

Ownership and Control in Joint Ventures: Theory and Evidence*

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Abstract

Joint ventures, a particularly popular form of corporate cooperation, exhibit ownership patterns that are clustered around equal shareholdings for a wide variety of parent firms. In this paper, we investigate why 50-50 or “50 plus one share” equity allocations should be so prevalent. In our model, parent firms trade off control benefits and costs with incentives for resource contributions in the presence of asset complementarities. We show that strict resource complementarity eliminates moral hazard in parent contributions so that ownership provides sufficient incentives for optimal investments. However, the potential for extraction of residual control benefits by the majority owner creates a discontinuity in contribution incentives at 50% equity stakes that explains the optimal clustering of ownership around 50-50 shareholdings. Using data from 1,248 US joint ventures announced between 1985 and 2000, we empirically analyze the determinants of their ownership allocations and conduct tests of model predictions that offer strong support for our theory.

1 Introduction

Hardly a day goes by without the announcement of a major strategic alliance between businesses. Such corporate cooperation takes various forms, ranging from loose *ad hoc* understandings over explicit contractual agreements to joint ventures. In all these arrangements, firms are willing to grant each other access to some of their assets. This sharing of control over resources raises questions of ownership, governance, and the appropriation of benefits to better understand how firms assert property rights over common assets and define their boundaries. In this paper, we focus on joint ventures for which ownership and control arrangements are particularly well documented because the partners incorporate their cooperation in an independent, jointly owned company.¹

Joint ventures exhibit the following intriguing ownership pattern: the vast majority allocate equal or almost equal equity stakes to the parent firms.² Large-sample data (Table 1 in Appendix C) indicate that about two thirds of two-parent joint ventures have 50-50 equity allocations, while up to 12% show 50.1% or 51% majority stakes (“50 plus one share”). This clustering of shareholdings is all the more surprising that typical determinants of ownership such as parent attributes or incentives would seem to call for unequal share allocations, especially in such a large and diverse cross-section of firms. Indeed, it has been argued that differences in resource costs (Belleflamme and Bloch, 2000), private information (Darrough and Stoughton, 1989), or incentive requirements (Chemla, Habib and Ljungqvist, 2001) all imply optimal asymmetric ownership structures. But Table 2 underscores that even dissimilar parent firms show a preference for 50-50 shareholdings.

This economic puzzle is compounded by a legal one. The prevailing rules governing joint ventures do not seem to favor equal shareholdings because disagreement between 50-50 owners might result in permanent legal deadlock and, ultimately, significant value losses. To explain the observed equity patterns, we develop a simple model of ownership and control in joint ventures that we then use to empirically analyze the determinants of ownership in two-parent US joint ventures.

In our model, two parent firms contribute noncontractible tangible or intangible resources such

¹Corporate partnerships are very different from private ones in which tradeoffs between risk sharing and incentives are central (see, e.g., Lang and Gordon, 1995). By contrast, Johnson and Houston (2000) do not find evidence for risk sharing motives in joint ventures. Since firms can be taken to be risk-neutral by well-known arguments, other issues such as moral hazard in joint production (see Holmström, 1982) and the impact of control costs and benefits on ownership arrangements (see Grossman and Hart, 1986 and Hart and Moore, 1990) move to the forefront.

²The management literature has long recognized this puzzle: see, e.g., Bleeke and Ernst (1991).

as physical assets or R&D effort to a jointly owned, but independent corporate entity in an effort to exploit asset complementarities (“synergies”). Ownership not only provides incentives for resource contributions, but also confers private control benefits, which are socially costly, on majority shareholders. Since parent contributions are noncontractible, the parties face a trade-off between investment incentives and control benefits extraction. Hence, parents choose ownership allocations that are optimal in light of their respective contributions and economic attributes so as to mitigate the adverse consequences of control rights on investment incentives.

We first establish that strong complementarities in parent resources, a commonly cited rationale for joint ventures, eliminate typical moral hazard in joint production, in which one venturer attempts to free-ride on the other’s contribution (see Holmström, 1982). Simple equity allocations suffice to implement first-best contribution incentives and, hence, joint venture value. These incentive effects might explain the popularity of joint ventures in the presence of strong synergies because they are the only form of inter-firm cooperation that relies on explicit ownership stakes.³ The result is robust to introducing private control benefits in the sense that strict asset complementarity still does away with free-riding although control costs are otherwise responsible for second-best outcomes.

Our main result shows that the three observed control regimes - joint control (50-50), 50 plus one share, and outright majority control - coexist in equilibrium and can each be optimal for a wide range of firms. In particular, we characterize optimal ownership arrangements in terms of parents’ cost attributes and the net impact of control on value creation. It emerges that relatively small social costs arising from the exercise of control rights suffice to make equal or almost equal shareholdings optimal for quite heterogeneous parent firms, providing an explanation for the two observed cluster points around 50-50 ownership.

The rationale behind the optimality of 50-50 shareholdings and joint control is that the potential for value extraction by a dominant partner would hurt the minority firm’s contribution incentives to a point where equal equity stakes maximize joint value creation. Only 50-50 ownership offers protection against rent seeking activities because each parent can resort to legal action and force a stalemate in case the other firm attempts to extract residual benefits.

³Fama and Jensen (1985) also argue that organizational form and investment decisions are interdependent because of the implicit incentive effects of the former for the latter.

At the other cluster point, 50 plus one share, parents equally split return rights but allocate control to the company with the more valuable resource. Partners trade off return with control rights for the dominant parent who, otherwise, would underinvest because of insufficient contribution incentives. We also show that asset complementarities are the driving force behind such ownership structures that disappear if parent contributions are substitutes.

Finally, if the partners are very dissimilar or the net impact of control minor, it is optimal to grant outright majority ownership to the parent that makes the more valuable resource contribution. In this situation, synergies and the positive incentive effects of private benefits for the dominant shareholder outweigh the negative consequences of one-sided control in terms of contribution disincentives for the minority partner.

We also provide an empirical perspective on our results by investigating the cross-sectional determinants of joint venture ownership. In a first step, we estimate the announcement effect of 1,248 US joint ventures formed between January 1985 and 2000, and find that they generate wealth gains for parent-firm shareholders averaging \$30 to \$60 millions that underscore the economic significance of joint ventures. Consistent with our model, the dominant partner in joint ventures with one-sided control exhibits significantly larger average wealth gains. Furthermore, joint ventures with explicit buyout options that can mitigate incentive or contracting problems (see, e.g., Chemla, Habib and Ljungqvist, 2001) generate significantly higher abnormal returns for their parents.

