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by Horst Raff, Michael Ryan and
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JEL classification: F23; L20

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Whole versus Shared Ownership of Foreign Affiliates[1]

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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.

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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. 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 of foreign affiliates is an empirically important phenomenon. In our data on Japanese manufacturers, a sample of 1512 invest-

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

ments into manufacturing affiliates located in 22 OECD countries that did not impose local ownership requirements at the time of investment, some 55% of investments were wholly owned, while 45% involved shared ownership.[2] Of these joint ventures, nearly half (48%) had a local firm as the principal investment partner, 27% were joint ventures between two Japanese companies, 10% were investments between a previously established Japanese foreign affiliate and a local firm, and 15% were between a Japanese parent and one (or more) of its previously established foreign affiliates. Thus, in some 60% of Japanese joint ventures, a local firm played the role as the main investment partner. In these joint ventures with a local partner, the principal Japanese investor on average owned a 44% share of the affiliate.

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 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 is indeed a response to adverse

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

selection? A case in point is the acquisition of a 53% stake in Philip's domestic appliances unit by Whirlpool. According to Reuer and Ragozzino (2006), shared ownership in this case was due to Whirlpool's incomplete information about the value of Philip's dealer network. Other examples include the attempted partial acquisition of Skype, a provider of internet telephony, by News Corp in 2005, and the subsequent successful partial takeover of Skype by eBay. The latter example is also interesting, since it involved a so-called contingent earn-out. 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, and are used extensively in international acquisitions (Reuer, Shenkar and Ragozzino, 2004). This is also confirmed by the fact that earn-outs are popular not only when entering new geographic markets, but also in industries, such as information technology, where company values are especially difficult to determine (Harris, 2002). 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).[3]

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

[3]For more information on earn-outs and empirical investigations into the importance of equity alliances and other forms of shared ownership in dealing with adverse selection problems see Reuer and Ragozzino (2007), and Datar, Frankel and Wolfson (2001). More generally, 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).

[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).

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]

More generally, our paper contributes to the emerging literature on the organization of firms in international markets (see Helpman, 2006, and Feenstra, 2004, for recent surveys). We make two distinct contributions. First, we explain the presence of shared ownership, whereas in existing models ownership is allocated to one of the parties: either the multinational has complete ownership (as in the case of in-house production), or the local firm has whole

[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).

ownership (as in the case of outsourcing). Second, we show how ownership questions arise even in a complete-contracting framework, whereas existing studies typically rely on the assumption of incomplete contracts.

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. An Appendix contains proofs and data sources.

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".[7] 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.[8] To

[7]Note that we assume that the joint venture is established by having the multinational acquire (part of) the local firm's assets rather than by having the multinational and the local firm cooperate to set up a new firm.

[8]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 by assuming that joint ventures do not coordinate outputs (see

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.[9]

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 $w - \alpha_i < a$, $\alpha_i \in [\underline{\alpha}, \overline{\alpha}]$ and $\underline{\alpha} \geq 0$; 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 infer the size of aggregate assets in this market. This assumption means that the multinational can observe the overall performance of the market, i.e., industry output or market price, but not 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 $\Phi_i \equiv \Omega + \alpha_i$.[10]

If the multinational enters the host market through greenfield investment, it has to carry a fixed cost of size F, which may include 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

Raff, Ryan and Stähler, 2007).

[9]Also note that we do not consider possible strategic interactions between different multinationals when choosing their ownership arrangement. As Neary (2007) points out, a merger between two firms may set off a wave of additional mergers. Considering such (partial) merger waves in the context of our model would raise additional issues due to the fact that mergers may signal information about the profitability of future mergers.

[10]Our model is one of horizontal FDI since the multinational takes market demand as given. In a vertical FDI model, where the multinational sources intermediates from an overseas affiliate, demand would be derived from the multinational's production of downstream goods. The reason for choosing a model of horizontal FDI is that it is likely to be a better match for the Japanese data at hand. Since all of the host countries in our sample are high-income countries with similar factor endowments and technological capabilities as Japan, and since these countries are quite distant from Japan, our presumption is that most of the FDI in the sample is of the horizontal (i.e., market seeking) type. That said, we would expect that our adverse-selection-based explanation of shared ownership could also be applied to vertical FDI.

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.[11]

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. We assume $0 < \gamma < 1$, so that the multinational's assets and local firms' assets are not perfectly complementary. For the sake of simplicity, we also assume that $\Omega - (\gamma - 1)\overline{\alpha} - \gamma\beta > 0$, which guarantees that each local firm will continue to produce after the multinational has formed a venture with a competing local firm.[12] Note that this assumption implies that $\Phi_i > 0$.

