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

How the ownership of productive assets should be allocated is a central issue in the theory of the firm.[1] It is also one of the key issues multinationals have to deal with when setting up a foreign affiliate. Multinationals often 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 local company, or through a joint venture or another form of alliance that leads to the creation of a new business enterprise. We do not focus on the exact process by which shared ownership is established, but rather on possible reasons why ownership is shared. Throughout the paper, we will use the terms shared ownership and joint venture interchangeably.

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.

Shared ownership is an empirically important phenomenon. In our data

[1] See, for instance, the seminal papers by Grossman and Hart (1986), and Hart and Moore (1990).

on Japanese manufacturers, a sample of 1228 investments into manufacturing affiliates located in 20 OECD countries that did not impose local ownership requirements at the time of investment, some 58% of investments were wholly owned, while 42% involved shared ownership.[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 affiliate when in partnership with another Japanese firm (and slightly more than this when the main partner is a member of the same keiretsu). In addition, basic OLS and Tobit regression analysis (see Table 2) suggests that a firm's financial situation, as indicated by its gross revenue, cash flow, and interest burden, has no significant effect on its ownership share.[3]

< Insert Tables 1 and 2 about here >

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

[2]Authors' calculation. See Appendix A.5 for information on the dataset.

[3]While this in contrast to the Klein, Peek and Rosengren (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 their ownership structure.

incomplete information about the value of the local firm's assets. Specifically only a local firm knows how much its assets are worth. We show that this adverse selection problem 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.

Is there evidence that shared ownership of foreign affiliates is a response to adverse selection? Several pieces of evidence suggest that this is indeed the case. First, there is considerable evidence that adverse selection is an important factor in shaping foreign investment decisions (see, for instance, Gordon and Bovenberg, 1996, and Qiu and Zhou, 2006). Second, more than half of all acquisitions of private companies, where adverse selection is a much more severe problem than in the case of publicly traded companies, involve so-called earn-outs (Real Business, 2007). Earn-outs are deals in which part of the purchase price is paid ex post, contingent on specified levels of the seller's performance, typically sales or earnings. The seller retains a stake in the company and hence in ex-post profits for a specified time, possibly forever. Such earn-outs are designed specifically to deal with situations where the value of the acquisition target is private information. This is also confirmed by the fact that earn-outs are popular when entering new geographic markets and in industries, such as information technology, where company values are especially difficult to determine (Harris, 2002).

Given this background, our modelling approach derives a set of contracts offered by a foreign firm to a potential target firm whose productivity is private information.[4] Based on the model results, we are able to derive testable

[4]This approach is similar to Stähler (2005) who uses it to study cross-border mergers but does not consider an outside option of the multinational. Note that our model also differs from the standard adverse selection literature, since the target firm's outside option depends on its type. For a general discussion of this kind of adverse selection models, see Jullien (2000).

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 productivity. This prediction is confirmed in our empirical analysis.

We see our model as a complement to other approaches of explaining shared ownership. 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 Nakamura 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.[5] The ownership share of the multinational then reflects the bargaining power of the two parties. Related explanations of partial ownership of foreign affiliates that are driven by the implicit 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.[6]

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

[5]Note that earn-outs also help to solve such moral hazard problems, because they give the seller an incentive ex post to stay with the company and to maximize profit (Herrman, 2003).

[6]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).

without seeking a local partner. In Section 4 we confront the predictions of the model with our Japanese firm-level data. Section 5 concludes. An Appendix contains proofs, data sources and tables.

2 A Model of Shared Ownership

We consider a multinational enterprise that has to decide how to establish an affiliate 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 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.[7] 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

[7]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; see Raff, Ryan and Stähler (2007). In the paper here, 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.

