Whole versus Shared Ownership of Foreign Affiliates

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Abstract

This paper studies why multinational firms often share ownership of a foreign affiliate with a local partner even in the absence of government restrictions on ownership. We show that shared ownership may arise, if (i) the partner owns assets that are potentially important for the investment project, and (ii) the value of these assets is private information. In this context shared ownership acts as a screening device. Our model predicts that the multinational's ownership share is increasing in its productivity, with the most productive multinationals choosing not to rely on a foreign partner at all. This prediction is shown to be consistent with data on the ownership choices of Japanese multinationals.

JEL-Classification: F23, L20.

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1 Introduction

Consider a multinational enterprise that has to choose an ownership structure for its overseas affiliate. Will it assume whole ownership or share ownership with a local partner? If it chooses shared ownership, how large will its share be? We examine these questions by constructing a model in which the multinational faces no government restrictions on ownership and no financial constraints, and in which contracts can be written to ensure that the affiliate's ex-post profit is maximized. We show that under these conditions the profit-maximizing choice of ownership structure entails shared ownership if the following two conditions are met: (i) the local partner can contribute potentially valuable assets to the investment project, such as market-specific knowledge, a distribution network, or valuable contacts with potential customers and suppliers; and (ii) the value of these assets is private information of the local firm. The model predicts that in equilibrium the multinational's ownership share is increasing in the value of its own productive assets, with the most productive multinationals always choosing whole ownership. We test this prediction using Japanese firm-level data, and find that it is consistent with the ownership choices of Japanese multinationals.

The allocation of ownership of productive assets is a central issue in the theory of the firm. It is also one of the key issues multinationals have to deal with when setting up a foreign affiliate. Multinationals frequently have a choice between establishing a wholly owned subsidiary or sharing ownership of an affiliate with local partners. Shared ownership may take the form of majority or minority ownership, and may be established through the acquisition of a stake in a foreign company, or through a joint venture or other form of alliance that leads to the creatioin of a new legal entity. We do not focus on the exact process by which shared ownership is established, but rather on possible reasons why ownership is shared. In what follows, we will use the terms shared ownership and joint venture interchangeably.

Shared ownership is an empirically important phenomenon. According to Desai, Foley and Hines (2004) about 80 percent of all U.S. affiliates abroad in 1997 were wholly owned, with the remaining 20 percent equally divided

between minority- and majority-owned affiliates.[1] In our data on Japanese manufacturers, a sample of 1228 investments into manufacturing affiliates located in OECD countries, some 58% of investments were wholly owned, while 42% were joint ventures.[2] Of these joint ventures, nearly half (49%) had a local firm as the principal investment partner, while 26% were joint ventures between two Japanese companies, while some 10% were investments between a previously established Japanese foreign affiliate and a local firm. Thus, in some 60% of Japanese joint ventures, a local firm played the role as the main investment partner. Within the joint venture arrangements, we also find that the equity ownership percentage of the principal Japanese investor differs across joint venture partner types. As shown in Table 1, the principal Japanese investor typically owns a 45% share of the affiliate when it contracts with a local firm to establish the affiliate, but over 60% of the the affiliate when in partnership with another Japanese firm (and slightly more than this when the main partner is a member of the same keiretsu).[3] In addition, basic OLS and Tobit regression analyis suggest (Table 2) that a firm's financial situation, as indicated by its gross revenue, cash flow, and interest burden, has no significant affect on the equity ownership percentage held by the firm.[4]

Insert Tables 1, 2 about here.

Absent any financial constraints or ownership requirements, a necessary condition for a multinational to want to share ownership of its affiliate with

[1]The ownership share of US multinationals is positively correlated with host country gross national product (GNP). In the richest quartile of host countries, partially owned affiliates accounted for only 15.5 percent, whereas in the poorest quartile they made up more than half of all U.S. foreign affiliates. This is partly due to the fact that it is mostly developing countries that impose local ownership requirements. These ownership requirements often prevent foreign investors from acquiring more than 49% of a local firm's shares.

[2]Authors' calculation. See Appendix for information on the dataset. Data is for Japanese FDI into countries that imposed no local ownership requirement at the time of investment.

[3]See Appendix Table 1 for the T-tests on equality of these means.

[4]While this in contrast to the Klein, et. al. (2002) result that suggests financial constraints (through Japanese bank credit problems) do play a role in FDI, their study examined the number of Japanese affiliates established in the U.S., not the their ownership structure.

a local partner is that the partner contributes valuable assets or capabilities. This is not a sufficient condition, however. If the markets for these assets worked perfectly and the two parties could write complete contracts, then the ownership structure would be indeterminate; the firms could simply write contracts to coordinate how their assets are to be used. The ownership structure therefore has to be a response to failures in the markets for these assets. In the current paper, we take this market failure to be the result of incomplete information about the value of the local firm's assets. Specifically only a local firm knows how much its assets are worth. This adverse selection problem has been recognized as an important factor in shaping foreign investment decisions (see, for instance, Gordon and Bovenberg, 1996, and Qiu and Zhou (2006)). We show that it can be solved through shared ownership. By offering the local firm a menu of contracts, consisting of a share of the affiliate's ex-post profits and a transfer, the multinational can induce the local firm to reveal its information. The intuition is simple: the menu can be structured in such a way that a local firm with high-value assets would choose a contract where it keeps a large share of the ex-post profits and receives a small transfer rather than picking a contract with a small ownership share and a larger transfer, and vice versa for a local firm with less valuable assets.