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 multinational proposes a contract to the local firm. This contract specifies a menu of offers $(T(\alpha), s(\alpha))$ from the multinational to the target firm. In the second stage, the target firm accepts or rejects the contract. 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 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.

[11] 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 under greenfield investment.

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

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 profit of a potential partner firm i.

The profits of a joint venture and 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 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 n is sufficiently big, 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 n and/or β are sufficiently big.*

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 big.*

Proof: See Appendix A.4.

Lemma 4 shows that the first effect, i.e., 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 propose a menu of joint venture offers $(T(\alpha), s(\alpha))$, from which the target firm will pick one.[13] We first use the tools of principal-agent theory to derive conditions under which the target firm reveals its true α and to characterize the optimal sharing rule. We then derive comparative static results concerning the local firm's ownership share that we can use to inform our empirical analysis.

Invoking the revelation principle we have to identify the multinational's optimal $(T(\alpha), s(\alpha))$ contract within the set of incentive-compatible contracts. Incentive compatibility implies that a target firm of type α finds it best to truthfully reveal its type. Let $U(\alpha, \hat{\alpha})$ denote the payoff of a target firm of type α that announces 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 multinational cannot observe the target's assets. The multinational's joint venture profit, and firm i's independent profit, however, depend on the true size of assets. Consider two different target firms with assets α' and α'', respectively. Truthful revelation requires that $U(\alpha', \alpha') \geq U(\alpha', \alpha'')$ and $U(\alpha'', \alpha'') \geq U(\alpha'', \alpha')$ which leads to

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

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

Adding up these two inequalities yields

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

which demonstrates that truthful revelation requires that s is nondecreasing in α. The intuition is straightforward: a low-asset (i.e., low ex-post profit) firm can be prevented from picking an offer designed for a higher-asset firm, if the higher-asset firm obtains a larger share of the ex-post profit.

The necessary condition for incentive compatibility is

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

According to a general result of principal-agent theory, this condition is also globally sufficient if $ds/d\alpha \geq 0$ (see, for instance, Theorem 7.3 in Fudenberg and Tirole, 1991). Assuming for the moment that this is the case, we can use (6) to see how payoffs have to change with the type:

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

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

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

Note that the monotonicity of Π^{*V} and Π_i^G implies that the target does not earn any information rent.

The following result establishes sufficiency and summarizes the optimal sharing rule:

Proposition 1 *An incentive compatible contract for all types $\alpha \in [\tilde{\alpha}, \overline{\alpha}]$ exists. The optimal sharing rule is given by $s^*(\alpha)$ in (9).*

Proof: Condition (6) is sufficient if s does not decrease with α. Differentiation yields

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

because $n\gamma(n+2)\beta + (n+1-n\gamma)\Phi > 0$ as $\gamma < 1$ and $\Phi > 0$. □

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:

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

with the sign depending on the value of γ. If $\gamma < ((n+1)\alpha - \beta)\,/n(\alpha+\beta)$, 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 firm 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 is the host market, the more likely it is that the multinational establishes 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.

An important assumption of our analysis is that the multinational does not face any financial constraints when making its ownership decision. We verify that this assumption is satisfied for our sample of investments before turning to the main empirical analysis. Basic OLS and Tobit regression analysis (see Table 1) suggests that the Japanese multinational's financial situation in the year prior to a foreign investment, as indicated by its gross revenue, cash flow, and interest burden, has indeed no significant effect on its ownership share.[14] However, the principal Japanese investor's ownership share is positively and significantly related to its total factor productivity (TFP).[15] That is, the more productive the Japanese multinational is, the larger is its ownership share of the affiliate.

< Insert Table 1 about here >

We examine the model's predictions in two ways: first, we carry out Kolmogorov-Smirnov (K-S) stochastic dominance tests to investigate

[14] Data limitations restrict this table to 90% of the parent firms (and thus 88% of the investments) of our complete sample. Note that Klein, Peek and Rosengren (2002) find that financial constraints (through Japanese bank credit problems) do play a role in FDI decisions. However, their study examines the number of Japanese affiliates established in the U.S., not their ownership structure.

[15] See Appendix A.5 for details concerning the calculation of TFP.

whether there are statistically significant differences in the productivity distributions of parent companies depending on their choice of affiliate ownership structure.[16] 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 local partner's ownership share.