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 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 $c^* = w - \beta > 0$ with $\beta \geq \overline{\alpha}$; hence the multinational is assumed to be more productive than local firms. In the case of greenfield investment, $n+1$ 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.[8]

In case of a joint venture with a local firm, the marginal cost of the venture will be equal to $c_v = w - \gamma(\alpha_i + \beta) > 0$, 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 $\Omega - (\gamma - 1)\overline{\alpha} - \gamma\beta + (n+1)\underline{\alpha} > 0$ which guarantees that each local firm will continue to produce after the multinational has formed a venture with a competing local firm.[9]

We assume that one local firm is willing to form a joint venture with the multinational. The game we consider has three stages: in the first stage, the

[8]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.

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

multinational makes a proposal to the local firm. 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.

3 The Equilibrium Ownership Structure

Our analysis proceeds 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 Appendix A.1.

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.*

Proof: See Appendix A.2.

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: See Appendix A.3.

Lemmas 1 and 3 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: See Appendix A.4.

Lemma 4 shows that the first effect, that is raising the profit from greenfield FDI, dominates the other two effects if the multinational is already sufficiently productive and the gains from forming a joint venture are not too large. In this case, an increase in the multinational's productivity requires a higher productivity of the target firm in order to keep the joint venture attractive for the multinational.

3.2 Incomplete Information

Under incomplete information the multinational will offer a menu of joint venture offers $(T(\alpha), s(\alpha))$, from which the target firm will pick one.[10] We

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

first use the standard tools of principal-agent theory to characterize the optimal sharing rule and to derive conditions under which there exists a fully 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 $\hat{\alpha}$:

$$U(\alpha, \hat{\alpha}) = T(\hat{\alpha}) + s(\hat{\alpha})\Pi^{*V}(\alpha) - \Pi_i^G(\alpha). \tag{4}$$

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

$$(s(\alpha') - s(\alpha''))(\Pi^{*V}(\alpha') - \Pi^{*V}(\alpha'')) \geq 0 \tag{5}$$

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 requires that each type picks the offer which is designed for this type. That is,

$$U_{\hat{\alpha}}(\alpha, \hat{\alpha} = \alpha) = \frac{dT}{d\alpha} + \frac{ds}{d\alpha}(\alpha)\Pi^{*V}(\alpha) = 0. \tag{6}$$

Using this condition, we find that payoffs change with the type as follows:

$$\frac{dU}{d\alpha} = U_\alpha = s(\alpha)\frac{d\Pi^{*V}}{d\alpha} - \frac{d\Pi_i^G}{d\alpha}. \tag{7}$$

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

$$U(\tilde{\alpha}) = 0, \frac{dU}{d\alpha} = 0, \forall \alpha \in [\tilde{\alpha}, \overline{\alpha}], \tag{8}$$

which implies

$$\forall \alpha \in [\tilde{\alpha}, \overline{\alpha}] : s^*(\alpha, \beta, \Phi) = \frac{\frac{d\Pi_i^G}{d\alpha}}{\frac{d\Pi^{*V}}{d\alpha}} = \frac{(n+1)^3((n+1)\alpha - \beta + \Phi)}{(n+2)^2 n\gamma(n\gamma(\alpha+\beta)+\Phi)}. \tag{9}$$

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

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

Proof: Expression (9) holds true only if s does not decrease with α. Differentiation yields

$$\frac{\partial s^*}{\partial \alpha} = \frac{(n+1)^3(n\gamma(n+2)\beta + (n+1-n\gamma)\Phi}{n\gamma(n+1)^2(n\gamma(\alpha+\beta)+\Phi)^2} > 0 \tag{10}$$

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:

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

That is, the more productive is the multinational, the lower is the ownership share it leaves to the local firm. The reason for this can best be seen in (9): a higher β raises the joint venture profit, Π^{*V}, and reduces the profit of an independent local firm if the multinational chooses greenfield FDI, Π_i^G. Hence the multinational is able to reduce s without deterring the local firm.

