overseas affiliates have engaged in business since the 1990s. Kimura *et al.* (2008), Lee *et al.* (2007), and Park and Lim (2000) well explained the Korean Firms' globalization motives and behaviors in the overseas countries.

A Korean parent firm could flexibly increase or decrease the share of the equity of an affiliate as Blodgett (1990) described, responding to the change in the specific factors of an affiliate. The Korean MNF would actually change the equity share of an affiliate as the relative importance of the intermediate inputs changed. During 2002, some Korean parent firms in the data set invested a total of 2.868 billion dollars to increase equity share of overseas affiliates, and some Korean firms withdrew a total of 184 million dollars through liquidating overseas affiliates or decreasing equity ownership of overseas affiliates. Although this paper does not have the panel data,<sup>25)</sup> it is still possible to test the hypothesis by using a cross section of Korean firm-level data.

Among the 318 overseas affiliates, 166 affiliates belong to the manufacturing industry and the other 152 affiliates are in a non-manufacturing industry (table

**Table 1 Affiliates by Industry**

	No. of Affil.	Average* (%)	Median* (%)	St.dev. * (%)	Sales (\$ mil.)
Manufacturing	166	88.0	100	17.8	27,564
Non-manufac.	152	87.8	100	24.5	55,667
Whole Industry	318	87.9	100	21.2	83,231

Note: \* equity shares.

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serious problem since the paper can have unbiased estimators of the parameters. In addition, firms would be more careful when they decide to invest because of huge amount of investment.

<sup>25)</sup> It is possible that a parent firm might have never altered the equity share since it first decided the share of equity of an affiliate, even though the ratio of intangible assets to sales of an affiliate (or the parent firm) changed. Under such circumstances, the panel data should be used to correctly test the relationship between the preference of a parent firm for equity ownership and the relative importance of intermediate inputs.

1). In the manufacturing sector, the majority of overseas affiliates (56.0%) are in the manufacturing industry of fabricated metal products, machinery, and equipment. In the non-manufacturing sector, 95 of 152 affiliates belong to the non-manufacturing industry of wholesale and retail trade, along with restaurants and hotels. In the data set, over 60% of all affiliates (197) are wholly owned (100 % ownership) by the Korean parent firms. Among these 197 affiliates, 87 affiliates belong to the manufacturing industry. As a result, the ratio of wholly owned affiliates to all affiliates in the non-manufacturing industry (72.3%) is higher than that in the manufacturing industry (52.4%).

The paper adds the per capita income of a host country to control the effects of the income of a host country on the equity ownership of a firm. The per capita gross national income of the host country in 2002 (per capita GNI) is obtained from the World Bank. In addition, to measure the institutional quality of each host country, the political stability index developed by Kaufmann *et al.* (2002) is used. The index combines several indicators that measure perceptions of the likelihood that the government in power will be destabilized or overthrown by unconstitutional or violent means. This index captures the idea that the quality of governance in a country is compromised by the likelihood of wrenching changes in the government, which not only have a direct effect on the continuity of policies, but also at a deeper level, undermine the ability of all citizens to peacefully select and replace those in power (Kaufmann *et al.*, 2002, p. 5). This index ranges between -2.5 (lowest institutional quality) and 2.5 (highest institutional quality).<sup>26)27)</sup>

To control the possibility that the differences in legal protections of investors affect the preference of Korean firms for equity participation, the paper categorizes the host countries as in La Porta *et al.* (1998). La Porta *et al.* classified 49 countries into four different legal groups based on the origin of the initial laws,<sup>28)</sup> such as English-origin-countries that are also called

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<sup>26)</sup> For descriptive statistics, refer to table A1.

<sup>27)</sup> For the correlation matrix, refer to table A3.

<sup>28)</sup> Civil legal traditions originated in Roman law that used statutes and comprehensive codes as

**Table 2 Countries by Legal Origin**

Origins	Countries
Common-law	Australia, Canada, Hong Kong, India, Ireland, Malaysia, Singapore, South Africa, Sri Lanka, Thailand, U.K., U.S., Israel
French-civil-law	Argentina, Belgium, Brazil, Chile, France, Indonesia, Italy, Mexico, Netherlands, Peru, Philippines, Portugal, Spain, Turkey
German-civil-law	Austria, Germany, Japan, Switzerland, Taiwan
Scandinavian-civil-law	Sweden
Others	Bangladesh, China, Vietnam, Uzbekistan, Czech Rep., Hungary, Poland, Romania, Russia, Cayman Islands, Panama, Puerto Rico, Virgin Islands, Guam, Morocco, Sudan

common-law countries, French-civil-law countries, German-civil-law countries, and Scandinavian-civil-law countries. Relatively higher ownership concentration is found in the countries where investors were poorly protected. They showed that good accounting standards and shareholder protection measures are associated with a lower ownership concentration. Based on the classifications of countries, this paper adds dummies to represent the differences in legal protections of investors (table 2).