Table 2 provides the results of the K-S tests concerning differences in the TFP distribution of parents across ownership structures.

< Insert Table 2 about here >

The "*Equality of Distribution*" reports the coefficient on the two-sided K-S test. The remaining columns report on the one-sided K-S tests, indicating whether 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, i.e., 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 have to run multiple K-S tests. Results from the two-sided "*Equality of Distribution*" 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

[16] Kolmogorov-Smirnov tests are preferred to simple comparisons across group averages/medians for two primary reasons: (i) K-S tests are non-parametric tests, so we face no distributional concerns; and (ii) they compare differences in all moments of the groups' cumulative distribution function (CDF), not just one. Recently, these tests have been used to evaluate TFP differences across firms that sell only domestically, firms that also export, and multinational firms. See, for instance, Delgado, Farinas and Ruano (2001), and Girma, Kneller and Pisu (2005).

(by decreasing TFP of the parent) of greenfield subsidiary/majority-owned JV/minority-owned JV, as is suggested by our theory. This can also be seen in Figure 1 which provides the cumulative distribution plots for each of the three ownership types.

< Insert Figure 1 about here >

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. 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 3), we use the local firm's ownership share as the dependent variable. We employ a Tobit specification to account for the fact that the local partner's ownership share is bounded between 5% and 90%.[17] We use one-year lagged values of our explanatory variables to avoid any endogeneity issues. This has the additional advantage that it controls for a possible lag between the FDI decision and affiliate establishment. Note that standard errors are clustered at the parent company level, since TFP is estimated at this level, and one would expect a given parent's error terms to be correlated.

< Insert Table 3 about here >

Column (1) of Table 3 provides the results of our base regression, in which only the parent firm's TFP and the host's wage are included.[18] The results generally support our theoretical model, as we find a negative coefficient on

[17]A Japanese parent 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). Affiliates in which the Japanese parent has at least a 95% stake are considered to be wholly owned. The 95% cutoff to determine a wholly owned affiliate is standard; lowering this cutoff to 90% does not significantly affect our results.

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

the TFP variable, indicating 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.[19]

In columns (2)-(5), we include several other firm and affiliate characteristics that might be expected to influence the ownership share decision. In column (2) we add the host's industry-level value added as a 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. 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 this sense, previous experience seems to enable multinational firms to exclude some (but not all) inefficient firms from the set of potential partners, which leads to an increase in the average ownership share of local partners in the course of time. 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. 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.

By setting our affiliate-parent-Diversity dummy to 0 we capture only those investments where both the Japanese parent and the newly established affiliate are in the same industry, as assumed by our model.[20] Column (6) provides the coefficient estimates from these regressions; note that our qual-

[19]This would be consistent with our model for high levels of γ.

[20]We do not have enough information on our host target firms to establish their SIC code. Hence we cannot restrict our sample to cases where both the multinational and the local firm are in the same industry.

itative results are the same as in column (5), where we allow the established affiliate to be located in an industry outside of the parent's main industry. However, the similarity in the results may be explained in part by the fact that 77% of the FDI in our sample occurs in the same SIC code as the main parent.

Although these results suggest that our theory is supported by the data, we wish to investigate the robustness of our results to changes in how we measure some of the key explanatory variables. First, in column (7), we change how we measure a firm's TFP from the Levinsohn-Petrin TFP measure to an "Approximate TFP" measure. This approximate measure adjusts a firm's average labor productivity by its capital intensity, and is calculated as $ATFP = ln(Q/L) - sln(K/L)$, where s indicates the importance of capital in the firm's production function. Similar to Head and Ries (2003), who also use this measure on Japanese outward FDI, we set $s = 1/3$. Note that the switch from TFP to ATFP does not significantly affect the overall results, although the ATFP measure is a slightly less significant than the Levinsohn-Petrin TFP measure, in part because its value reflects the firm's technical efficiency as well as its scale economies (see Head and Ries, 2003). Note also the difference in the size of the coefficient when we replace TFP with a firm's size (measured by its total assets) in column (8). This may be the result of the fact that firm size is only weakly correlated with TFP (see Raff and Ryan, 2008).