To directly relate our theory to the empirical evidence, we next use parent wealth gains to recover and estimate a model parameter that measures venturer similarity in terms of cost attributes and determines ownership allocations together with the costs and benefits of control. Although the latter are typically unobservable, we attempt to capture their effect through a proxy for the scope of value diversion on the basis of parent and joint venture relatedness. The final step is to estimate discrete choice models of the three prevalent control regimes with these measures for parent similarity and control benefits as explanatory variables.

The results provide strong evidence in favor of our model predictions. Not only are our proxies for parent similarity and value diversion statistically highly significant, they also exhibit the exact marginal effects predicted by our analysis across the three ownership regimes. Parent firms are more likely to adopt 50-50 ownership allocations when there is high potential for value diversion

or when their resource costs are not too dissimilar. We also find that leverage of the joint venture increases the likelihood of adopting joint control, but decreases the likelihood of one-sided control. Hence, one of our contributions is to shed some light on the empirical determinants of ownership structures in joint ventures.

Our main contribution, however, is to formally show and empirically verify that relatively small distortions in incentives arising from discontinuities in control rights suffice to explain the optimal clustering of ownership in joint ventures around equal shareholdings. To our knowledge, the observed prevalence of 50-50 and 50 plus one share equity allocations has not been formally addressed, yet. Our paper attempts to fill this void all the more that prior theoretical work has mainly focused on asymmetric control and return rights in joint ventures, while empirical studies have concentrated on their wealth effects for parent shareholders.

In a setting of joint production with double-sided moral hazard similar to ours, Bhattacharyya and Lafontaine (1995) establish that linear sharing rules such as equity can induce optimal investments. However, the implied ownership arrangements are usually asymmetric. By adding costly value diversion as in our model to this framework, Chemla, Habib and Ljungqvist (2001) analyze typical contractual provisions of joint ventures such as options and exit clauses to overcome the consequences of incomplete contracts, but do not address the determinants of ownership and control. Belleflamme and Bloch (2000) share our focus on parent attributes in terms of resource costs but argue that asymmetries in the parent companies' noncontractible contributions imply asymmetric ownership arrangements. In a different setting, Darrough and Stoughton (1989) analyze the effect of asymmetric sharing rules on *ex post* production levels and profit allocations in a bargaining framework under private information.

On the empirical side, McConnell and Nantell (1985) and Lummer and McConnell (1990) were the first to identify the value creation in joint ventures by documenting the positive abnormal return reactions of parents' stock prices to their announcement. Their findings were subsequently confirmed by Mohanram and Nanda (1998) and Johnson and Houston (2000) who analyze abnormal return reactions in terms of horizontal and vertical joint ventures as compared to contractual cooperation. However, these studies do not investigate the determinants of ownership structures in joint ventures, which is central to our work.

This paper is also related to the more general question of governance and incentives in strategic alliances. Rey and Tirole (2001) show that the alignment or divergence of parent objectives and governance issues determine the appropriate organizational form for strategic alliances including joint ventures. Questions of ownership and control have also come to the forefront in the large literature on international alliances where recent papers such as Desai, Hines and Foley (2001) examine the optimality of international joint ventures and their ownership determinants.

The growing empirical literature on corporate cooperation documents many features of our analytic framework. Elfenbein and Lerner (2001) report that the division of ownership and control rights in internet portal alliances is consistent with predictions derived from incomplete contracts. Similarly, Robinson and Stuart (2001) find significant empirical evidence for contractual incompleteness in biotech strategic alliances and joint ventures that equity participations serve to overcome. Allen and Phillips (2000) also highlight the importance of equity-based incentives by showing that corporate share block purchases create significantly higher abnormal returns in the presence of strategic alliances including joint ventures. Regarding strategic alliances without equity components, Chan, Kesinger, Keown and Martin (1997) find announcement effects that are consistent with trade-offs between synergies and control costs, as in our case.

The paper proceeds as follows. Section 2 motivates our analysis in terms of empirical evidence on joint venture ownership and the ambient legal environment. Section 3 presents a simple model of joint venture formation and analyzes the consequences of asset complementarity. Optimal ownership and control allocations are derived in Section 4. In Sections 5 and 6, we describe our data and methodology, and summarize our empirical findings. The last section discusses our results and concludes. All proofs and tables are relegated to the Appendix.

2 Ownership Patterns in Joint Ventures

To motivate our subsequent analysis, we first provide some background evidence on ownership patterns in joint ventures. Our data is drawn from the Joint Ventures and Strategic Alliances database of Thomson Financial Securities Data and consists of two-parent joint ventures (about 80% of all recorded joint ventures) announced between 1985 and 2000 whose main activity lies in

the US.⁴ Table 1 in Appendix C shows that about two thirds of joint ventures exhibit 50-50 equity allocations: the parties equally share control and residual cash flow rights. Another cluster point arises at 50.1% or 51% majority stakes, which we will refer to as *50-plus* because one party holds 50 plus one share, and group in one category (8%). While cash flow rights are (almost) equally distributed the capital structure allocates clear control to one party. Two further samples - US joint ventures with at least one publicly quoted parent and a similarly selected sample of joint ventures active in the European Union containing 12% 50-plus joint ventures - confirm these ownership patterns (see Table 1).

The prevalence of joint control (50-50) is puzzling for two reasons. First, it is unclear how parent attributes such as resource costs, incentive requirements or information distribution would imply symmetric shareholdings as the optimal arrangement for such a large and diverse cross-section of joint ventures and partners. Indeed, the management literature and corporate announcements emphasize complementarities between the parties' tangible or intangible assets as the primary reason for entering into a joint venture (see, e.g., Hennart, 1988 or Bleeke and Ernst, 1991). Such a synergy rationale, however, suggests that the parents' contributions and attributes are typically heterogeneous and, hence, should not give rise to symmetric ownership stakes except for cases of sheer coincidence. Furthermore, Table 2 illustrates that parent firms differing in their attributes still prefer 50-50 ownership and joint control by far over asymmetric equity arrangements.⁵

Second, the ambient legal rules that govern joint ventures in the US do not seem to favor equal shareholdings. In 49 of the states, joint ventures fall under the *Uniform Partnership Act* and the *Revised Uniform Partnership Act*. "Disagreement among the partners" is resolved in all jurisdictions by majority vote, strict in most. In such cases, the court will let the parties vote their shares and decide according to the respective equity weights.⁶ Hence, disagreement in 50-50 joint ventures becomes nearly intractable and might lead to permanent deadlock, all the more that it is nearly impossible to specify a clear, complete and enforceable mechanism to break the impasse in

⁴The database defines a joint venture as "... a cooperative business activity, formed by two or more separate organizations for strategic purpose(s), which creates an *independent business entity*, and allocates ownership, operational responsibilities, and financial risks and rewards to each member, while preserving each member's separate identity/autonomy" (Thomson Financial Securities Data, our emphasis).