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 negative and s^* increases with 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) increases with the host wage, provided that γ is sufficiently small.*

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 leave to the local partner. The most productive multinationals retain whole ownership for their affiliates. When we do have joint ownership, the local firm's ownership share is decreasing in the multinational's 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 greenfield subsidiary without a local partner. However, if the multinational takes on a local partner, then the ownership share should be independent of market size. The effect of the host's wage rate is ambiguous as it depends on the size of γ, which we do not observe.

We examine these results in two ways: first, we carry out Kolmogorov-Smirnov (K-S) stochastic dominance tests to investigate whether there are statistically significant differences in the productivity distributions of parent

companies depending on their choice of affiliate ownership structure.[11] Second, we carry out regression analysis with a full set of parent firm-, affiliate-, and host-specific variables to examine how these characteristics affect the local partner's ownership share.

Table 3 provides the results of our K-S tests concerning differences in the TFP distribution of parents across ownership structures.

< Insert Table 3 about here >

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 distribution stochastically dominates ("$F \leq S$ "), or is stochastically dominated by S's distribution ("$S \leq F$ ") (see Appendix A.6 for details on how these tests were implemented). The reported coefficients are the D-statistics, the maximum difference between the two distributions. The D-statistic is measured as $S(z) - F(z)$, so non-negative coefficients are expected when F stochastically dominates S, and negative coefficients when S stochastically dominates F. K-S tests are pairwise, so to compare parent TFPs across affiliate ownership structures, we must run multiple K-S tests. Results from the two-sided tests indicate the presence of significant TFP differences between the parent firms of greenfield subsidiaries, majority-owned JVs, and minority-owned JVs. In addition, the one-sided test results reveal TFPs drawn from firms establishing greenfield affiliates stochastically dominate TFPs drawn from firms establishing both majority- and minority-owned 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. Combined, these results suggest a rank ordering (by decreasing TFP of

[11] Recently, stochastic dominance tests have been used to evaluate TFP differences across firms selling only domestically, firms that also export, and multinational firms. These tests show that the most productive firms in an industry are multinationals, while less productive firms export their products abroad, and the least productive firms sell only on the domestic market. See, for instance, Delgado, Farinas and Ruano (2001) and Girma, Kneller and Pisu (2005).

the parent) of greenfield 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 ownership choices firms make when establishing their foreign affiliates. Our theoretical model suggests that a firm has to make two decisions, namely to choose between greenfield investment and joint venture and, in case of a joint venture, to determine what ownership share to leave to the local partner.

We first analyze the determinants of the local firm's ownership share within joint venture affiliates. In the first set of empirical tests (Table 4), we use the local firm's ownership share as the dependent variable. Given that the Japanese multinational has to own at least a 10% share of the affiliate in order for the investment to be classified as FDI (rather than portfolio investment), and for joint ventures is limited to a 95% share, the local partner's ownership share is bounded between 5% and 90%.[12] As such, a Tobit specification is employed to examine the local firm's ownership share. We follow Smith and Blundell (1986) in using a two-stage instrumental variables Tobit technique in order to deal with potential endogeneity problems within our data, especially in regard to TFP. In the first stage, we generate residual terms from linear regressions of the possibly endogenous regressors on their instruments and the other exogenous regressors. For the second stage, we estimate a standard Tobit model, including the residuals from the first step. We use one-year lagged values of TFP, Host Wage, Host Size, and Keiretsu membership as the instruments, which provides the additional benefit of controlling for the time period between the FDI decision and affiliate establishment.

< Insert Table 4 about here >

Columns (1) and (2) of Table 4 provide the results of our base regression, in which only the parent firm's TFP and the host's wage are included.[13]

[12]The 95% cutoff to determine a wholly owned affiliate is standard; lowering this cutoff to 90% does not significantly affect our results.

[13]Data collection and specifications are detailed in Appendix A.5.