In our study, we use the TFP of the principal Japanese parent, even though there may be two Japanese parents in the joint venture with the local firm.[21] However, to check if there are empirical differences between single and multiple Japanese parents in the JV, we also use the mean TFP of all JV partners (when all partner TFPs are known). Column (9) provides

[21]There are two reasons for using the TFP of the primary parent: (1) the average equity ownership holding of the primary parent in joint ventures where there are two or more Japanese parents is 74%; (2) in cases where we know the TFP of all of the Japanese parents in the JV (this requires the JV to be between publicly listed firms), the simple correlation between the TFP values is 0.72, suggesting a strong productivity similarity between investing parents. In addition, in less than 10% of joint ventures do we find a minority partner with a higher TFP than the primary parent.

these results, and shows that our results are robust to this change.[22]

Two additional changes are highlighted in columns (10) and (11). In column (10), we change the measure of host market size to a Harris-type "economic potential" (Harris, 1954). As predicted by theory, economic potential has no effect on ownership shares. Finally, we add a measure of affiliate age to control for the time between affiliate establishment and the date the affiliate enters the Toyo Keizai database. The potential concern here is that if Japanese firms increase their ownership percentage over time, the time between affiliate establishment and when Toyo Keizai surveyed the parent firm may be large enough to result in our data not actually capturing the ownership structure at establishment.[23] If this were true, our variable "Affiliate Age" would have a negative and significant impact on local ownership share. However, as shown in column (11), this is not the case.[24]

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. To account for this potential bias, we run a Heckman (1979) two-step test that controls 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

[22]In this case, each group of JV partners acts as a 'firm', with different JV partner pairings considered as different 'firms.' This allows us to cluster the error terms at the 'firm' level. Note, however that we have a smaller sample size for this regressions, as we have to eliminate 87 joint ventures from the sample due to the additional data requirements.

[23]However, our theory would be consistent with rising Japanese ownership shares over time in the following sense: suppose that there is even a small coordination cost associated with operating a joint venture compared to a wholly owned affiliate. Then the initial investment would still involve partial ownership to deal with adverse selection. Once the information problem has been solved, however, the Japanese multinational would acquire whole ownership.

[24]We use several volumes of the Japanese Overseas Investment (Toyo Keizai) database series (1991, 1994, 2000), and each affiliate's data are located in the volume closest to the date of investment in part to avoid this potential problem. As a result, the 'affiliate age' variable is never more than a few years old, and ownership share changes are likely be minimal during this time.

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 are reported in Table 4. They are similar to the results from our Tobit estimation, especially in the case (column 3) where we restrict our attention to affiliates in the same SIC as the parent. Note, however, that the insignificant Inverse Mills Ratio suggests selection bias is not a problem in our sample.

< Insert Table 4 about here >

As our Tobit model estimates a linear relationship between the ownership share and the independent variables, it is useful to confirm the robustness of these results to other model specifications. One alternative specification focuses on the type of joint venture formed by the Japanese parent. Specifically, 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; 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 a multinomial logit (MNL) regression, 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. The effects of our other aforementioned control variables (previous investment, affiliate diversity, keiretsu membership, and host size results) are confirmed in the MNL framework. The variables used to test the robustness of our model yield similar results to our initial Tobit and Heckman tests.

Next, we 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 >

Column (1) presents the estimation results from our base theoretical framework, while the remaining columns 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. Our results also remain robust to the restriction (column 5) of investments in the same SIC as the parent. We also find that keiretsu membership of the parent has no statistical effect on ownership structure. In regard to our other robustness checks, we find that ATFP, Firm Size, and AverageTFP are significant influences on ownership, but their use results in a model with a reduced goodness of fit measure as compared to the Levinsohn-Petrin TFP measure. Finally, Economic Potential has a positive influence on greenfield investment, while Affiliate Age has no impact.

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 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

Signing the derivative with respect to b (market size) is straightforward. A reduction in the wage (higher Φ_i) has the following impact:

$$\text{sign}\left\{\frac{\partial(\Pi^{*G}+\Pi_i^G-\Pi^{*V})}{\partial\Phi_i}\right\} = \text{sign}\left\{(n^2-2)\Phi_i + n(\alpha_i+\beta)((n+2)^2\,(1-\gamma)-3-2n\right\}.$$

The derivative is positive if n is sufficiently big; 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

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

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

$$n\left(\beta\gamma^2+\alpha_i\gamma^2-\alpha_i\right)+\beta-\alpha_i-(1-\gamma)\Phi_i > 0.$$

This condition is fulfilled if n and/or β are sufficiently big. Note that it will always hold if $\gamma \to 1$ as $\beta > \alpha_i$.