⁵Studying 668 worldwide alliances, Veugelers and Kesteloot (1996) also report that 50% of the joint ventures between two asymmetric parents exhibit 50-50 share allocations.

⁶UPA §18(h); see also *National Biscuit v. Stroud*, 106 S.E.2d 692 (1959) which articulates the strict majority rule in corporate partnerships such as joint ventures.

all contingencies.

Since control rights are interpreted by US courts in the narrow equity share sense, the legal environment seems to favor a clear allocation of control rights, not 50-50 shareholdings. However, majority control is also fraught with problems as it might lead to abuses by the majority partner, which are often hard to verify for an outside party such as a court. As a result, fiduciary duty provisions extend only limited protection to the minority partner.⁷

3 Model Description and Joint Venture Optimality

In this section, we describe our model and establish the desirability of joint ventures as an organizational form for strategic alliances in the presence of strict resource complementarities.

3.1 Model Description

In the attempt to exploit synergies, two risk-neutral firms A and B form a joint venture (JV for short). This jointly owned corporate entity is an independent company with its own distinct management and run at arm's length from the parents. In the start-up phase, the venturers contribute resources $I_i, i = A, B$ to the common enterprise at non-verifiable cost $c_i(I_i) = \frac{c_i}{2} I_i^2$. These contributions might take the form of tangible assets such as funds, plant or machinery (“investments”), or intangible ones such as human, technology or marketing resources (“effort”). Since the joint venture’s *raison d’être* are complementarities in assets and expertise, the partners’ inputs I_A and I_B are nonhomogeneous and, hence, differ in value and cost parameters c_i . Without loss of generality, let A contribute the more valuable resource so that $c_A > c_B$. We think of the c_i parameters as capturing both the direct resource cost and indirect ones in terms of spillovers through, e.g., technological leakages, the threat of future competition by the joint venture or partner, etc.

In the production phase, the joint venture creates terminal value $V(I_A, I_B)$ from the parents’ resource contributions. We adopt the familiar Leontief specification $V(I_A, I_B) = \min\{I_A, I_B\}$ for the value creation process so that the contributed assets are truly complementary in the sense that

⁷See the decision in *Meinhard v. Salmon*, 154 N.E. 545 (1928).

there is no scope for substitution in inputs.⁸ This choice is consistent with our focus on synergies in joint venture design, which is also the most widely accepted rationale for their formation. We analyze the consequences of perfect input substitutability, the other polar case, for joint venture design in Appendix A.

An initial agreement specifies the new entity's capital structure. We take the parties' contributions to be noncontractible in the sense that contractual provisions in their regard are difficult to verify or enforce.⁹ This assumption captures the often very specialized or intangible nature of the contributions, whose quality or value might be hard to assess by the partner, let alone an outside party such as a court of law. Hence, contracts can only be written on verifiable output, not contributions such as physical assets or effort I_i . As a result, the parties need to receive appropriate incentives through their control and return rights which they implement through the joint venture's capital structure.

To round out our financial design problem, we need to be specific about the distribution and consequences of control. Following established American legal practices, we assume that 50% ownership plus one share suffices for effective control which, for joint ventures, is particularly valuable because it confers private benefits. The controlling parent is able to appropriate a fraction δ of the joint venture's gross value V which we think of as residual control benefits. They come at the expense of diminishing the terminal value by a fraction $d > \delta$ through, e.g., the erosion of synergy gains or competition by the dominant parent, so that the remainder of the company has only a value of $(1 - d)V$. The non-contractible nature of control rights prevents commitment not to engage in such value diversion, or to share residual benefits. In case of 50-50 ownership, neither control costs nor benefits accrue because the threat of legal action and ensuing stalemate suffices to deter private benefits extraction.

⁸The Leontief production function's elasticity of substitution between the inputs is zero. The absence of uncertainty about terminal value is without loss of generality because parent firms are risk-neutral.

⁹This assumption implies double-sided moral hazard in joint production as in Bhattacharyya and Lafontaine (1995). Elfenbein and Lerner (2001) or Robinson and Stuart (2001) provide empirical evidence consistent with significant contractual incompleteness including effort provision in the context of corporate cooperation.

3.2 Optimality of All-Equity Joint Ventures

We first establish the optimality of all-equity joint ventures as an organizational form for strategic alliances when the partners' contributions are strictly complementary. Consider the joint venture's first-best value found by maximizing

$$W(I_A, I_B) = \min\{I_A, I_B\} - \frac{c_A}{2}I_A^2 - \frac{c_B}{2}I_B^2$$

with respect to parent contributions I_i . Enforcing the efficiency condition $I_A = I_B$ to insure that none of the two inputs is wasted, the optimization problem simplifies to

$$\max_{I_A} \left\{ I_A - \frac{c_A + c_B}{2} I_A^2 \right\}.$$

From the value maximizing resource contributions $I_A^* = \frac{1}{c_A + c_B} = I_B^*$ we obtain the first-best net value of the joint venture as $W^* = \frac{1}{2} \frac{1}{c_A + c_B}$ with output $V^* = \frac{1}{c_A + c_B}$.

We next introduce ownership and, as a benchmark, derive the venturers' resource contributions in the absence of private control costs and benefits, i.e., $\delta = d = 0$. Let the equity stakes be γ for parent A and $1 - \gamma$ for parent B .