The basic modelling of this information revelation mechanism follows Stähler (2005) who uses it to study cross-border mergers. Applying it to our setting, we are able to derive testable predictions regarding the multinational's ownership share in the affiliate. For a given distribution of local firms' assets, and controlling for the host-country wage rate and market size, the ownership share of the multinational is increasing in the multinational's own assets. This prediction is confirmed in our empirical analysis.

We see our model as a complement to other approaches of explaining shared ownership, particulary since data limitations make it difficult to distinguish between them empirically. Recall that in our model we assume implicitly that markets work perfectly in all respects, except that there is adverse selection. In particular, the two parties can write complete contracts to solve ex-post incentive problems, so that the affiliate's profit can be maximized and distributed according to the agreed-upon sharing rule. In Naka-

mura and Xie (1998) contract incompleteness is the market failure underlying shared ownership; there is no information asymmetry. By retaining at least partial ownership of their assets, firms retain some residual rights of control over their assets. These control rights are assumed to help reduce technological spillovers and solve agency problems in running the affiliate that cannot be solved through incentive contracts. The ownership share of the multinational reflects the bargaining power of the two parties. If bargaining power is correlated with the value of productive assets, then this model, too, predicts that the multinational's ownership share should be increasing in the value of its assets.

Related explanations of partial ownership of foreign affiliates that are driven by the implicitly assumption that it is impossible to solve ex-post incentive problems include Asiedu and Esfahani (2001), and Hennart (1991). In the former paper, incentive contracts fail because the parties cannot make any side-payments. In the latter paper, the multinational is only interested in some of the assets of the local firm, and will not buy the whole company if it is too costly to operate it ex post.[5]

In the next section we develop a model of shared ownership based on adverse selection. In Section 3 we examine how shared ownership may help the multinational overcome this problem, and in which situations the multinational will adopt this solution rather than pursue the investment project without seeking a local partner. In Section 4 we confront the predictions of the model with our Japanese firm-level data. Section 5 concludes.

2 A Model of Shared Ownership

We consider a multinational enterprise that has to decide how to establish an affliate in the host-country market and how to own it. The multinational's first option is to undertake the investment entirely by itself and hence retain whole ownership of its subsidiary. The multinational thus relies only on its

[5]In our paper we explicitly abstract from host government intervention. Joint ventures may of course be a response to such intervention (actual or anticipated). For further details see, for instance, Müller and Schnitzer (2006).

own productive assets, such as technology and marketing skills. For simplicity, we refer to this option as "greenfield investment". The second option is to undertake the investment in cooperation with a local firm. This cooperation involves the combination of the multinational's assets with those of the local firm and includes a contract specifying a payment T from the multinational to the local firm for the use of its assets and a sharing rule for the resulting profit, where s denotes the share left to the local partner. We call this option a "joint venture". Whether this cooperation takes the form of an actual joint venture or a (partial) merger does not matter. Assuming that the two parties can write sufficiently complete contracts to ensure that the cooperation leads to an ex-post maximization of the venture's profit, the only aspect of ownership that matters is that it provides a contractual claim on the venture's ex-post profits.[6] To avoid the uninteresting case where the multinational has no choice but to take on a local partner, we assume that greenfield investment always yields strictly positive profits.

Due to quasi-linear preferences in the host country, demand is given by the inverse demand function $p = a - bQ$. The marginal cost of a local firm i is $c(\alpha_i) = w - \alpha_i$ with $w - \alpha_i < a$ and $\alpha_i \in [\underline{\alpha}, \overline{\alpha}]$; w denotes the local wage rate, and α stands for the size of the assets and hence productivity. There are n local firms, and each local firm knows each rival's marginal cost. The multinational, however, is not able to observe an individual firm's productivity but can derive the aggregate and average size of assets in this market. This assumption means that the multinational can observe the overall performance of the market but cannot observe individual market shares. The aggregate assets of all local firms are denoted by $A \equiv \sum_n \alpha_i$, and for future convenience we define $\Omega \equiv a - w - A$ and $\Phi_i \equiv \Omega + \alpha_i$.