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. Furthermore, note that it will hold even if $\gamma \to 1$, provided that β is sufficiently large. For $\gamma \to 1$, $f_\beta < 0$ if

$$\beta \frac{2+3n(n+2)}{(2+3n+n^2)^2} > \frac{n^2\tilde{\alpha}}{(n+1)^2} + n\tilde{\Phi}\left(\frac{1}{(n+1)^2} - \frac{1}{(n+2)^2}\right).$$

Hence, Lemma 3 and Lemma 4 are not mutually exclusive.

A.5 Data

- Japanese outward FDI data for the period 1985-2001 are compiled from several issues of Toyo Keizai Inc.'s *Japanese Overseas Investment: A complete listing by firms and countries*. This dataset provides information on the equity ownership share of the Japanese parent as well as of any local partner firm. To be included in the sample used for this study, we require the following criteria to be fulfilled: (i) the SIC codes for both the main Japanese parent (firm with largest equity ownership percentage) and the affiliate are known, and both are in manufacturing; (ii) there is (at least) one Japanese firm with greater than 10% ownership in the affiliate (to differentiate the investment from portfolio investment); (iii) the equity ownership percentage of all investors is known (and sums to 100%); (iv) the date of affiliate establishment is known; and (v) the main Japanese parent's TFP data can be calculated. As we focus on the number of investments (affiliates), affiliates established via joint venture with multiple Japanese parents are counted only once. The TFP of the main parent is used in the regression analysis.

- Twenty-two countries are included in this sample: Australia, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, the Netherlands, New Zealand, Poland, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States.

- There are 517 unique firms that serve as the primary parent in our sample, and 111 firms that only serve as non-main parents in joint venture investments, for a total of 628 Japanese MNEs in the sample. Firm-level financial data are found in the Pacific Basin Capital Markets (PACAP) database. Gross revenue is calculated as sales divided by total assets, the 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 are collected for the year prior to each investment.

- Host GDP (constant US$) comes from the World Bank's *World Development Indicators* CD-ROM. Industry-level value added (constant US$) 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. While we have several options to determine TFP, we avoid OLS estimation as it often provides biased productivity estimates. Specifically, there may be a simultaneity bias, as firms can often observe productivity/output and change their factor input mix accordingly. Olley-Pakes (1996) requires data on firm investment to solve this problem; however, the number of 0's reported for annual investment values in the PACAP dataset leaves this an unattractive alternative. The Levinsohn and Petrin (2003) estimation technique/accompanying STATA program corrects for the simultaneity bias through the use of data on intermediate input purchases to proxy for firm investment. While highly correlated with the ATFP measure, the Levinsohn-Petrin TFP measure is the more econometrically consistent of the two measures.

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 $z \epsilon \mathbb{R}$. 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:

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

The KS test statistics for the two-sided and one-sided tests are, respectively,

$$\begin{aligned} KS_1 &= \sqrt{\frac{nm}{N}} \max_{1 \leq i \leq N} |F_n(z_i) - S_m(z_i)| \\ &\text{and} \\ KS_2 &= \sqrt{\frac{nm}{N}} \max_{1 \leq i \leq N} \{F_n(z_i) - S_m(z_i)\}, \end{aligned}$$

where n and m represent the sample sizes of the F and S distributions, and $N = n + m$. Thus, 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.

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Table 1: Tests of Equality Ownership Percentages in Japanese Foreign Affiliates

	Full Sample		Joint Ventures	
	OLS	Tobit	OLS	Tobit
Total Factor Productivity	2.417^b	2.391^b	1.169^b	1.165^b
	(0.037)	(0.041)	(0.044)	(0.046)
Gross Revenue	14.102	13.238	12.385	12.012
	(0.402)	(0.481)	(0.502)	(0.547)
Cash Flow	21.546	20.947	28.419	28.529
	(0.841)	(0.879)	(0.701)	(0.679)
Interest Burden	291.983	286.678	233.568	231.374
	(0.814)	(0.809)	(0.752)	(0.777)
Prev. Investment into Country	-1.113	-1.148	1.640	1.709
	(0.889)	(0.907)	(0.914)	(0.906)
No. of Observations	1328	1328	517	517
Likelihood Ratio Index(ρ^2)	0.116	0.098	0.139	0.134
Adjusted (ρ^2)	0.131	0.110	0.153	0.148

Note: p-values in parenthesis. a,b,c – significant at the 1%,5%, and 10% levels. Host/industry/time fixed effects dummies included.