Lemma 1 *Without private control costs and benefits, incentive compatible parent contributions and optimal share allocations are given by, respectively,*

$$I_A = \frac{\gamma}{c_A} \quad \text{and} \quad I_B = \frac{1 - \gamma}{c_B} \tag{1}$$

$$\gamma^* = \frac{c_A}{c_A + c_B}, \quad 1 - \gamma^* = \frac{c_B}{c_A + c_B}. \tag{2}$$

Proof. See the Appendix. ■

Optimal ownership implies that shareholdings are linear in the relative resource costs of the parties. In principle, there is no reason to expect that the optimal equity stakes in equation (2) lead to the first-best value of the joint venture. Joint production typically suffers from an externality problem between the partners, first analyzed by Holmström (1982). They face only

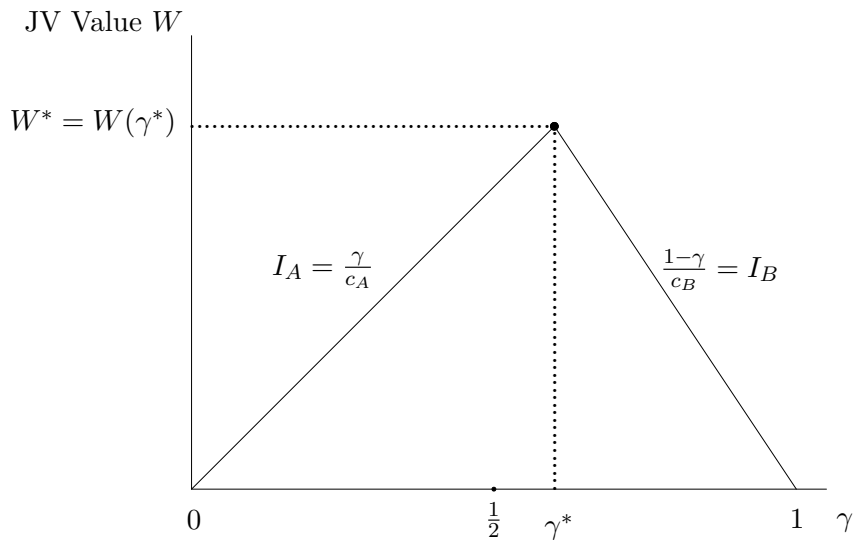


Figure 1: First-Best Incentives, Value and Ownership

limited individual incentives to provide resources because, at the margin, each parent recoups only a fraction of the increase in the joint surplus that she actually contributes. In our case, however, the strong complementarity embodied by the Leontief production function eliminates such free-riding.

Proposition 1 *If parent resources are strict complements, optimal ownership stakes implement first-best investment incentives so that all-equity joint ventures attain first-best value in the absence of control costs and benefits.*

Proof. See the Appendix. ■

Figure 1 illustrates the preceding result and the intuition behind it. If inputs are pure complements the optimal joint output will show a much stronger reaction to a reduction in contributions than to an increase which introduces an efficient asymmetry in the incentive schedule I_i of each party. If a parent were to reduce her contributions from the optimal level, her revenue would fall correspondingly so that free-riding on the partner's contribution becomes suboptimal. Hence, in the absence of control costs or benefits, return rights provide sufficient investment incentives to attain first-best outcomes. Note, however, that the resulting ownership structure is typically asymmetric except for the case of identical parent cost attributes, i.e., $c_A = c_B$.

This rather strong result provides a theoretical justification for the popularity (and optimality)

of all-equity joint ventures as an organizational choice for strategic alliances. It shows that the partners can use equity allocations - ownership - to decentralize first-best value creation in joint ventures with significant synergy effects. However, to capture these incentive benefits, firms have to resort to joint ventures as the only form of corporate cooperation with explicit equity stakes.¹⁰ We would expect the requisite strong synergy effects to primarily arise in vertical joint ventures. The finding of Johnson and Houston (2000) that such joint ventures create significantly more value for parents than comparable contractual arrangements or horizontal joint ventures provides empirical evidence in favor of Proposition 1. They also report that firms choose joint ventures over simple contracts when noncontractibilities measured in terms of R&D expenditure (effort) are more severe which is again consistent with the implications of the preceding proposition.

As A 's first-best share γ^* also provides an intuitive measure of relative resource cost, we retain it for the subsequent analysis to gauge the degree of parent homogeneity. Notice that γ^* equals $\frac{1}{2}$ for resource costs $c_A = c_B$ indicating that the venturers are homogeneous in their economic attributes; the further away γ^* is from $\frac{1}{2}$, the more dissimilar are the parents.

4 Ownership and Control

We now introduce control costs and benefits so that a majority of shares confers a fraction δ of private benefits at a fractional cost d to the joint venture. Its net value W_A to parent A as a function of ownership becomes

$$W_A = \begin{cases} [\delta + \gamma(1 - d)]V(I_A, I_B) - c_A \frac{I_A^2}{2} & \text{for } \gamma > \frac{1}{2} \\ \gamma V(I_A, I_B) - c_A \frac{I_A^2}{2} & \text{for } \gamma = \frac{1}{2} \\ \gamma(1 - d)V(I_A, I_B) - c_A \frac{I_A^2}{2} & \text{for } \gamma < \frac{1}{2} \end{cases} \quad (3)$$

and similarly for parent B 's net value W_B . The crucial idea in the above expression is the absence of control benefits and costs for 50-50 equity stakes. In the case of joint control, no parent can extract residual control benefits because the threat of a legal stalemate suffices to deter either party from rent seeking activities.

¹⁰Proposition 1 also offers a theoretical foundation based on incentives for the argument in Hart and Moore (1990) that common asset ownership might be optimal in the presence of strict complementarities.

4.1 Majority Control

In theory, nothing precludes the parties from allocating control rights separately from return rights, for instance, giving 49% of returns to A together with control and its benefits. In practice, such contracts could not possibly foresee all future contingencies so that the default provisions in the *Uniform Partnership Acts* come into play and intertwine the two rights. As a consequence, an increase in return rights beyond 50% leads to an increase in control rights so that parents cannot effectively separate the allocation of income and voting rights. We consider either control by parent i or joint control (J) and, accordingly, index joint venture related quantities such equity stakes γ^k , gross value (output) V^k , and net value W^k by $k = A, B, J$.

Recall our cost convention that $c_A > c_B$. By the first-best ownership allocation in equation (2), parent A should hold the larger equity stake for optimal investment incentives. Since she would get a fraction $\delta + \gamma(1 - d)$ of the joint venture's value including her private benefits, the value of control to A is $\delta - \gamma d$. Hence, control is valuable as long as

$$\delta > \gamma d, \gamma \geq \frac{1}{2} \quad (4)$$

which we henceforth assume. Otherwise, the majority owner would not choose to extract control rents because her loss as a shareholder γd would exceed her private benefit δ .