### 3.3. Results

The paper divides the whole sample into two sub-samples such as a sample of manufacturing industry, and a sample of non-manufacturing industry. The dependent variable is the logarithm value of equity share (*lequity*) and the independent variables are the ratio of intangible assets to sales of parent firm (*lpit*), the ratio of intangible assets to sales of affiliate (*lsit*), the logarithm value of the sales of a parent firm (*lpsale*), the logarithm value of the sale of

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the primary means of ordering legal material and relied on legal scholars to ascertain and formulate rules. Scholars typically identify three currently common families of laws within the civil-law tradition: French, German, and Scandinavian. But, common law is formed by judges who have to resolve specific disputes. Precedents from judicial decisions shape the application of common law (La Porta *et al.*, 1998, pp. 1118-1119).

**Table 3 Equity Ownership Structures with Location Dummy**

	Whole Industry	Manufacturing	Non-manufacturing
<i>lpit</i>	-0.000 (0.011)	-0.002 (0.014)	-0.002 (0.020)
<i>lsit</i>	-0.048*** (0.011)	-0.045*** (0.012)	-0.048* (0.024)
<i>lpsale</i>	-0.020 (0.013)	-0.009 (0.016)	-0.010 (0.027)
<i>lssale</i>	-0.031* (0.017)	-0.063*** (0.023)	-0.036 (0.025)
<i>stabil</i>	0.059 (0.046)	0.068 (0.044)	-1.003*** (0.335)
<i>lpgni</i>	0.051* (0.029)	0.042 (0.039)	0.340*** (0.088)
<i>dummies</i>	for location and industry		
No. of obs.	134	88	46
$R^2$	0.39	0.34	0.67

Note: Standard errors in parenthesis. \*, and \*\*\* are 10%, and 1% significance levels, respectively.

an affiliate (*lssale*), the political stability of a host country (*stabil*), per capita gross national income of a host country (*lpgni*), and dummies for the location and industry of an affiliate (*dummies*).

The empirical results partially support the theory. Table 3 shows that the *lsit* is statistically significant in the whole industry and manufacturing sector at the 1% level, and it is also significant at the 10% level in the non-manufacturing sector. However, the *lpit* is not statistically different from zero. That is, if an affiliate has a higher ratio of intangible assets to sales, then the parent firm of the affiliate gives more of the equity shares to the affiliate. However, the ratio of intangible assets to sales of the parent firm does not play any important role in the choice of equity participation by the parent firm.<sup>29)</sup>

<sup>29)</sup> The paper also runs regressions by using the logarithm value of the intangible assets of the parent firm (*plin*) and the logarithm value of the intangible assets of the affiliate (*slin*) instead of *lpit* and *lsit*. Similarly, however, *plin* is not statistically significant, but *slin* is significantly negative. In addition, this paper uses the logarithm value of the ratio

Another result is that the effect of the size of an affiliate (*lssale*) on the equity ownership of a parent firm is significantly negative in the manufacturing sector. A Korean parent firm holds less of the equity share when the overseas affiliate is very big. It is because the parent firm might want to reduce the risks to which it is exposed, through choosing a joint venture. The other possible reason is that the host country imposes some restrictions on the equity ownership of a foreigner when the local firm is very big. The host country might be concerned about the possibility of future unemployment when the foreign parent firm withdraws the investment. However, the size of the parent firm (*lpsale*) does not play any important role in the equity ownership of a parent firm.