Table 2: Kolmogorov-Smirnov Tests of Principal Investor's TFP

Comparison Group (F vs. S)	*Equality of Distributions*	$F \leq S$	$S \leq F$
(F) Greenfield vs. (S) All JVs	0.1339 (0.002)[a]	0.1339 (0.002)[a]	-0.0002 (0.943)
(F) Greenfield vs. (S) Majority JVs	0.1206 (0.098)[c]	0.1206 (0.098)[c]	-0.0061 (0.614)
(F) Greenfield vs. (S) Minority JVs	0.2026 (0.005)[a]	0.2026 (0.005)[a]	-0.0000 (0.958)
(F) Majority JVs vs. (S) Minority JVs	0.1602 (0.087)[c]	0.1602 (0.087)[c]	-0.0526 (0.552)

Notes: Reported statistics is D-statistic. p-values in parenthesis. a,b,c – significant at the 1%, 5%, and 10%-levels, respectively.

Table 3: Tobit Tests on Joint Ventures and the Local Partner's Ownership Share

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Total Factor Productivity	-1.412^b	-1.409^b	-1.407^b	-1.402^b	-1.401^b	-1.397^b	.	.	.	-1.403^b	-1.401^b
	(0.021)	(0.023)	(0.024)	(0.027)	(0.027)	(0.029)				(0.026)	(0.027)
Host Wage	-0.317^b	-0.319^b	-0.311^b	-0.306^b	-0.306^b	-0.301^b	-0.309^b	-0.309^b	-0.311^b	-0.308^b	-0.305^b
	(0.041)	(0.043)	(0.043)	(0.045)	(0.045)	(0.045)	(0.044)	(0.044)	(0.043)	(0.044)	(0.046)
Host Size	.	0.171	0.168	0.161	0.159	0.163	0.161	0.160	0.161	.	0.158
		(0.642)	(0.653)	(0.661)	(0.662)	(0.657)	(0.661)	(0.661)	(0.661)		(0.664)
Previous Investment	.	.	0.781^c	0.774^c	0.768^c	0.783^c	0.769^c	0.768^c	0.767^c	0.768^c	0.765^c
			(0.071)	(0.074)	(0.076)	(0.070)	(0.076)	(0.076)	(0.077)	(0.076)	(0.078)
Affiliate Diversity	.	.	.	0.684^b	0.679^b	.	0.681^b	0.680^b	0.681^b	0.681^b	0.679^b
				(0.037)	(0.039)		(0.038)	(0.039)	(0.038)	(0.038)	(0.039)
Keiretsu Membership	.	.	.	.	2.147	2.151	2.138	2.141	2.140	2.139	2.144
					(0.614)	(0.609)	(0.618)	(0.616)	(0.616)	(0.618)	(0.615)
ATFP	.	.	.	.	.	.	-1.514^b	.	.	.	.
							(0.037)				
Firm Size	.	.	.	.	.	.	.	$-.876^b$	.	.	.
								(0.044)			
Avg TFP	.	.	.	.	.	.	.	.	-1.357^b	.	.
									(0.041)		
Economic Potential	.	.	.	.	.	.	.	.	.	0.701	.
										(0.402)	
Affiliate Age	.	.	.	.	.	.	.	.	.	.	0.317
											(0.814)
No. of Observations	684	684	684	684	684	631	684	684	597	684	684
Likelihood Ratio Index (ρ^2)	0.158	0.160	0.164	0.171	0.172	0.161	0.169	0.168	0.168	0.170	0.174
Adjusted (ρ^2)	0.161	0.162	0.166	0.174	0.175	0.163	0.171	0.170	0.170	0.173	0.176

Note: p-values in parenthesis. a,b,c – significant at the 1%,5%, and 10% levels, respectively. Host/Industry/Time fixed effects dummies included. In column (6), Affiliate Diversity dummy variable set equal to 0