If the multinational enters the host market through greenfield investment, it has to carry a fixed cost of size F, which can be thought of including the

[6]Whether ownership conveys residual rights of control over assets is of no relevance in our complete contracting framework. . In another paper, we distinguish between joint ventures and acquisitions such that joint ventures do not coordinate outputs. In this paper, we do not consider the merger paradox which arises in case of an acquisition which coordinates outputs. The merger paradox would not change our results substantially. Furthermore, we do not have data on market concentration on an industry level.

cost of gaining market information and establishing a distribution network, that it would otherwise obtain from its joint venture partner. The marginal cost of the multinational producing via a greenfield investment is equal to $c^* = w - \beta$ with $\beta \geq \overline{\alpha}$; hence the multinational is assumed to be more productive than local firms. In the case of greenfield FDI, $n+1$ independent firms are active in the host market, and since the multinational knows the aggregate assets of all local firms, the equilibrium can be derived in the standard Cournot-Nash fashion.[7]

In case of a joint venture with a local firm, the marginal cost of the venture will be equal to $c_v = w - \gamma(\alpha_i + \beta)$ where γ measures the degree of complementarity between assets. For $\gamma < 1$ the multinational's assets and local firms' assets are not perfectly complementary. For $\gamma > 1$, the combined assets are even more valuable than their sum. For the sake of simplicity, we assume that $\Omega - (\gamma - 1)\overline{\alpha} - \gamma\beta + (n+1)\underline{\alpha_j} > 0$ which guarantees that each local firm will continue to produce after the multinational has formed a venture with a competing local firm.[8]

The game we consider has three stages: in the first stage, the multinational makes a proposal to a local firm it has picked randomly. This proposal will specify a menu of contract offers $(T(\alpha), s(\alpha))$ from the multinational to the target firm. In the second stage, the target firm will accept one offer or will reject them all. In case of acceptance, the deal is done as agreed; in case of rejection, the target firm stays independent and the multinational enters the market via greenfield investment. Finally, the active firms then play a Cournot game.

[7]Bergstrom and Varian (1985) show that a Cournot equilibrium depends only on aggregate marginal costs and not on their distribution. The multinational therefore does not have to know the distribution of individual productivities but only the size of aggregate assets when determining its optimal production level.

[8]Permitting market exit would not change our results substantially, but would make the analysis tedious due to possibly discontinuous reaction functions.

3 The Equilibrium Ownership Structure

Our analysis procedes in two steps. First, we examine the multinational's decision under complete information. The ownership structure of a joint venture will be indeterminate in this case. Nevertheless we can establish several useful preliminary results. Second, we derive the equilibrium ownership structure under incomplete information and provide comparative static results.

3.1 Complete Information

Let the case of greenfield investment be denoted by the superscript G. The equilibrium profit levels of the multinational (denoted by an asterisk) and of a local firm i in the case of greenfield investment are respectively equal to

$$\begin{aligned} \Pi^{*G} &= \frac{(\Omega + (n+1)\beta)^2}{b(n+2)^2} - F, \\ \Pi_i^G &= \frac{(\Phi_i - \beta + (n+1)\alpha_i)^2}{b(n+2)^2}. \end{aligned} \tag{1}$$

The assumption that greenfield FDI is always profitable hence is equivalent to $\Pi^{*G} > 0$. We will refer to Π_i^G as the independent profits of a potential partner firm i.

The profits of a joint venture and those of a local firm j that is not part of the joint venture, both denoted by the superscript V, are respectively equal to

$$\begin{aligned} \Pi^{*V} &= \frac{(\Phi_i + n\gamma(\alpha_i + \beta))^2}{b(n+1)^2}, \\ \Pi_j^V &= \frac{(\Phi_i - \gamma(\alpha_i + \beta) + (n+1)\alpha_j)^2}{b(n+1)^2}. \end{aligned} \tag{2}$$

Any combination $(T(\alpha_i), s(\alpha_i))$ that will leave a local firm i of type α_i at least a profit equal to its outside option of refusing the joint venture, namely Π_i^G, will be accepted by this firm. A joint venture with firm i is hence preferred to greenfield investment if

$$\Delta \equiv \Pi^{*V} - \Pi_i^G \geq \Pi^{*G}. \tag{3}$$

The first result characterizes the multinational's preferences over greenfield FDI and joint venture for any level of a target firm's assets:

Lemma 1 *For any possible α_i there exists a critical value of β, such that the multinational prefers greenfield FDI to a joint venture for any β above the critical value.*

Proof: See Result 3 of Raff, Ryan, Stähler (2006).■

Hence a multinational will always choose greenfield FDI, if it has sufficiently many assets. If it does not, it will consider a joint venture. This decision is also affected by host country characteristics, such as market size (measured by parameter b) and wage rate. Taking the derivative of Δ with respect to b and w, we obtain:

Lemma 2 *The multinational is more likely to prefer greenfield FDI to a joint venture the bigger is the host market and, provided that Φ_i is sufficiently big and/or γ is small, the lower is the host wage.*

The next result establishes that in case of a joint venture the multinational would like the target firm to have as many assets as possible, provided that certain conditions hold.