The coefficient on *lpgni* is positive and statistically significant in the whole industry (10% level) and in the non-manufacturing sector (1% level). This shows that Korean firms in the non-manufacturing sector tend to hold greater equity shares of affiliates when they invest in higher income countries. The firm would hold a greater equity share to obtain a larger share of profits when it invests in higher income countries. The qualitative results do not change when the categorization of the host countries is altered. For example, this paper runs regressions again after the host countries are put in Oceania<sup>30)</sup> into Asia and / or divide Europe into Western Europe and Eastern Europe. The sign of *lsit* is still significantly negative irrespective of the changes in categorization of the host countries.<sup>31)</sup>

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of the intangible assets of an affiliate to the intangible assets of a parent firm (*lratio*). The sign of *lratio* is significantly negative both in the whole industry and in the manufacturing industry, but is not significant in the non-manufacturing industry.

<sup>30)</sup> Australia and Guam.

<sup>31)</sup> This paper adds year dummies for the periods of Korean economic problems to capture the possibility that Korean economic difficulties may affect the equity ownership structures of Korean firms. There have been two different years of major economic turmoil in Korea since a Korean parent firm first invested in an overseas affiliate in 1973. In 1980, Korea faced many difficulties throughout the entire economy that included the first ever negative growth since planned development was launched in 1962. The second economic turmoil was when Korea experienced a foreign exchange crisis in 1997. To represent these economic difficulties, the dummies for 1980 and 1997 are used to control these uncommon years. However, the dummies are not significant and the qualitative results do not change.

**Table 4 Equity Ownership Structures (above a \$10,000 income)**

	Whole Industry	Manufacturing	Non-manufacturing
<i>lpit</i>	-0.008 (0.016)	-0.034 (0.026)	-0.002 (0.022)
<i>lsit</i>	-0.053*** (0.015)	-0.082** (0.021)	-0.049** (0.021)
<i>lpsale</i>	-0.044** (0.022)	-0.048 (0.040)	-0.039 (0.028)
<i>lssale</i>	-0.041* (0.021)	-0.074 (0.054)	-0.041 (0.030)
<i>stabil</i>	-1.045*** (0.256)	-0.546 (0.604)	-1.139*** (0.348)
<i>lpgni</i>	0.353*** (0.125)	0.510** (0.185)	0.382* (0.368)
No. of obs.	54	17	37
$R^2$	0.45	0.80	0.37

Note: Standard errors in parenthesis. \*, \*\*, and \*\*\* are 10%, 5%, and 1% significance levels, respectively.

When the dummy for the legal orientation of the host country are added to control the possibility that the differences in investor protections might affect the equity ownership structure of the MNF, the *lsit* is still negative and statistically significant (table A2). Considering the possibility that the affiliates located in higher income countries have meaningful intangible assets, this paper tests the same hypothesis with the affiliates located in countries where the per capita gross national incomes are above 10,000 U.S. dollars (table 4). In this small sample, the *lsit* is still statistically significant and negative.<sup>32)</sup>

It is expected that if the host country is politically more stable, then a parent firm will hold a greater share of the equity of an affiliate. A parent

<sup>32)</sup> The independent variables, *lpit* and *lsit* might be endogenous. The causality might go from ownership to the ratios of intangible assets to sales. However, this paper cannot reject that the causality goes from ratios of intangible assets to sales to ownership since it does not have instrument variables.

firm might depend heavily on the local partner since the local partner can play important roles in handling the problems originating from the instability of the host country. The Korean firm might tend to hold a smaller equity share when it acquires an affiliate in a more unstable country. This expectation is supported since the *stabil* is significantly positive in the manufacturing sector in table A6. However, table 3 shows that the *stabil* is statistically negative in the non-manufacturing sector. In addition, table 4 shows that the signs of *stabil* are significantly negative in the whole and non-manufacturing industry. It is not possible to find any consistent results concerning the effects of the political stability of a host country on the equity ownership of a firm.

#### 4. CONCLUSION

The paper examines the vertical integration of MNFs and shows that joint ventures are the organizational choices of MNFs under the situation of ex ante incomplete contracts. In theory, the paper assumes that the quality of intermediate input is assumed to be non-contractible ex ante. To produce a high-quality intermediate input, the MNF and the supplier are assumed to use specific factors. This paper finds that if the intermediate input of suppliers is important, then the MNF (final-product producer) holds a smaller equity share of the supplier's firm to give the supplier an incentive to produce high-quality intermediate input. However, if the intermediate input made by the producer is more important than the input made by the supplier, then the producer is inclined to hold a greater equity share of the supplier's firm to take a larger fraction of the total revenues.