Under control by A , maximizing the appropriate net total return in equation (3) for the parents by choice of contribution I_i , i.e., $\max_{I_i} W_i^A$, $i = A, B$, yields the new incentive compatibility conditions so that for $\gamma \geq \frac{1}{2}$ the venturers contribute at most

$$I_A = \frac{\delta + \gamma(1 - d)}{c_A}, \quad I_B = \frac{(1 - \gamma)(1 - d)}{c_B}. \quad (5)$$

The preceding expressions reveal that granting control to one party (A) hurts the investment incentives of the other (B). The optimal distribution of return and control rights now depends on which partner's contribution determines, at the margin, the value of the joint venture.

We take each parent in turn and let first A 's contribution constrain the JV's value. In this case, it is in both parties' interest to adjust A 's stake γ so that investment incentives are equalized and A has outright majority control.

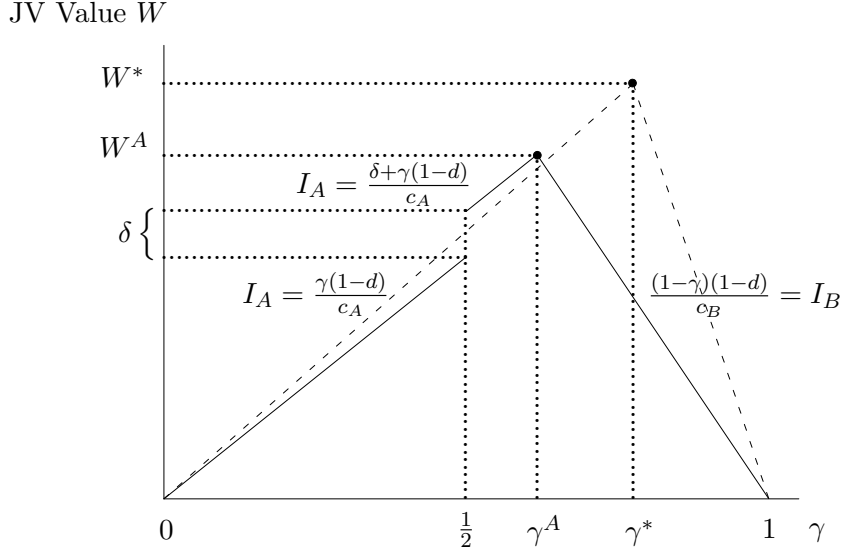


Figure 2: Outright Majority Control with Asymmetric Return and Control Rights

Proposition 2 *If firm A, contributing the more valuable resource, determines the joint venture's value at the margin, outright majority control by parent A is optimal with corresponding equity stakes*

$$\gamma^A = \gamma^* - \frac{\delta}{(1-d)}(1-\gamma^*) \text{ and } 1-\gamma^A = \frac{1-d+\delta}{1-d}(1-\gamma^*). \quad (6)$$

Proof. See the Appendix. ■

The expression for optimal equity stakes in equation (6) shows that the presence of control rights distorts the allocation of ownership and, hence, investment incentives. In their absence, we would obtain first-best resource contributions and shareholdings as in Lemma 1. Larger control benefits or costs reduce A 's stake but increase B 's. Put differently, the parties gross up B 's stake and decrease A 's by the relative value of control to provide second-best efficient contribution incentives. Figure 2 depicts how an asymmetric allocation of control and income rights determines joint venture value. Under control by A , the net value of the stakes to parent i are $W_i^A = (1-d+\delta)^2 W_i^*$ which is simply their first-best value adjusted for the net social cost of control $d-\delta$.

In the other case, control by firm A hurts B 's incentives to a point where the latter's contribution becomes the constraining factor in value creation. It is now impossible for the parties to fine-tune the distribution of return and control rights so that both firms face identical investment incentives.

Raising B 's stake would decrease A 's below 50%, granting B control with the associated costs and benefits. But then, it is A 's contribution that would limit the joint venture's value by the resource cost convention $c_A > c_B$.

Hence, there exists a critical region around 50-50 shareholdings where it is impossible to equalize investment incentives through the ownership structure. The following lemma characterizes this region in terms of a threshold for relative resource costs γ^* .

Lemma 2 *If the relative resource cost parameter γ^* lies in the interval $(\frac{1}{2}, \bar{\gamma})$, where $\bar{\gamma} = \frac{(1-d)/2+\delta}{1-d+\delta}$, share allocations cannot equalize contribution incentives.*

Proof. See the Appendix. ■

Lemma 2 implies that even small benefits and costs associated with control rights might lead to a large range of relative costs γ^* for which ownership stakes cannot equalize incentives.

4.2 The Choice of Control Regime

So far, we have only considered outright majority control by parent A . When γ^* as a measure of parent homogeneity falls into the critical region, two further control regimes might become optimal: joint control with 50-50 ownership, and 50-plus control (indexed by $k = P$) for which A holds 50 plus one share so that cash flow rights are equally split but control is one-sided. Since granting control to company B is never optimal by our cost convention $c_A > c_B$, it is sufficient to examine the consequences of control by A .

Suppose that the relative resource cost parameter $\gamma^* = \frac{c_A}{c_A+c_B}$ falls into the critical region defined in Lemma 2, and consider the choice between 50-50 ownership and one-sided control by A . In the latter case, it might be in the venturers' interest to reduce A 's stake to provide better contribution incentives to parent B . Since the joint venture's output V is maximized at $\gamma = \frac{1}{2}$, we compare its net value W^k under joint control (50-50) with the corresponding values under outright majority and 50-plus control to determine the optimal allocation of ownership.

Lemma 3 *There exists a threshold $\hat{\gamma} = \frac{1+\sqrt{1-(1-d+\delta)^2}}{2(1-d+\delta)^2} > \frac{1}{2}$ such that for all $\gamma^* \in (\frac{1}{2}, \hat{\gamma})$, 50-50 ownership with joint control maximizes value creation in the joint venture.*

Proof. See the Appendix. ■

Figure 3 depicts the intuition behind Lemma 3. Equal equity stakes not only avoid the net social cost of control $d - \delta$, but also the discontinuity in contribution incentives. Hence, minor frictions stemming from control rights suffice to make joint control optimal. In particular, the preceding lemma reveals that firms prefer 50-50 ownership if the net social costs of control are significant in comparison with relative resource costs γ^* . If parents are very heterogeneous in terms of cost attributes ($\gamma^* > \hat{\gamma}$) the need for incentives for the majority owner outweighs any efficiency losses. It is easily verified that the 50-50 threshold $\hat{\gamma}$ increases in net social control costs.

The following proposition characterizes the different second-best ownership arrangements in joint ventures.