Lemma 3 *Δ increases with α_i, if $\gamma \geq 1$ or $\gamma < 1$ but not too small.*

Proof: Differentiation leads to

$$\frac{\partial \Delta}{\partial \alpha_i} = \frac{2n\gamma((n\gamma(\alpha_i + \beta) + \Phi_i)}{b(n+1)^2} - \frac{2(n+1)((n+1)\alpha_i - \beta + \Phi_i)}{b(n+2)^2}. \tag{4}$$

First, observe that $n/(n+1)^2 > (n+1)/(n+2)^2$. Hence, Δ increases with α_i if

$$\gamma(n\gamma(\alpha_i + \beta) + \Phi_i) > (n+1)\alpha_i - \beta + \Phi_i.$$

This condition is fulfilled for $\gamma \geq 1$ or γ not too small because $\beta \geq \alpha_i$. ■

Lemmas 1 and 2 establish that for a comparison between greenfield investment and joint venture we have to distinguish between three cases:

1. $\Delta(\underline{\alpha}, \beta) \geq \Pi^{*G}$: all targets are profitable,

2. $\Delta(\overline{\alpha}, \beta) \leq \Pi^{*G}$: no target is profitable,

3. $\Delta(\underline{\alpha}, \beta) < \Pi^{*G}$, $\Delta(\overline{\alpha}, \beta) > \Pi^{*G}$: some (high asset) targets are profitable.

Consider now Case 3, and define the critical asset level $\tilde{\alpha}$ such that $\Delta(\tilde{\alpha}, \beta) = \Pi^{*G}(\beta)$. We would like to establish how this critical value changes with β. An increase in β has three effects: (i) it raises the profit from greenfield FDI; (ii) it raises the profit from a joint venture; and (iii) it reduces the transfer that the multinational has to make to the target firm. Obviously we have to introduce further conditions, if we are to say anything about the relative change in these profits. The following result provides sufficient conditions for the critical value to increase with β.

Lemma 4 *$\tilde{\alpha}$ is increasing in β, if β is sufficiently big and γ is not too large.*

Proof: Define the indifference between joint venture and greenfield investment as an implicit function $f(\tilde{\alpha}, \beta) \equiv \Delta(\tilde{\alpha}, \beta) - \Pi^{*G}(\beta)$, such that $d\tilde{\alpha}/d\beta = -f_\beta/f_\alpha$. Due to Lemma 3, $f_\alpha > 0$. Moreover,

$$f_\beta = \frac{2}{b}\left(n\gamma\frac{n\gamma(\tilde{\alpha}+\beta)+\tilde{\Phi})}{(n+1)^2} - \frac{((n+1)^2+1)\beta + n\tilde{\Phi}}{(n+2)^2}\right).$$

$f_\beta < 0$ if

$$\beta\left(\frac{n^2+2n+2}{(n+2)^2} - \frac{n^2\gamma}{(n+1)^2}\right) > \frac{n^2\gamma^2\tilde{\alpha}}{n+1)^2} + \tilde{\Phi}\left(\frac{n\gamma}{(n+1)^2} - \frac{n}{(n+2)^2}\right).$$

This condition holds if γ is not too large and β is sufficiently big. ■

3.2 Incomplete Information

Under incomplete information the multinational will offer a randomly chosen target firm a menu of joint venture offers $(T(\alpha), s(\alpha))$, from which the target firm will pick one.[9] We first use the standard tools of principal-agent theory to characterize the optimal sharing rule and to derive conditions under

[9]For convenience, we drop the subscript in this subsection and use α only.

which there exists a separating equilibrium in which by selecting a contract the target firm reveals its true α. We then derive comparative static results concerning the local firm's ownership share that we can use to inform our empirical analysis.

Consider the accept-or-reject decision of the target firm. The target firm is free to accept any offer it wants to, and by doing so to pretend to be of a certain type which may not be its true type. Let $U(\alpha, \hat{\alpha})$ denote the payoff of a target firm of type α which accepts an offer designed for type $\hat{\alpha}$:

$$U(\alpha, \hat{\alpha}) = T(\hat{\alpha}) + s(\hat{\alpha})\Pi^{*V}(\alpha) - \Pi_i^G(\alpha). \tag{5}$$

Both T and s depend on $\hat{\alpha}$ because the foreign firm cannot observe the target's assets. The independent profits and the cooperative profits, however, depend on the true size of assets. Consider two different target firms with assets α' and α'', respectively. True revelation requires that $U(\alpha', \alpha') \geq U(\alpha', \alpha'')$ and $U(\alpha'', \alpha'') \geq U(\alpha'', \alpha')$ which leads to

$$\begin{aligned} T(\alpha') - T(\alpha'') + \Pi^{*V}(\alpha')(s(\alpha') - s(\alpha'')) &\leq 0, \\ T(\alpha'') - T(\alpha') + \Pi^{*V}(\alpha'')(s(\alpha'') - s(\alpha')) &\leq 0. \end{aligned}$$

Adding up these two inequalities yields

$$(s(\alpha') - s(\alpha''))(\Pi^{*V}(\alpha') - \Pi^{*V}(\alpha'')) \geq 0 \tag{6}$$

which demonstrates that true revelation requires that s increases with α. The intuition is straightforward: a low-asset firm can be prevented from picking an offer designed for a high-asset firm only if the share of ex-post profits is large for the high-asset firm.