Using a firm-level data set, the paper tests the predictions in the theory that the MNF chooses the equity share of the supplier's firm depending on the relative importance of intermediate inputs. To represent specific factors in the theory, the paper uses the intangible assets of a firm; such as a brand, franchise, or patent. The empirical tests partially support the theory that if

an affiliate has the higher ratio of intangible assets to sales, then the Korean MNF is inclined to hold a smaller share of the equity of an affiliate. However, the ratio of intangible assets to the sales of MNFs is not statistically significant.

There might be other factors not considered in this paper which affect the MNF choice of an equity share. The paper does not consider the possibilities that the two parties, the producer (MNF) and the intermediate-input supplier (affiliate), come into a conflict of interest. These conflicts are strongly related to issues concerning the management costs of MNFs. In addition, technology leakage from MNFs to affiliates or to other local companies in the host country is also important. Technology leakage is a very sensitive problem to an MNF since an MNF is usually an oligopolist in industry and has advanced technology (Markusen, 1995). Due to the technology leakage problem, an MNF might prefer whole ownership to outsourcing or a joint venture. A more thorough examination is expected to be done in the future.

## APPENDIX

### A1. Bargaining Process

The outside option<sup>33)</sup> for the producer is different depending on how much share of the supplier firm's equity the producer holds. In cases where the producer has an equity share majority ( $0.5 < s \leq 1$ ), it is assumed that the producer has the residual rights. If the producer and the supplier cannot arrive at an agreement, the producer has the control rights on the fraction,  $\delta$ , of  $x_H$ , because the supplier's firm is under the control of the producer, and the producer can directly order to pass over the fraction  $\delta$  of  $x_H$ .

This fraction  $\delta$  is independent of the equity share when the producer has an equity share majority ( $0.5 < s \leq 1$ ) because the intermediate input  $x_H$  is

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<sup>33)</sup> The actions chosen when the two parties leave the negotiating table.

useless to outside producers. That is,  $x_H$  is useless for the supplier if the two parties walk away from a deal. Since the outside option for the supplier is still zero no matter how much of the equity share the supplier has under the situation when producer has an equity share majority ( $0 \leq s_s < 0.5$ , where  $s_s$  is an equity share which the supplier has ( $s_s = (1 - s)$ )), the producer tries to acquire the maximum  $\delta$ .

However, when the supplier has 50% or more of the equity share ( $0.5 \leq s_s \leq 1$ ), it is assumed that the supplier has residual rights. In this case, the producer cannot obtain anything if they do not reach an agreement.<sup>34)</sup> The fraction  $\delta$  (default fraction) should be strictly less than one. If  $\delta$  is equal to 1, then the supplier receives nothing ex post but only bears the costs to produce the intermediate input  $x_H$  when the producer has an equity share majority. As a result, the optimal production of a supplier in intermediate input is 0 when the producer can control the supplier. If  $\delta = 1$ , then the majority ownership ( $0.5 < s \leq 1$ ) never occurred and the  $\delta$  should be in the range of  $[0, 1)$  and is assumed to be close to 0.<sup>35)</sup>

In summary, the first case is when the producer has an equity share majority ( $0.5 < s \leq 1$ ). If the two parties reach an agreement, then the producer obtains the default fraction of intermediate input,  $\delta x_H$ , which is identical to  $\delta^{\alpha(1-\phi)} R$ , and additional  $\eta(s)(1 - \delta^{\alpha(1-\phi)})R$  through bargaining over the remaining revenues,  $(1 - \delta^{\alpha(1-\phi)})R$ .<sup>36)</sup> Then, the supplier can obtain  $(1 - \eta(s))(1 - \delta^{\alpha(1-\phi)})R$  by bargaining over the remaining revenue. If the two parties do not arrive at an agreement, then the producer can acquire only the default option,  $\delta^{\alpha(1-\phi)} R$ , and the supplier cannot receive anything.

The second case is when the producer does not have an equity share majority ( $0 \leq s < 0.5$ ). Under the agreement, the producer can obtain

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<sup>34)</sup> It is assumed that if the producer has 50% of the equity of a supplier firm ( $s=0.5$ ), then the producer cannot control the firm of the supplier.

<sup>35)</sup> This paper makes this assumption for simplicity and takes  $\delta$  to be far from zero. However, the fact that the fraction of total revenues the producer can obtain is monotonically increasing with respect to equity share ( $s$ ) the producer holds makes a difference.