The negative coefficient on TFP indicates that an increase in the TFP of the Japanese parent reduces the ownership share of the local partner, as predicted by our model. We also find that an increase in the host's industry-level average wage rate leads to a lower ownership share of the partner.[14]

In columns (3)-(5), we include several other firm and affiliate characteristics that might be expected to influence the ownership share decision. In column (3) we find that previous investment into a particular host by the Japanese parent tends to increase the ownership share of the partner firm. 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 positive and significant coefficient on the diversity variable indicates that multinationals are more likely to leave a larger ownership share to the local partner in affiliates located outside their main business line than for those in it, suggesting the necessity to rely on local firm's greater expertise in those markets.[15] 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. Column (5) reveals that keiretsu membership of the parent does not significantly affect ownership share. Finally, we include a measure of host GDP (column 6) to confirm our theoretical result indicating that the ownership share is independent of host market size. Our results in column (6) use a host's industry-level value added as the measure of market size, and we find that this indeed does not affect the partner's ownership share. Similar results are found (although not reported) when we use the host's GDP as the market size measure.

While the above results suggest that greater parent firm TFP leads to a lower local ownership share, a potential selection bias exists in the fact that we are (in this case) only examining the TFP of Japanese firms that select joint ventures. As a result, columns (6) and (7) provide the results of a

[14]This would be consistent with our model for high levels of γ. However, we might also pick up the effect that if wages are high because of high labor productivity, Japanese firms might want to own a larger share of the affiliate.

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

Heckman (1979) two-step test, which control for the parent firm's likelihood of selecting a joint venture. Specifically, the first stage uses a probit model to examine the firm's ownership "choice", where the dependent variable equals 1 if the firm chooses a joint venture, and 0 otherwise. Using the parameter estimates from this first step, we are able to calculate the Inverse Mills Ratio, which is used as a regressor in the second stage Tobit estimation, in which the local firm's "share" is determined. The results from the second stage of the Heckman estimation reveal similar results to our two-stage Tobit estimation; however, the insignificant Inverse Mills Ratio suggests that selection bias is not a problem, and that the use of the two-stage Tobit is appropriate.

As our above Tobit models estimate a linear relationship between ownership share and the independent variables, it is useful to confirm the robustness of these results to other model specifications. One such method is to focus on the type of joint venture formed by the Japanese parent, which captures indirectly the ownership share of the partner firm. In regard to joint venture formation, we allow the Japanese firm to choose between three forms of joint ventures: a majority-owned JV ($MajJV$), where the Japanese parent owns between 50.1% and 95% of the affiliate (leaving between 5% and 49.9% for its partner); an equal partnership joint venture, where each firm owns 50% of the affiliate ($50/50$); and a minority-owned JV ($MinJV$), where the Japanese firm owns between 10% and 49.9% of the affiliate. Table 5 provides the results of multinomial logit (MNL) regression analysis, where the base case for the analysis is the majority-owned JV; that is, a positive (negative) coefficient estimate suggests a greater (lower) likelihood of selection as compared to a majority-owned JV.

< Insert Table 5 about here >

Given that these categories are ordered by decreasing level of Japanese parental ownership, it is not surprising that our multinomial logit results mimic our Tobit estimation results. A Japanese parent's TFP is significantly lower in the 50/50 split and minority-owned joint ventures than in the majority-owned affiliates, with a more significant difference between majority- and minority-owned affiliates than between majority-owned and

50/50 split affiliates. Host country wage rates only slightly lower the likelihood of a 50/50 split affiliate as compared to a majority-owned JV, but more significantly affect the choice of minority-owned JVs. Thus, the higher the wage rate, the more likely the firm chooses a majority-owned JV. Finally, the effects of our other aforementioned control variables (previous investment, affiliate diversity, keiretsu membership, and host size results) are confirmed in the MNL framework.