True revelation warrants that each type picks the offer which is designed for this type. Under the assumption that U is quasi-concave, this condition requires

$$U_{\hat{\alpha}}(\alpha, \hat{\alpha} = \alpha) = \frac{dT}{d\alpha} + \frac{ds}{d\alpha}(\alpha)\Pi^{*V}(\alpha). \tag{7}$$

Due to the envelope theorem, the change in payoffs with the type is

$$\frac{dU}{d\alpha} = U_\alpha = s(\alpha)\frac{d\Pi^{*V}}{d\alpha} - \frac{d\Pi_i^G}{d\alpha}. \tag{8}$$

The optimal policy of the multinational for those types with which a joint venture is more profitable than a greenfield investment makes target firms indifferent between accepting and rejecting, that is,

$$U(\tilde{\alpha}) = 0, \frac{dU}{d\alpha} = 0, \forall \alpha \in [\tilde{\alpha}, \overline{\alpha}], \tag{9}$$

which implies

$$\forall \alpha \in [\tilde{\alpha}, \overline{\alpha}] : s^*(\alpha) = \frac{\frac{d\Pi_i^G}{d\alpha}}{\frac{d\Pi^{*V}}{d\alpha}} = \frac{(n+1)^3((n+1)\alpha - \beta + \Phi)}{(n+2)^2 n\gamma(n\gamma(\alpha+\beta)+\Phi)}. \tag{10}$$

We can now establish the following result concerning the existence of a separating equilibrium:

Proposition 1 *A separating equilibrium for all types $\alpha \in [\tilde{\alpha}, \overline{\alpha}]$ exists.*

Proof: Expression (10) holds true only if s does not decrease with α. Differentiation yields

$$\frac{\partial s^*}{\partial \alpha} = \frac{(n+1)^3(n\gamma(n+2)\beta + (n+1-n\gamma)\Phi}{n\gamma(n+1)^2(n\gamma(\alpha+\beta)+\Phi)^2} > 0 \tag{11}$$

because $n\gamma(n+2)\beta + (n+1-n\gamma)\Phi = n\gamma(\beta(n+2)-\Phi) + (n-1)\Phi > 0$ as $\beta(n+2) > \Phi$.■

Having characterized the optimal ownership share of the local firm, we may now examine its comparative-static properties. First, consider how the equilibrium ownership share of a local firm of asset size α changes with the size of the multinational's assets. We find that the corresponding derivative is negative:

$$\frac{\partial s^*}{\partial \beta} = -\frac{(n+1)^3(n\gamma(n+2)\alpha + (n\gamma+1)\Phi)}{(n+2)^2 n\gamma(n\gamma(\alpha+\beta)+\Phi)^2} < 0. \tag{12}$$

That is, the more productive is the multinational the lower is the ownership share it leaves to the local firm. The reason for this is that a higher β creates

slack in the incentive compatibility constraint that the multinational can take advantage of by reducing s. This can best be seen in (10), where $d\Pi_i^G/d\alpha$ is decreasing and $d\Pi^{*V}/d\alpha$ is increasing in β so that s can be reduced without creating an incentive for low-asset types to pick the wrong contract.

Second, note that s^* is independent of market size parameter b, but depends on the host wage via Φ. The derivative with respect to Φ is:

$$\frac{\partial s^*}{\partial \Phi} = \frac{(n+1)^3 \left(n\gamma(\beta+\alpha)+\beta-(n+1)\alpha\right)}{(n\gamma(n+2)^2(n\gamma(\beta+\alpha)+\Phi)^2},$$

with the sign depending on the value of γ. If $\gamma > \left((n+1)\alpha-\beta\right)/n(\alpha+\beta)$, the sign is positive and s^* decreases the host wage. These results are summarized in the following Proposition:

Proposition 2 *The local firm's ownership share s^* (i) decreases with the multinational's productivity; (ii) is independent of host market size; and (iii) decreases with the foreign wage, provided that γ is sufficiently big.*

4 Empirical Evidence

Our model predicts that the multinational's productivity affects the decision on whether to share ownership of an overseas affiliate with a local firms and, if yes, how large a stake to retain. The most productive multinationals retain whole ownership for their affiliates. When we do have joint ownership, the multinational's share of ownership is increasing in its own productivity. The role of host market size is less straightforward. According to Lemma 2, the larger the host market the more likely it is that the multinational established a wholly owned subsidiary without a local partner. However, if the multinational takes on a local partner, then its ownership share should be independent of market size. The effect of the host's wage rate is generally ambiguous, and depends on the size of parameter γ. In this section of the paper, we empirically examine these results in two ways: first, we examine productivity differences across different affiliate ownership structures through the use of Kolmogorov-Smirnov stochastic dominance tests; and second, we carry

out a regression analysis with a full set of parent firm-, affiliate-, and host-specific variables to examine how these characteristics affect the ownership share.