<sup>36)</sup> This remaining part is called quasi-rent. Quasi-rent is the excess of value over the salvage value or the value of the next best use to another renter (Klein *et al.*, 1978).

$\eta(s)R$  and the supplier can receive  $(1-\eta(s))R$ . If they do not reach an agreement, both of them obtain nothing. As a result, reaching an agreement is always preferable (dominant equilibrium) for both parties in the first case as well as the second case. Although the first derivative of  $\beta$  with respect to  $s(\beta'(s))$  is not well defined when  $s$  is 0.5, it is not a serious problem.<sup>37)</sup> Most of affiliates (suppliers) of Korean firms (producers) are owned through a majority equity share ( $s > 0.5$ ).

**A2. Derivation of Optimal Equity Share**

After solving the two maximization equations (5) and (6), the optimal  $x_s^o$  and  $x_H^o$  are obtained by the producer and the supplier.

$$x_s^o = \beta^{\frac{2-\alpha(1-\phi)}{2(2-\alpha)}} (1-\beta)^{\frac{\alpha(1-\alpha)}{2(2-\alpha)}} \left[ \alpha Y^{1-\alpha} P^{\alpha-1} \left( \frac{\gamma_S}{\phi} \right)^{\frac{\alpha(1-\phi)-2}{2}} \left( \frac{(1-\phi)}{\gamma_H} \right)^{\frac{\alpha(1-\phi)}{2}} \right]^{\frac{1}{2-\alpha}} \quad (A2.1)$$

$$x_H^o = \beta^{\frac{\alpha\phi}{2(2-\alpha)}} (1-\beta)^{\frac{2-\alpha\phi}{2(2-\alpha)}} \left[ \alpha Y^{1-\alpha} P^{\alpha-1} \left( \frac{\phi}{\gamma_S} \right)^{\frac{\alpha\phi}{2}} \left( \frac{\gamma_H}{(1-\phi)} \right)^{\frac{\alpha\phi-2}{2}} \right]^{\frac{1}{2-\alpha}} \quad (A2.2)$$

From these two equations, it is easily derived that the demand for the intermediate input  $x_s^o$  is negatively related to  $(\gamma_s(\partial x_s^o / \partial \gamma_s < 0))$ . The  $\partial x_i / \partial \gamma_j$  (where  $i \neq j$ ) is negative and that means the  $j$  cost effectiveness of a country is negatively related to the demand for  $i$  firm's intermediate input since an increase of  $\gamma_j$  causes the cost of  $j$  for the intermediate input

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<sup>37)</sup> There is a discontinuous point when  $s=0.5$ . However, the discontinuity does not cause any problem since the fraction which the producer receives is increasing in  $s$  overall, and  $\delta$  is assumed to be close to 0. This discontinuity at  $s=0.5$  might explain the empirical findings by Blodgett (1991) that 50-50 joint ventures are the preponderant type overall (43.1%). However, these 50-50 joint ventures do not occur frequently in the Korean case (seven 50-50 joint ventures out of 124 joint ventures over all).

to rise.

When inserting two equations (A2.1) and (A2.2) into equation (2), then the final product is represented by parameters, income  $Y$  and price index  $P$ .

$$y = \left[ \alpha Y^{1-\alpha} P^{\alpha-1} \left( \frac{\phi\beta}{\gamma_S} \right)^\phi \left( \frac{(1-\phi)(1-\beta)}{\gamma_H} \right)^{(1-\phi)} \right]^{\frac{1}{2-\alpha}}. \quad (\text{A2.3})$$

The total revenues and the price of the final product are represented as

$$R = Y^{\frac{2(1-\alpha)}{2-\alpha}} P^{\frac{2(\alpha-1)}{2-\alpha}} \left[ \alpha \left( \frac{\phi\beta}{\gamma_S} \right)^\phi \left( \frac{(1-\phi)(1-\beta)}{\gamma_H} \right)^{(1-\phi)} \right]^{\frac{\alpha}{2-\alpha}}. \quad (\text{A2.4})$$

$$p = Y^{1-\alpha} P^{\alpha-1} y^{\alpha-1} = Y^{\frac{1-\alpha}{2-\alpha}} P^{\frac{\alpha-1}{2-\alpha}} \left[ \alpha \left( \frac{\phi\beta}{\gamma_S} \right)^\phi \left( \frac{(1-\phi)(1-\beta)}{\gamma_H} \right)^{(1-\phi)} \right]^{\frac{\alpha-1}{2-\alpha}}. \quad (\text{A2.5})$$