Having examined the choice of ownership shares within joint venture affiliates, we next turn our attention to the greenfield-joint venture decision made by the Japanese multinational. That is, we do not consider the ownership share given to the partner firm, but rather whether the Japanese MNE takes a partner at all. Our theory suggests that TFP and host market size will positively affect the choice of establishing a greenfield investment, while the effect of the host's wage is indeterminate. In Table 6 we examine the firm's choice of ownership structure via a binomial logit model, where the base case is greenfield investment. Thus, positive (negative) coefficients suggest a greater (lesser) likelihood of establishing a greenfield affiliate.

< Insert Table 6 about here >

Columns (1)-(3) highlight the estimation results from our base theoretical framework, while columns (4)-(6) add the other firm- and affiliate-specific characteristics. For our base framework, we find robust support for the notion that a Japanese parent's TFP and a host's industry-level value added positively affect greenfield investment selection. Higher host-specific industry-level wages tend to increase joint venture selection. Combined with our previous results, it appears that higher host wages lead to a greater likelihood of majority-owned JVs as compared to the other forms of potential ownership structures. We do find that previous investment increases joint venture selection, as does affiliate diversity, which is consistent with our theory. We also find that keiretsu membership of the parent has no statistical affect on ownership structure.

5 Conclusions

This paper argued that multinationals tend to share ownership of foreign affiliates 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, controlling for the host country's market size and wage costs, 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.

How ownership of a foreign affiliate is allocated between a multinational and a local company obviously has implications for the host country's social welfare. A direct effect comes from the sharing of profits and technology between the multinational and the local firm. Indirect effects arise because ownership influences investors' incentives to commit technological and management resources to the project. An examination of these effects is beyond the scope of the current paper. However, to the extent that a multinational firm has a say in the ownership decision and is not simply forced to take on a local partner, our model might serve as a building block of such an analysis.

Appendix

A.1 Proof of Lemma 1

The multinational prefers greenfield FDI to a joint venture if $\Pi^{*G}+\Pi_i^G \geq \Pi^{*V}$, or

$$\frac{(\Phi_i - \alpha_i + (n+1)\beta)^2}{b(n+2)^2} + \frac{(\Phi_i - \beta + (n+1)\alpha_i)^2}{b(n+2)^2} - F \geq \frac{(\Phi_i + n\gamma(\alpha_i + \beta))^2}{b(n+1)^2}. \tag{A.1}$$

Consider the multinational's indifference curve between greenfield FDI and joint venture with β on the horizontal axis and α_i on the vertical axis. This

curve must lie everywhere on or below a line with a slope of -1. To see this, suppose we increase β and reduce α_i by the same amount, i.e., $d\beta = -d\alpha_i$. This leaves the right-hand side of (A.1) unchanged. To keep the left-hand side unchanged we require

$$\frac{d\alpha_i}{d\beta} = -\frac{n\Phi_i + (n^2+2n+2)\beta - 2(n+1)\alpha_i}{n\Phi_i + (n^2+2n+2)\alpha_i - 2(n+1)\beta}. \tag{A.2}$$

Note that if $\beta = \alpha_i$, then $\frac{d\alpha_i}{d\beta} = -1$. If $\beta > \alpha_i$, then the numerator of (A.2) is positive and $\left|\frac{d\alpha_i}{d\beta}\right| > 1$. Hence starting at $\beta = \alpha_i$ and increasing β by increments $d\beta$ means that α_i has to fall by more than $d\beta$ to keep the left-hand side of (A.1) constant. As one continues to raise β, the denominator of (A.2) may become negative; this implies that the line representing the combinations of β and α_i for which the left-hand side of (A.1) stays constant first becomes vertical and then bends backward so that both β and α_i have to fall to keep the left-hand side of (A.1) the same. The indifference curve between greenfield investment and joint venture must have a slope that lies between -1 (the value that keeps the right-hand side of (A.1) unchanged) and (A.2). Hence greenfield FDI is preferred if β is sufficiently big.