Recently, stochastic dominance tests have been used to evaluate TFP differences across parent firm market orientations (domestic, exporters, MNEs),finding that the most productive firms in an industry become MNEs, while less productive firms export their products abroad, and the least productive firms sell only on the domestic market.[10] Here, we examine TFP differences across ownership structures. Stochastic dominance tests work in the following way: suppose we have the cumulative productivity distribution functions of two firm-types (F, S). For F to first-order stochastically dominate S, F(z)-S(z) $\leq$0 for some z $\epsilon\mathbb{R}$. Note that for some z strict equality is possible, enabling firms with identical TFP to choose different affiliate ownership structures (and allowing us to focus on the more robust picture of differences across the two distributions). To test for stochastic dominance, we employ both one-sided and two-sided Kolmogorov-Smirnov (K-S) tests. The null-hypotheses of the one- and two-sided tests are as follows:

$$H_0 \;:\; F(z) - S(z) \leq 0 \;\forall \text{z} \;\epsilon\; \mathbb{R} \;\text{ vs. H}_1\text{:}F(z) - S(z) > 0 \text{ for some } z \;\epsilon\; \mathbb{R}$$

$$\textit{and}$$

$$H_0 \;:\; F(z) - S(z) = 0 \;\forall \text{z} \;\epsilon\; \mathbb{R} \;\text{ vs. H}_1\text{:}F(z) - S(z) \neq 0 \text{ for some } z \;\epsilon\; \mathbb{R}$$

For F to stochastically dominate S, we must both reject the two-sided K-S test's null hypothesis and fail to reject the one-sided K-S test's null hypothesis.

Insert Table 3 about here.

Table 3 provides the results of our K-S tests. The "F=S" column reports the coefficient on the two-sided K-S (equality of the two distributions) test, while the remaining columns report on the one-sided K-S tests indicating F's

[10]See, for instance, Delgado et.al. (2001) and Girma, Kneller and Pisu (2005).

distribution is stochastically dominated by ("S≤F"), or stochastically dominates ("F≤S"), S's distribution. The reported coefficients are the D-statistics, the maximum difference between the two distributions. The D-statistic is measured as F(z) – S(z), so non-negative coefficients are expected when S stochastically dominates F, and negative coefficients when F stochastically dominates S.

K-S tests are pairwise, so to compare parent TFPs across affiliate ownership structures, we must run multiple K-S test. The top part of Table 3 indicates that there exists significant TFP differences between the parent firms of wholly owned subsidiaries, majority-owned JVs, and minority-owned JVs, as our theory would suggest. TFPs drawn from firms establishing wholly owned affiliates stochastically dominate TFPs drawn from firms establishing JVs. When focusing on the different JV types, we find that TFPs drawn from parent firms establishing majority-owned JVs stochastically dominate TFPs from parent firms establishing minority owned JVs. Finally, to complete the analysis, TFP draws for those firms establishing wholly owned subsidiaries stochastically dominate those from firms with minority-owned JVs. Combined, these results suggest a TFP rank ordering of wholly owned subsidiary/majority owned JV/minority owned JV, as is suggested by our theory.

While K-S tests are informative, we are unfortunately limited to analyzing a single firm-specific characteristic in each set of tests. Thus, we turn our attention to more traditional regression analysis to better analyze the choice firms make when establishing their foreign affiliates. Our model indicates that parent firm productivity, host market size, and host wages all play a role in the ownership choice, suggesting the following general empirical specification in regard to the equity ownership of the principal parent:

$$Ownership\_Percentage = f(TFP, Wage, Host\_Characteristics)$$

There are several ways to test our hypotheses. We begin by using a standard Tobit test to determine the equity ownership of the principal parent. A Tobit test is used as we have a bounded ownership percentage, with a 10%

minimum required for the investment to be considered FDI (rather than portfolio investment), and with maximum ownership at 100%. Table 4 contains the results of these tests, with column (1) providing the results of our base regression in which only the parent firm's TFP and the host's wage and GDP are included.[11] TFP is positively related to the parent firm's ownership percentage, while the host's wage negatively affects ownership. The host's GDP has no affect on ownership. However, since a large number of our host countries are in Europe, a host-specific GDP measure might be somewhat misleading, as it may be easy to service the entire EU market from a particular member country. Thus, to better determine production location effects, we replace the host's GDP with an industry-level measure of the host's value added. Column 2 indicates that the host's value added significantly influences the principal parent's ownership share.

In columns (3)-(5), we include several other firm and affiliate characteristics that might be expected to influence FDI decision. In column (3) we find that previous investment into a particular host tends to reduce ownership shares in subsequent investments, suggesting that as firms gain knowledge of the local market they are more likely to share affiliate ownership. In column (4) we add an indicator of affiliate-parent diversity, where the investment takes the value 1 for affiliates established in industries outside of the parent's main industry (at the 2-digit level). The negative and significant coefficient on this variable indicates our firms are more likely to share ownership in affiliates outside their main business line than for those in it, suggesting the necessity to rely on local firm's greater expertise in those markets.[12] This is consistent with our model, specifically with the assumption that local firms have to contribute assets (such as expertise) to the joint venture, but have private information about the value of these assets. Finally, column (5) reveals keiretsu membership does not significantly affect a parent's ownership share. Finally, columns (6)-(8) replicate our Tobit tests for the joint ventures in our sample. Note that our basic results from the complete sample hold for

[11]Data collection and specifications are detailed in the appendix.