**Table A1 Descriptive Statistics**

		Obs.	Mean	St. dev.	Min.	Max.
Whole Industry	<i>equity</i>	318	87.9	21.2	5.00	100
	<i>lpit</i>	293	-4.90	2.01	-13.25	-0.62
	<i>lsit</i>	156	-4.74	2.57	-10.93	2.57
	<i>lpsale</i>	314	14.76	1.96	8.52	17.51
	<i>lssale</i>	283	10.91	2.12	1.38	16.10
	<i>stabil</i>	312	0.60	0.76	-2.01	1.61
	<i>lpgni</i>	311	8.58	1.69	5.73	10.54
Manufac.	<i>equity</i>	166	88.0	17.8	10.0	100
	<i>lpit</i>	153	-4.64	1.99	-13.24	-0.61
	<i>lsit</i>	101	-4.55	2.30	-9.69	2.57
	<i>lpsale</i>	166	14.40	1.88	8.52	17.51
	<i>lssale</i>	153	11.06	1.58	3.91	15.29
	<i>stabil</i>	164	0.35	0.78	-2.01	1.48
	<i>lpgni</i>	163	7.86	1.57	5.73	10.46
Non-Manufac.	<i>equity</i>	152	87.8	24.5	5.00	100
	<i>lpit</i>	140	-5.17	2.00	-10.64	0.68
	<i>lsit</i>	55	-5.10	2.99	-10.92	0.68
	<i>lpsale</i>	148	15.17	1.97	8.97	17.51
	<i>lssale</i>	130	10.72	2.60	1.38	16.10
	<i>stabil</i>	148	0.88	0.62	-1.56	1.61
	<i>lpgni</i>	148	9.38	1.44	5.88	10.54

**Table A2 Equity Ownership Structures with Legal Origin Dummy**

	Whole Industry	Manufacturing	Non-manufacturing
<i>lpit</i>	0.002 (0.011)	0.006 (0.014)	-0.003 (0.019)
<i>lsit</i>	-0.039*** (0.011)	-0.027** (0.012)	-0.052** (0.024)
<i>lpsale</i>	-0.018 (0.014)	-0.017 (0.017)	-0.021 (0.026)
<i>lssale</i>	-0.028 (0.018)	-0.044* (0.024)	-0.026 (0.024)
<i>stabil</i>	0.091 (0.063)	0.160** (0.061)	-1.397*** (0.339)
<i>lpgni</i>	-0.028 (0.042)	-0.081* (0.042)	0.274** (0.109)
<i>dummies</i>	for legal origins and industry		
No. of obs.	134	88	46
$R^2$	0.32	0.23	0.69

Note: Standard errors in parenthesis. \*, \*\*, and \*\*\* are 10%, 5%, and 1% significance levels, respectively.

**Table A3 Correlations among Variables**

	<i>lpit</i>	<i>lsit</i>	<i>lpsale</i>	<i>lssale</i>	<i>stabil</i>	<i>lpgni</i>
<i>lpit</i>	1.000					
<i>lsit</i>	0.073	1.000				
<i>lpsale</i>	0.772	0.144	1.000			
<i>lssale</i>	0.341	0.303	0.377	1.000		
<i>stabil</i>	0.110	0.078	0.128	0.176	1.000	
<i>lpgni</i>	0.249	-0.116	0.195	0.289	0.719	1.000