Table 4: Heckman Tests on Equity Ownership in Joint Ventures

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Total Factor Productivity	-1.426^b	-1.398^b	-1.410^b	.	.	.	-1.389^b	-1.387^b
	(0.027)	(0.031)	(0.028)				(0.037)	(0.038)
Host Wage	-0.412^b	-0.401^b	-0.404^b	-0.400^b	-0.402^b	-0.402^b	-0.399^b	-0.401^b
	(0.038)	(0.047)	(0.042)	(0.047)	(0.045)	(0.045)	(0.048)	(0.047)
Host Size	.	0.108	0.120	0.111	0.100	0.101	.	0.107
		(0.874)	(0.801)	(0.863)	(0.878)	(0.876)		(0.875)
Previous Investment	.	0.817^c	0.831^c	0.819^c	0.824^c	0.819^c	0.817^c	0.820^c
		(0.073)	(0.062)	(0.072)	(0.069)	(0.072)	(0.073)	(0.070)
Affiliate Diversity	.	0.761^b	.	0.753^b	0.755^b	0.755^b	0.753^b	0.759^b
		(0.042)		(0.045)	(0.044)	(0.044)	(0.045)	(0.043)
Keiretsu Membership	.	2.108	2.121	2.111	2.101	2.099	2.109	2.111
		(0.478)	(0.443)	(0.467)	(0.481)	(0.483)	(0.477)	(0.467)
Inverse Mills Ratio	0.175	0.170	0.171	0.172	0.171	0.170	0.173	0.170
	(0.202)	(0.199)	(0.200)	(0.200)	(0.200)	(0.199)	(0.201)	(0.199)
ATFP	.	.	.	-1.207^b	.	.	.	.
				(0.047)				
Firm Size	.	.	.	.	-.987^b	.	.	.
					(0.044)			
Avg TFP	.	.	.	.	.	-1.361^b	.	.
						(0.041)		
Economic Potential	.	.	.	.	.	.	0.761	
							(0.141)	
Affiliate Age	.	.	.	.	.	.	.	0.201
								(0.310)
No. of Observations	684	684	631	684	684	597	684	684
Likelihood Ratio Index (ρ^2)	0.167	0.194	0.201	0.174	0.180	0.181	0.188	0.198
Adjusted (ρ^2)	0.169	0.197	0.203	0.176	0.182	0.183	0.190	0.200

Notes: p-values in parenthesis. a,b,c – significant at the 1%, 5%, and 10%-levels,respectively.Host/Industry/Time fixed effects dummies included.In column (3), Affiliate Diversity dummy variable set equal to 0

Table 5: Multinomial Logit Tests of Affiliate Ownership Choice

	(1)		(2)		(3)		(4)		(5)		(6)		(7)		(8)	
	50/50	MinJV	50/50	MinJV	50/50	MinJV	50/50	MinJV	50/50	MinJV	50/50	MinJV	50/50	MinJV	50/50	MinJV
Total Factor Productivity	-0.100^{c}	-0.195^{a}	-0.097^{c}	-0.189^{a}	-0.104^{c}	-0.197^{a}	.	.	.	.	.	.	-0.096^{c}	-0.191^{a}	-0.095^{c}	-0.190^{a}
	(0.078)	(0.004)	(0.082)	(0.008)	(0.071)	(0.004)							(0.081)	(0.006)	(0.082)	(0.007)
Host Wage	-0.021	-0.058^{b}	-0.019	-0.051	-0.021	-0.060	-0.021	-0.055^{b}	-0.022	-0.053^{b}	-0.022	-0.049^{b}	-0.022	-0.049^{b}	-0.020	-0.050^{b}
	(0.314)	(0.028)	(0.317)	(0.034)	(0.314)	(0.027)	(0.314)	(0.030)	(0.320)	(0.031)	(0.320)	(0.035)	(0.320)	(0.030)	(0.320)	(0.030)
Previous Investment	.	.	0.049^{c}	0.199^{b}	0.055^{c}	0.217	0.048^{c}	0.194^{b}	0.051^{c}	0.200^{b}	0.051^{c}	0.200^{b}	0.050^{c}	0.199^{b}	0.050	0.199^{b}
			(0.092)	(0.039)	(0.087)	(0.030)	(0.093)	(0.040)	(0.091)	(0.039)	(0.091)	(0.039)	(0.091)	(0.039)	(0.091)	(0.039)
Affiliate Diversity	.	.	0.140^{c}	0.638^{a}	.	.	0.141^{c}	0.640^{a}	0.143^{c}	0.640^{a}	0.141^{c}	0.640^{a}	0.143^{c}	0.642^{a}	0.143^{c}	0.643^{a}
			(0.063)	(0.004)			(0.061)	(0.003)	(0.059)	(0.003)	(0.061)	(0.003)	(0.059)	(0.002)	(0.059)	(0.002)
Keiretsu Membership	.	.	0.253	0.031	0.261	0.048	0.252	0.033	0.252	0.031	0.252	0.029	0.251	0.035	0.252	0.033
			(0.421)	(0.149)	(0.407)	(0.131)	(0.422)	(0.138)	(0.422)	(0.149)	(0.422)	(0.151)	(0.429)	(0.131)	(0.421)	(0.138)
Host Size	.	.	0.003	0.001	0.004	0.003	0.005	0.001	0.005	0.001	0.004	0.001	0.005	0.001	0.004	0.001
			(0.487)	(0.512)	(0.484)	(0.491)	(0.485)	(0.511)	(0.485)	(0.511)	(0.484)	(0.511)	(0.485)	(0.511)	(0.484)	(0.511)
ATFP	.	.	.	.	.	.	-0.097^{c}	-0.184^{a}	.	.	.	.	.	.	.	.
							(0.081)	(0.009)								
Firm Size	.	.	.	.	.	.	.	.	-0.088	-0.174^{b}	.	.	.	.	.	.
									(0.109)	(0.031)						
Avg TFP	.	.	.	.	.	.	.	.	.	.	-0.089^{c}	-0.184^{a}	.	.	.	.
											(0.088)	(0.008)				
Economic Potential	.	.	.	.	.	.	.	.	.	.	.	.	0.006	0.002	.	.
													(0.502)	(0.491)		
Affiliate Age	.	.	.	.	.	.	.	.	.	.	.	.	.	.	-0.117	-0.216
															(0.218)	(0.384)
	684		684		631		684		684		597		684		684	
	0.141		0.155		0.157		0.155		0.147		0.153		0.155		0.156	
	0.144		0.158		0.160		0.158		0.150		0.156		0.158		0.160	