[12]While our data provides the name of joint venture partners, data on host-based partners is often quite limited.

this sub-sample.

Insert Table 4 here.

Our above results suggest that the greater the parent firm's TFP, the larger its ownership share, even among JVs. Using this result, we next examine ownership choice in a slightly different manner by focusing on the ownership percentage indirectly. Firms are allowed not only to choose between a wholly owned affiliate and a joint venture but, in regard to joint ventures, the type of joint venture they want to establish. We thus suggest four different types of affiliate ownership structures in this setting: a wholly owned subsidiary (in which the principal parent owns at least 95% of the firm),[13] and three joint venture types: a majority-owned JV ($MajJV$), a 50-50 split ($50/50$), and a minority-owned JV ($MinJV$). Table 5 provides the results of multinomial logit regression analysis, where the base case for analysis is the wholly owned subsidiary category. In these results, a positive (negative) coefficient estimate suggests a greater (lower) likelihood of selection than in the base case.

Insert Table 5 here.

Given that we have ordered these categories by decreasing level of ownership of the parent firm, it is not surprising that our multinomial logit results mimic our Tobit estimation. TFP is significantly lower in our majority and minority-owned joint ventures than in the wholly owned affiliates, although this is not the case for the 50-50 split JVs. Host country wage rates tended to be higher in each of our JV categories than for wholly owned investments, although it is only in the minority-owned JVs where wage rates were (statistically) significantly higher than for the wholly owned affiliates. Note also that joint ventures tend to occur in host's with lower industry-level valued added, which is especially evident in the minority-owned affiliates. Both the wage and market size effect are consistent with Lemma 2. Even more notable was affiliate diversity, which was significantly more likely to occur in

[13]This is a standard cutoff, and lowering this cutoff to 90% does not significantly affect our results.

the minority-owned joint ventures than in wholly owned firms, a result not seen for the majority-owned and 50-50 split affiliates. This suggests that our Japanese firms were willing to take minority ownership stakes in affiliates located outside of their main business line. Finally, keiretsu membership does not appear to affect affiliate ownership structure.

5 Conclusions

This paper examined a multinational's choice of ownership structure for its foreign affiliate, and linked this choice to the multinational's productivity as well as to host country characteristics. Ownership is shared with a local partner if the latter has (i) potentially valuable assets to contribute to the investment project, and (ii) private information about the value of these assets. Shared ownership in this case acts as a screening mechanism to separate those local firms with valuable assets from those with less valuable assets. The model predicted that in equilibrium the multinational's ownership share is increasing in the value of its own productive assets, with the most productive multinationals always choosing whole ownership. We tested this prediction using Japanese firm-level data, and found that it was consistent with the ownership choices of Japanese multinationals.

There several potentially fruitful avenues for future research. First, it would be interesting to find a way to distinguish empirically between our explanation for shared ownership and alternative explanations. Second, as indicated in the introduction, there appears to be a significant difference in the incidence of joint ventures between Japanese firms and US firms. Whereas only 20% of all US foreign affiliates are under shared ownership, even less in manufacturing, shared ownership seems much more common for Japanese firms. In our sample 42% of the foreign affiliates established by Japanese manufacturers were joint ventures. What accounts for these differences?

Appendix

- Japanese FDI data was compiled from several issues of Toyo Keizai Inc.'s *Japanese Overseas Investment: A complete listing by firms and countries*. The countries included in this sample are Australia, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, the Netherlands, New Zealand, Poland, Portugal, Spain, Sweden, Switzerland, and the UK.

- Firm-level financial data is found in the Pacific Basin Capital Markets database. Gross revenue is calculated as sales divided by total assets, while interest burden is calculated as interest payments divided by sales, and cash flow is calculated as (gross profit-income tax payments +depreciation charges) divided by total assets. Keiretsu membership is determined through data located in Dodwell Marketing's *Industrial Groupings in Japan*.

- Host GDP (1995 US$) was found in the World Bank's *World Development Indicators* CD-ROM. Industry-level value added (constant US$) is found in the OECD's STAN database. Wage data (constant US$) comes from the U.S. Bureau of Labor Statistics. Conversions to US$, when necessary, use exchange rates provided by the IMF's *International Financial Statistics* CD-ROM.

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Table 1: Equity Ownership Characteristics of Principal Investor Across Joint Ventures Arrangements

	Other Japanese Firm	Prev. Estab. Affiliate	Local Firm	Local Firm*
Mean	60.63	68.07	45.97	44.07
Std. Dev.	(17.41)	(20.37)	(20.30)	(21.38)

* Main parent is Previously Established Foreign Affiliate.