Proposition 3 *If $\hat{\gamma} < \bar{\gamma}$, there exists a 50-plus threshold $\tilde{\gamma} \in (\hat{\gamma}, \bar{\gamma})$ so that joint control is optimal for $\gamma^* \in [\frac{1}{2}, \tilde{\gamma})$, 50-plus control for all $\gamma^* \in [\tilde{\gamma}, \bar{\gamma})$, and outright majority control by A for $\gamma^* \geq \bar{\gamma}$.*

If $\hat{\gamma} \geq \bar{\gamma}$, 50-plus ownership is never optimal so that the parents choose joint control for $\gamma^ \in [\frac{1}{2}, \hat{\gamma})$ and outright majority control by A otherwise.*

Proof. See the Appendix. ■

The thresholds $\bar{\gamma}$ and $\hat{\gamma}$ derived in Lemmata 2 and 3 are both functions of the net social cost of control $d - \delta$. When these costs are not too important, Proposition 3 shows that a third control regime exists: 50-plus control combines equal return rights with control for the parent contributing the more valuable resource (A). Figure 4 illustrates how 50-plus control optimally re-equilibrates investment incentives when parents are mildly heterogeneous, i.e., for γ^* close to the outright majority threshold $\bar{\gamma}$. When the costs associated with control rights are large, only two control regimes exist because the overriding parent concern becomes either the large efficiency losses from majority control or the need to equalize contribution incentives.

Figure 5 depicts our main results and their testable implications that follow from the fact that optimal ownership arrangements vary with parent homogeneity γ^* and net control costs $d - \delta$. From a cross-sectional perspective, a wide set of parameters can generate the observed ownership

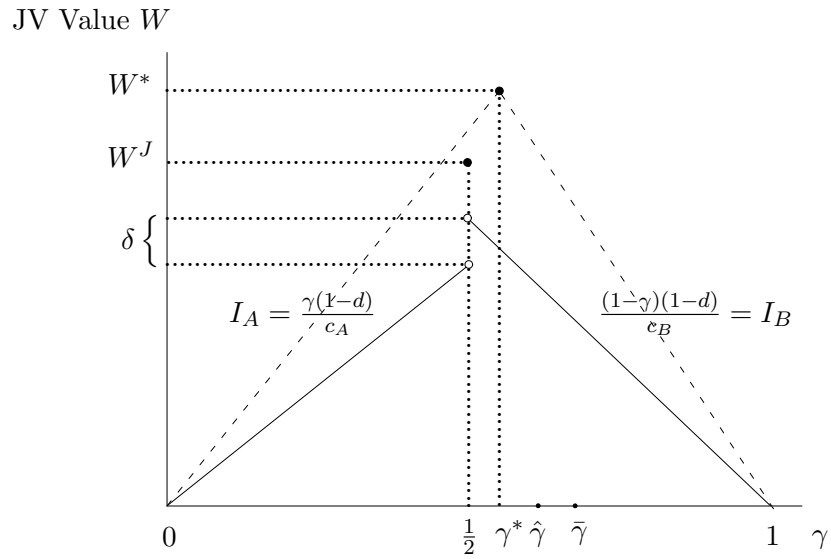


Figure 3: 50-50 Ownership Combining Symmetric Return and Control Rights

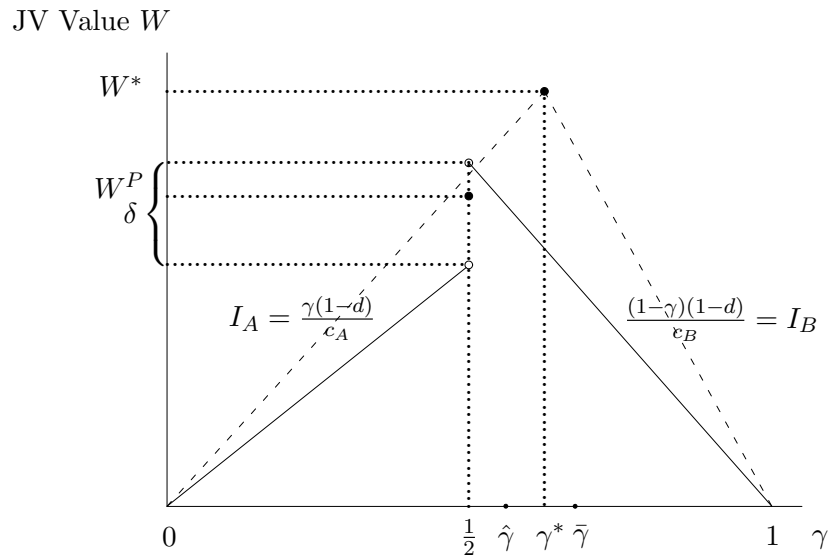


Figure 4: 50-plus Ownership with Symmetric Return but One-Sided Control Rights

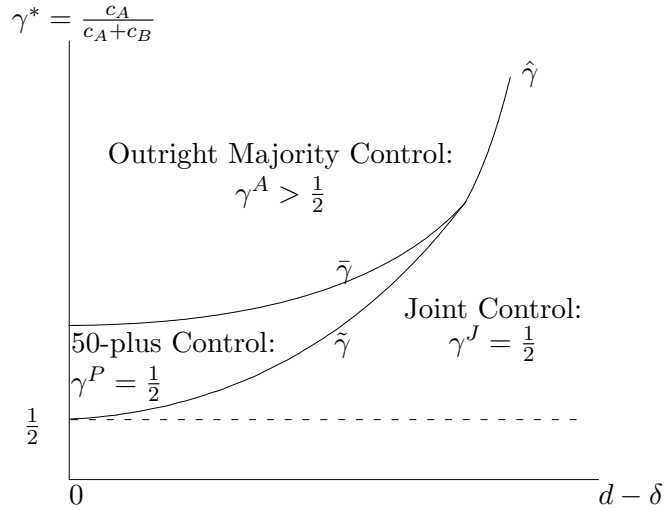


Figure 5: Ownership and Control

patterns. In particular, very different, possibly industry-specific combinations of parent attributes and net control costs give rise to the same optimal share allocation, which might account for the optimal clustering of ownership around 50-50. The key insight is that control rights associated with majority ownership lead to efficiency losses that equal shareholdings avoid.