A.2 Proof of Lemma 2

Consider (A.1). An increase in market size (lower b) makes greenfield FDI more attractive as does a lower F and a smaller γ. The impact of a reduction in the wage (higher Φ_i) is ambiguous. In particular, we have

$$sign\left\{\frac{\partial(\Pi^{*G} + \Pi_i^G - \Pi^{*V})}{\partial\Phi_i}\right\} =$$
$$sign\left\{((n+1)^2 - 2(n+1) - 1)\Phi_1 + n(\alpha_i+\beta)((n+1)^2 - \gamma(n+2)^2)\right\}.$$

The derivative is positive if Φ_i is sufficiently large and/or γ is small; in this case, a reduction in the wage makes greenfield investment more likely relative to a joint venture.

A.3 Proof of Lemma 3

Differentiation leads to

$$\frac{\partial \Delta}{\partial \alpha_i} = \frac{2n\gamma((n\gamma(\alpha_i+\beta)+\Phi_i)}{b(n+1)^2} - \frac{2(n+1)((n+1)\alpha_i-\beta+\Phi_i)}{b(n+2)^2}. \qquad \text{(A.3)}$$

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 $\beta \geq \alpha_i$.

A.4 Proof of Lemma 4

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.

A.5 Data Sources

- Japanese outward FDI data for the period 1985-2001 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. This dataset provides the equity ownership share of the Japanese parent as well as for any local partner firm.

- Firm-level financial data is found in the Pacific Basin Capital Markets (PACAP) 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*. All data is collected for the year prior to each investment.

- Host GDP (constant 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.

- TFP values are computed for each parent firm for the year prior to each investment, using the firm's financial data found in the PACAP database. Given our data availability, and the number of zero observations in the firms' investment data, we employ the Levinsohn-Petrin (2003) method in STATA to calculate the firms' TFP values. The Levinsohn-Petrin estimation technique to determine TFP corrects for the simultaneity bias that may arise when productivity can be observed by the firm but not the econometrician.

A.6 Kolmogorov-Smirnov Test

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, we require $F(z) - S(z) \leq 0$ for some $z \in \mathbb{R}$. 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:

$$H_0{:}F(z) - S(z) \leq 0 \ \forall \text{z} \ \epsilon \ \mathbb{R} \quad \text{vs.} \quad H_1{:}F(z) - S(z) > 0 \text{ for some } z \ \epsilon \ \mathbb{R}$$

and

$$H_0{:}F(z) - S(z) = 0 \ \forall \text{z} \ \epsilon \ \mathbb{R} \quad \text{vs.} \quad H_1{:}F(z) - S(z) \neq 0 \text{ for some } z \ \epsilon \ \mathbb{R}$$

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.

A.7 Tables

Table 1: Equity Ownership Shares of Principal Japanese Investors

	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	5.83	27.22	3.36	19.90
Prob > F	0.016	0.001	0.003	0.003
Adj 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

Comparison Group (F vs. S)	$F = S$	$F \leq S$	$S \leq F$
Greenfield vs. All JVs	0.1339^a	0.1339^a	-0.0002
Greenfield vs. Majority JVs	0.1206^c	0.1206^c	-0.0061
Greenfield vs. Minority JVs	0.2026^a	0.2026^a	-0.0000
Majority JVs vs. Minority JVs	0.1602^c	0.1602^c	-0.0526

Note: a,b,c – significant at the 1%,5%, and 10% levels, respectively.