Table 2: Tests of Equity Ownership Percentages in Japanese Foreign Affiliates

	Full Sample		Joint Ventures	
	OLS	Tobit	OLS	Tobit
Total Factor Productivity	2.388^b	2.350^b	1.175^b	1.174^b
	(1.061)	(0.956)	(0.651)	(0.640)
Gross Revenue	13.339	13.508	11.010	11.012
	(8.115)	(8.946)	(6.877)	(6.809)
Cash Flow	19.548	18.373	27.539	27.529
	(30.551)	(29.860)	(17.659)	(17.415)
Interest Burden	279.116	275.438	228.499	228.485
	(184.558)	(181.405)	(132.869)	(132.447)
Prev. Investment into Country	-1.158	-1.198	1.910	1.909
	(1.727)	(1.719)	(1.896)	(1.870)
No. of Observations	586	586	298	298
F-Test or LR-test	5.83	27.22	3.36	19.90
Prob > F or Prob > χ^2	0.016	0.001	0.003	0.003
Adj R^2 or Pseudo R^2	0.1259	0.108	0.153	0.148

Standard Deviations in parenthesis. a,b,c -significant at the 1%,5%, and 10% levels.

Table 3: Kolmogorov-Smirnov Tests of Principal Investor's TFP Across Ownership Arrangements

Comparison Group (F vs. S)	F=S	$F \leq S$	$S \leq F$
Wholly Owned Subsidiaries vs. JVs	0.1339^a	0.1339^a	-0.0002
Majority- vs. Minority-Owned JVs	0.1602^c	0.1602^c	-0.0526
Wholly Owned vs. Minority JVs	0.2026^a	0.2026^a	-0.0000

a,b,c -significant at the 1%,5%, and 10% levels, respectively.

Table 4: Tobit Tests on Equity Ownership Percentages in Japanese Foreign Affiliates

	Full Sample					Joint Ventures Only		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Total Factor Productivity	2.052^b	1.886^b	1.905^b	1.637^c	1.497^c	0.264^c	0.262^c	0.332^c
Host Wage	-0.747^c	-0.882^b	-0.868^b	-0.892^b	-0.864^b	-0.440^c	-0.438^c	-0.432^c
Host GDP	1.29	..	..	..	..	..		..
Host Value Added	..	0.327^c	0.383^c	0.378^c	0.364^c	0.280^c	0.280^c	0.274^c
Previous Investment	..	..	-2.682^b	-1.564^c	-1.425^c		-1.140^c	-1.212^c
Affiliate Diversity	..	..	..	-12.755^a	-13.115^a		-7.131^a	-7.234^a
Keiretsu Membership					-4.570		..	-1.751
Host/Industry/Time Dummy	YES	YES	YES	YES	YES	YES	YES	YES
No. of Observations	1010	1010	1010	1010	1010	452	452	452
LR-test	11.23	9.46	11.57	15.58	16.30	10.69	11.50	11.81
Prob $> \chi^2$	0.011	0.024	0.041	0.008	0.012	0.054	0.042	0.047
Pseudo R^2	0.094	0.104	0.164	0.189	0.192	0.114	0.163	0.166

a,b,c - Significant at the 1%, 5%, and 10%-levels, respectively. a,b,c - Significant at

Table 5: Multinomial Logit Tests of Equity Ownership Percentages in Japanese Foreign Affiliates

	(1)			(2)			(3)		
	MajJV	50/50	MinJV	MajJV	50/50	MinJV	MajJV	50/50	MinJV
Total Factor Productivity	-0.070^{c}	-0.077	-0.100^{c}	-0.063^{c}	-0.071	-0.086^{c}	-0.057^{c}	-0.062	-0.085^{c}
Host Wage	0.007	0.036	0.046^{b}	0.006	0.034	0.048^{b}	0.005	0.032	0.048^{b}
Host Value Added	-0.012	-0.016	-0.034^{b}	-0.001	-0.019	-0.036^{b}	-0.010	0.019	-0.036^{b}
Previous Investment	.	.	.	0.149	0.257	-0.093	0.145	0.253	-0.094
Affiliate Diversity	.	.	.	0.168	-0.053	0.727^{a}	0.182	-0.028	0.730^{a}
Keiretsu Membership	.	.	.	.	.	.	0.164	0.258	0.032
Host/Industry/Time Dummy		YES			YES			YES	
No. of Observations		464			464			464	
LR-test		15.47			25.00			25.60	
Prob > F or Prob > χ^2		0.079			0.050			0.046	
Adj R^2 or Pseudo R^2		0.115			0.136			0.142	

the 1%, 5%, and 10%-levels, respectively. Base category is wholly owned affilates.

Table 6: T-Tests For Equality Across Joint Venture Arrangements

Identity of Principal Partner	T-stat[1]	p-Value
Other Japanese vs. Overseas Affiliate	-1.938	0.058
Other Japanese vs. Local Firm	6.663	0.000
Other Japanese vs. Local Firm*	3.117	0.005
Overseas Affiliate vs. Local Firm	5.941	0.000
Overseas Affiliate vs. Local Firm*	3.933	0.000
Local Firm vs. Local Firm*	0.364	0.720
Keiretsu Member vs Non-Keiretsu Member	2.366	0.019

[1]-Test of H_0: Mean of first group equal to mean of second group, against H_a: mean of first group smaller than mean of second group. * -Main parent is Previously Established Foreign Affiliate.