The higher the net social cost of control, the more dissimilar the parties can be under 50-50 equity stakes in terms of cost attributes as in the case of the NUMMI 50-50 joint venture between Toyota and General Motors. This implication also explains our finding that dissimilar parents are as likely to form 50-50 joint ventures as their more homogenous peers (see Table 2 in Appendix C). Conversely, smaller social control costs imply that asymmetric control right allocations become more likely regardless of parent attributes so that 50-plus joint ventures are more frequent. As the parents become more heterogeneous, the optimal return allocation changes from 50-50 to asymmetric cash flow rights and outright majority control.

The analysis of the linear production function case in Appendix A establishes that strict resource complementarities are the underlying economic reason for the 50-plus regime. This arrangement disappears in their absence or, as Figure 5 shows, with high social costs of control. We should also point out that nothing in our specification precludes control benefits δ to outweigh costs d , i.e., $\delta > d$, so that one-sided control becomes socially desirable. In this situation, Lemma 3 and Proposition 3 imply that 50-plus ownership completely displaces the 50-50 regime. We would

expect this situation to arise in the presence of, for instance, beneficial R&D spillovers or learning of managerial techniques as exemplified by the 51-49 joint ventures between Sanofi S.A. and Sterling Drug Inc. (pharmaceuticals) or Nikko Securities and Salomon Smith Barney (financial services).

4.3 Managerial Agency Conflict

While 50-50 ownership and joint control can eliminate rent seeking activities through the threat of legal action, this ownership arrangement might give rise to other costs. For instance, the joint venture might suffer from ineffectual decision making or lack of oversight. Should the parent firms be unable to exercise effective control, the joint venture's management might be the inadvertent beneficiary. To explore the role of self-interested managers, we now add the joint venture's management as an additional player and potential source of conflict to our model.¹¹

Suppose that management can appropriate a fraction $\mu > 0$ of the value created at a fractional cost $m > 0$ to the joint venture: diverting $\mu V(I_A, I_B)$ leaves $(1 - m)V(I_A, I_B)$ for distribution to the parents. Such value diversion might take the form of shirking, negative NPV project selection, etc. whose private value to managers is $\mu V(I_A, I_B)$. We would expect this situation to occur under joint control (50-50) for which the parent firms are busy monitoring each other instead of management. If one partner had outright control ($k = A, P$), the threat to its private benefits should induce it to monitor or enforce managerial incentives. In this case, management colludes in the diversion of a fraction δ of the JV value to the controlling party so that we are back in the setting of Section 4.2.

Since control provides incentives for effective monitoring, the previous characterization of the control arrangements (Proposition 3) remains unchanged. However, the presence of managerial agency conflict changes the distribution of 50-50 and 50-plus in the critical region $(\frac{1}{2}, \bar{\gamma})$ defined in Lemma 2. We now derive the new joint control threshold $\hat{\gamma}_m$ in terms of parent homogeneity γ^* . 50-50 ownership and joint control in the face of managerial agency conflict is still preferable to control by A if $(1 - m)^2 W^J > W^A$. Proceeding as in the proof of Lemma 3, we obtain the new threshold $\hat{\gamma}_m$ as

$$\hat{\gamma}_m = (1 - m) \frac{(1 - m) + \sqrt{(1 - m)^2 - (1 - d + \delta)^2}}{2(1 - d + \delta)^2}$$

¹¹For an analysis of the organizational choice of corporate cooperation in terms of the intensity of managerial agency conflict and the partners' monitoring capabilities, see Rey and Tirole (2001).

so that parents choose joint control for all $\gamma^* < \hat{\gamma}_m$.

We immediately see that managerial moral hazard reduces the range of relative resource costs γ^* for which joint control is optimal: $\hat{\gamma}_m < \hat{\gamma}$. If the new threshold falls into the critical region ($\hat{\gamma}_m < \bar{\gamma}$), which is now more likely, parents have more reason to choose 50-plus control. Supervising management creates more value than the adverse investment incentives of one-sided control destroys. Note that the likelihood of 50-plus control increases in the cost of managerial agency conflict (increase in m) and decreases in the net control costs $d - \delta$ because of the governance improvements it offers.¹² As agency costs m approach net control costs $d - \delta$, the threshold $\hat{\gamma}_m$ converges to $\frac{1}{2}$ and 50-plus control completely displaces 50-50 ownership and joint control.

5 Methodology and Data Description

In preparation for our cross-sectional analysis of ownership determinants, we next describe the data set and methodology we use to relate our theoretical results to the empirical evidence.

5.1 Methodology

Joint venture partners trade off gains from resource complementarities with agency conflicts, investment incentives and control costs. From their shareholders' perspective, parent firms should only participate if the joint venture creates value net of resource and agency costs. If so, we would expect their share prices to show a positive abnormal return reaction to the announcement of the formation of one or more joint ventures. To verify such announcement effects, we conduct an event study following standard methodology.

We compute daily abnormal returns using a linear market model for the normal stock returns that we estimate with a correction for non-synchronous trading effects. For comparability between US and non-US parents, we take the S&P 500 index as the US market portfolio and similarly widely accepted foreign stock market indices. Our estimation window ranges from 280 to 50 days prior to the joint venture announcement while the event window stretches from 20 days before to 20 days after the announcement date.

¹²An implication of this result is that differences in the severity of managerial agency conflicts might explain the much higher frequency of 50-plus control in European joint ventures (see Table 1).

To relate theory to evidence, we use the cumulative abnormal wealth created by joint venture announcements $w_i, i = A, B$ that, under the assumption of informationally efficient markets, should correspond to parent i 's expected payoff W_i . We estimate parent wealth gains as

$$w_i(\tau_1, \tau_2) = \widehat{CAR}_i(\tau_1, \tau_2) \cdot K_{i-21} \quad (7)$$

where K_{i-21} and $\widehat{CAR}_i(\tau_1, \tau_2)$ are firm i 's market capitalization on the eve of the event period and its cumulative abnormal return over the event window τ_1 to τ_2 , respectively.¹³

Recall that optimal ownership arrangements depend on the relative resource cost γ^* (see Figure 5) that can also be thought of as a measure of parent similarity. To establish a direct link between our model predictions and cross-sectional evidence, we recover this unobservable cost parameter in terms of observable parent wealth gains in equation (7) for a given control regime k .