Notes: Base case is Majority Owned JV). Host/Industry/Time dummies included in all regressions. p-values in parenthesis. a,b,c – significant at the 1%, 5%, and 10%-levels, respectively.In column (3), Affiliate Diversity dummy variable set equal to 0)

Table 6: The Affiliate Ownership Choice

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Total Factor Productivity	0.101^a	0.101^a	0.099^a	0.097^a	0.103^a	.	.	.	0.103^a	0.103^a
	(0.006)	(0.006)	(0.007)	(0.008)	(0.008)				(0.006)	(0.006)
Host Wage	-0.021^c	-0.021^c	-0.020^c	-0.019^c	-0.024^c	-0.022^c	-0.020^c	-0.022^c	-0.017^c	-0.017^c
	(0.081)	(0.081)	(0.082)	(0.083)	(0.078)	(0.079)	(0.079)	(0.082)	(0.084)	(0.084)
Host Size	0.024^a	0.024^a	0.022^a	0.021^a	0.027^a	0.024^a	0.023^a	0.024^a	.	0.022^a
	(0.007)	(0.007)	(0.008)	(0.009)	(0.006)	(0.007)	(0.008)	(0.007)		(0.008)
Previous Investment	.	-0.081^c	-0.077^c	-0.074^c	-0.084^c	-0.071^c	-0.069^c	-0.071^c	-0.067^c	-0.065^c
		(0.089)	(0.091)	(0.093)	(0.087)	(0.094)	(0.095)	(0.094)	(0.096)	(0.097)
Affiliate Diversity	.	.	-0.298^b	-0.291^b	.	-0.295^b	-0.288^b	-0.285^b	-0.286^b	-0.287^b
			(0.041)	(0.042)		(0.041)	(0.043)	(0.043)	(0.043)	(0.043)
Keiretsu Membership	.	.	.	0.042	0.051	0.039	0.037	0.037	0.041	0.041
				(0.421)	(0.411)	(0.422)	(0.423)	(0.423)	(0.421)	(0.421)
ATFP	.	.	.	.	.	0.100^b	.	.	.	.
						(0.021)				
Firm Size	.	.	.	.	.	.	0.105^b	.	.	.
							(0.037)			
Avg TFP	.	.	.	.	.	.	.	0.084^c	.	.
								(0.091)		
Economic Potential	.	.	.	.	.	.	.	.	0.139^a	.
									(0.008)	
Affiliate Age	.	.	.	.	.	.	.	.	.	-0.104
										(0.452)
No. of Observations	1512	1512	1512	1512	1164	1512	1512	1425	1512	1512
Likelihood Ratio Index (ρ^2)	0.161	0.165	0.171	0.174	0.170	0.169	0.170	0.169	0.175	0.173
Adjusted (ρ^2)	0.163	0.166	0.173	0.177	0.172	0.171	0.172	0.171	0.178	0.175

Notes: p-values in parenthesis. a,b,c – significant at the 1%, 5%, and 10%-levels,respectively. Host/Industry/Time dummies included in all regressions.In column (5), Affiliate Diversity dummy variable set equal to 0

Figure 1: Plots of CDFs by ownership type