## REFERENCES

- Aghion, Philippe and Jean Tirole, "The Management of Innovation," *Quarterly Journal of Economics*, 109(4), 1994, pp. 1185-1209.
- Antràs, Pol, "Firms, Contracts, and Trade Structure," *Quarterly Journal of Economics*, 118(4), 2003, pp. 1374-1418.
- Antràs, Pol and Elhanan Helpman, "Global Sourcing," *Journal of Political Economy*, 112, 2004, pp. 553-580.
- Behrman, Jack N. and Robert E. Grosse, *International Business and Governments: Issues and Institutions*, University of South Carolina Press, 1990.
- Blodgett, Linda Longfellow, "Partner Contributions as Predictors of Equity Share in International Joint Ventures," *Journal of International Business Studies*, 22(1), 1991, pp. 63-78.
- Crampton, Peter, Robert Gibbons, and Paul Klemperer, "Dissolving a Partnership Efficiently," *Econometrica*, 55(3), 1987, pp. 615-632.
- The Export-Import Bank of Korea, *Financial Statement Analysis of Korea's Foreign Subsidiaries*, The Export-Import Bank of Korea, 2003.
- Fagre, Nathan and Louis T. Wells, Jr., "Bargaining Power of Multinationals and Host Governments," *Journal of International Business Studies*, 13(2), 1982, pp. 9-23.
- Gatignon, Hubert and Erin Anderson, "The Multinational Corporation's Degree of Control over Foreign Subsidiaries: An Empirical Test of a Transaction Cost Explanation," *Journal of Law, Economics, and Organization*, 4(2), 1988, pp. 304-336.
- Grossman, Sanford J. and Oliver D. Hart, "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration," *Journal of Political Economy*, 94(4), 1986, pp. 691-719.
- Grossman, Gene M. and Elhanan Helpman, "Integration versus Outsourcing in Industry Equilibrium," *Quarterly Journal of Economics*, 117(1), 2002, pp. 85-120.
- Hennart, Jean-Francois, "The Transaction Costs Theory of Joint Venture: An

- Empirical Study of Japanese Subsidiaries in the United States,” *Management Science*, 37(4), 1991, pp. 483-497.
- Hummels, David, Jun Ishii, and Kei-Mu Yi, “The Nature and Growth of Vertical Specialization in World Trade,” *Journal of International Economics*, 54, 2001, pp. 75-96.
- Kaufmann, Daniel, Aart Kraay, and Pablo Zoido-Lobaton, “Governance Matters 2: Updated Indicators for 2000/01,” World Bank Policy Research Working Paper No. 2772, 2002.
- Kimura, Fukunari, Kazunobu Hayakawa, and Zheng Ji, “Are Korean Firms Doing Well? Evidence from Shangdong Province in China,” *Journal of the Korean Economy*, 9(1), 2008, pp. 63-88.
- Kimura, Yui and Thomas A. Pugel, “Keiretsu and Japanese Direct Investment in US Manufacturing,” *Japan and the World Economy*, 7, 1995, pp. 481-503.
- Klein, Benjamin, Robert G. Crawford, and Armen A. Alchian, “Vertical Integration, Appropriable Rents, and the Competitive Contracting Process,” *Journal of Law and Economics*, 21, 1978, pp. 297-326.
- Kobrin, Stephen J., “Testing the Bargaining Hypothesis in the Manufacturing Sector in Developing Countries,” *International Organization*, 41(4), 1987, pp. 609-638.
- La Porta, Rafael, Florencio Lopez-de-Silanes, Andrei Shleifer, and Robert W. Vishny, “Law and Finance,” *Journal of Political Economy*, 106(6), 1998, pp. 1113-1155.
- Lecraw, Donald J., “Bargaining Power, Ownership, and Profitability of Multinational Corporations in Developing Countries,” *Journal of International Business Studies*, 15(1), 1984, pp. 27-43.
- Lee, Doowon, Hyeon-Seung Huh, and Seonghoon Cho, “Causal Relation between Sino-Korea FDI and Exports,” *Journal of the Korean Economy*, 8(2), 2007, pp. 377-395.
- Mataloni, Raymond J. Jr., “U.S. Multinational Companies: Operations in 2000,” *Survey of Current Business*, 82, 2002, pp. 111-131.
- Markusen, James R., “The Boundaries of Multinational Enterprises and the

- Theory of International Trade,” *Journal of Economic Perspectives*, 9(2), 1995, pp. 169-189.
- Park, Kang H. and Yong T. Lim, “External Factors inducing Korean Overseas Direct Investment,” *Journal of the Korean Economy*, 1(1), 2000, pp. 191-205.
- Svejnar, Jan and Stephen C. Smith, “The Economics of Joint Ventures in Less Developed Countries,” *Quarterly Journal of Economics*, 99 (1), 1984, pp. 149-167.
- Whinston, Michael D., “On the Transaction Cost Determinants of Vertical Integration,” *Journal of Law, Economic, and Organization*, 19(1), 2003, pp. 1-23.
- Wooldridge, Jeffrey M., *Introductory Econometrics — A Modern Approach*, South-Western College Publishing, 2000.