Table 4: Joint Ventures and the Local Partner's Ownership Share

	Two -Stage Tobit Models						Heckman 2-Stage	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Total Factor Productivity	-1.183^c	-1.176^c	-1.176	-1.176^c	-1.165^c	-1.164^c	-1.325^b	-1.311^b
	(0.079)	(0.083)	(0.083)	(0.083)	(0.089)	(0.090)	(0.061)	(0.058)
Host Wage	.	-0.282^c	-0.280^c	-0.280^c	-0.277^c	-0.277^c	-0.329^c	-0.307^c
		(0.092)	(0.094)	(0.094)	(0.097)	(0.097)	(0.089)	(0.078)
Previous Investment	.	.	0.892^c	0.892^c	0.892^c	0.891^c	.	0.941^b
			(0.095)	(0.095)	(0.094)	(0.094)		(0.078)
Affiliate Diversity	.	.	.	0.761^b	0.753^b	0.749^b	.	0.772^b
				(0.043)	(0.045)	(0.046)		(0.041)
Keiretsu Membership	.	.	.	.	3.164	3.159	.	2.675
					(0.542)	(0.544)		(0.578)
Host Size	.	.	.	.	.	0.154	.	0.112
						(0.964)		(0.978)
Inverse Mills Ratio	.	.	.	.	.	.	0.236	0.211
							(0.143)	(0.141)
Host/Industry/Time Dummy	YES	YES	YES	YES	YES	YES	YES	YES
No. of Observations	464	464	464	464	464	464	464	464
LR-test	11.38	11.48	11.54	11.68	12.01	12.04	11.67	12.11
Prob > χ^2	0.051	0.048	0.039	0.031	0.026	0.026	0.044	0.024
Pseudo R^2	0.105	0.110	0.115	0.119	0.121	0.122	0.114	0.125

Note: a,b,c – significant at the 1%,5%, and 10% levels, respectively. Heckman results are from second stage.

Table 5: Multinomial Logit Tests of Affiliate Ownership Choice

	(Base case is Majority Owned JV)									
	50/50	MinJV	50/50	MinJV	50/50	MinJV	50/50	MinJV	50/50	MinJV
Total Factor Productivity	-0.073^c	-0.096^b	-0.072^c	-0.094^b	-0.071^c	-0.090^b	-0.069^c	-0.085^b	-0.069^c	-0.085^b
Host Wage	.		-0.032^c	-0.047^b	-0.032^c	-0.047^b	-0.031^c	-0.047^b	-0.031^c	-0.047^b
Previous Investment	.	.	.	.	0.157^c	0.395^b	0.153^c	0.394^b	0.153^c	0.394^b
Affiliate Diversity	.	.	.	.	.	.	0.148^c	0.730^a	0.148^c	0.730^a
Keiretsu Membership	.	.	.	.	.	.	0.258	0.032	0.258	0.032
Host Size	.	.	.	.	.	.	.	.	0.157	0.117
Host/Industry/Time Dummy	.	.	YES		YES		YES		YES	
No. of Observations	464		464		464		464		464	
LR-test	11.12		11.61		11.74		12.21		12.60	
Prob > F or Prob > χ^2	0.091		0.082		0.079		0.048		0.047	
Pseudo R^2	0.101		0.109		0.115		0.136		0.137	

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

Table 6: The Affiliate Ownership Choice

	(1)	(2)	(3)	(4)	(5)	(6)
Total Factor Productivity	0.086^b	0.085^b	0.083^b	0.083^b	0.079^b	0.078^c
Host Wage	.	-0.018^c	-0.018^c	-0.017^c	-0.016^c	-0.013^c
Host Size	.	.	0.017^c	0.016^c	0.016^c	0.015^c
Previous Investment	.	.	.	-0.081^c	-0.079^c	-0.079^c
Affiliate Diversity	.	.	.	.	-0.317^c	-0.317^c
Keiretsu Membership	.	.	.	.	.	-0.177
Host/Industry/Time Dummy	YES	YES	YES	YES	YES	YES
No. of Observations	1010	1010	1010	1010	1010	1010
LR-test	9.28	9.31	9.34	9.42	9.51	9.52
Prob > F or Prob > χ^2	0.032	0.029	0.027	0.024	0.023	0.023
Pseudo R^2	0.114	0.117	0.121	0.124	0.127	0.128

Note: Logit specification (1=greenfield; 0= JV). a,b,c – significant at the 1%, 5%, and 10%-levels, respectively.

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