Proposition 4 *The relative cost parameter γ^* can be estimated in terms of observed cumulative wealth gains $w_i(\tau_1, \tau_2)$ for control regimes $k = A, J, P$ as $\hat{\gamma}^*(k)$ where*

$$\begin{aligned} k = A : \hat{\gamma}^*(A) &= \frac{w_A(\tau_1, \tau_2)}{w_A(\tau_1, \tau_2) + w_B(\tau_1, \tau_2)} \\ k = J : \hat{\gamma}^*(J) &= \frac{w_A(\tau_1, \tau_2)}{3w_A(\tau_1, \tau_2) - w_B(\tau_1, \tau_2)} \\ k = P : \hat{\gamma}^*(P; z) &= \frac{(2+z)w_B(\tau_1, \tau_2) - w_A(\tau_1, \tau_2)}{(3+z)w_B(\tau_1, \tau_2) - w_A(\tau_1, \tau_2)}, \quad z = \frac{4\delta}{1-d} > 0 \end{aligned} \quad (8)$$

Furthermore, the relative size of observed wealth gains and ownership stakes identify parents as A or B in each joint venture.

Proof. See the Appendix. ■

The second determinant of optimal ownership structures are the net social costs of control. Although we cannot directly measure these largely unobservable costs, we develop the following proxy. We first classify parents and joint ventures in terms of their relatedness by two-digit Standard Industry Classification (SIC) codes (related if they share the same two-digit code) and national

¹³Working with cumulative wealth instead of abnormal returns has the additional benefits that we can easily aggregate wealth effects and avoid size related biases.

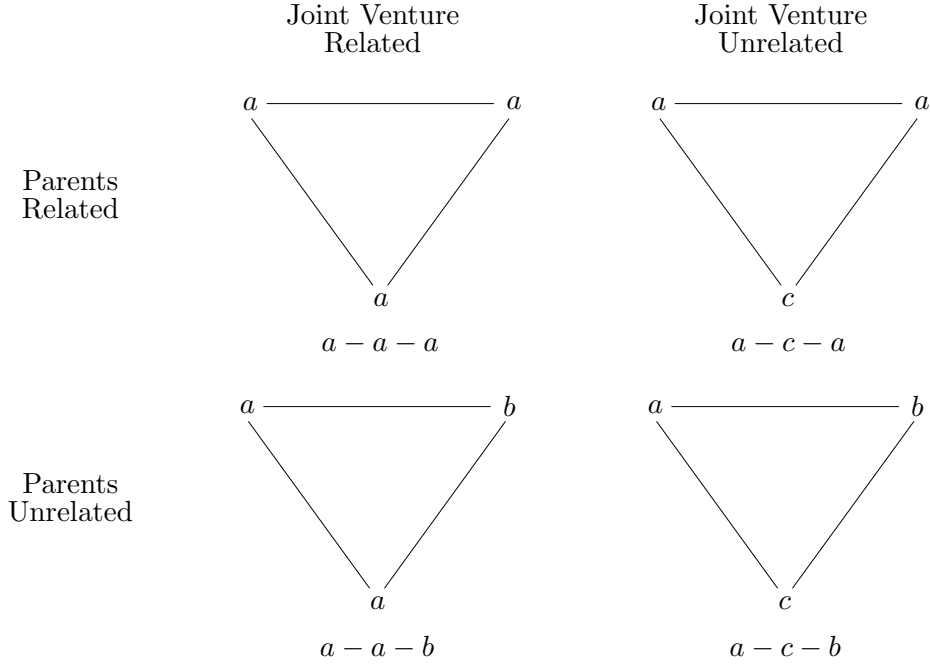


Figure 6: Classification Matrix for Joint Venture - Parents Relatedness

origin (headquarters in the same country) to gauge the scope for parent conflict and value diversion (see Figure 6). Our measure of scope for value diversion is then a binary variable for joint ventures of the type $a - a - b$ (unrelated parents, one parent related to the JV). A parent from the same industry or country (US) as the joint venture should be able to more easily extract private benefits because detecting and preventing such value diversion is presumably harder for its partner who, coming from a different industry or country, might not be as well versed in the “tricks of the trade.”

This proxy for residual benefit extraction in terms of SIC code or national origin (denoted by $SICaab$ and $NATaab$, respectively), and the expressions for γ^* in equation (8) allow us to test model predictions regarding ownership structure on the basis of estimates of parent attributes and observed control regime.

5.2 Data Description

We start with our sample of US joint ventures announced between January 1985 and 2000 drawn from the Joint Ventures and Strategic Alliances database of Thomson Financial Securities Data. If parents announce other joint ventures during the event window, we only include the first one. For joint ventures with at least one publicly traded parent we match venturers with stock price and

other financial information from the FactSet database family, whenever available. To improve the data quality, we verify and correct these data points with information obtained by electronically searching news wires around announcement dates. In case of conflicts, we delete the questionable observations which leaves a total of 1,248 joint venture announcements with 1,545 parent companies.

Given our focus on two-parent joint ventures, we extract a further sample of joint ventures whose parents are both publicly traded companies (297 joint ventures with 594 parent observations). We also exclude 22 contaminated observations for which at least one parent had other news reported in the three-day window around the announcement date in some of the analyses and report results for the full and noncontaminated samples in case of significant differences.

Table 1 in Appendix C indicates that ownership patterns in our samples closely correspond to the ones observed in the larger data sets: about two thirds of parents hold 50% equity stakes and share control. From Table 3 we see that, on the basis of SIC codes, most joint ventures occur in Transportation, Communications, Gas, Electricity, Manufacturing, Wholesale Trade, and Services.

Parent firm characteristics vary quite substantially (see Table 4). On average, parent firms tend to be large in terms of market value (\$7.18b), assets (\$13b), sales (\$11.7b) and number of employees (96,189) which, in light of our focus on publicly traded companies, is hardly surprising. However, a wide range of firms is represented: the largest parent counts 813,000 employees (GM in 1988), the smallest one 34 (Cyanotech in 1994). Table 5 shows that the vast majority of venturers are American companies (73%), followed by Japanese (14%), British and Canadian parent firms.

6 Empirical Evidence

In this section, we summarize our empirical findings and test model predictions.

6.1 Shareholdings and Wealth Creation

Table 6 in the Appendix provides mean daily and cumulative abnormal returns that highlight the value created by joint venture announcements for their parents. About 53% of cumulative return reactions are positive. Their means range from $CAR(-1, 0) = 0.668\%$ to $CAR(-2, 2) = 0.672\%$ in the full sample, and are highly significant (P values of below 0.0009). The results are even more pronounced in the noncontaminated two-parent subsample that is presumably informationally more

efficient. Cumulative abnormal return means rise to $CAR(-1, 0) = 0.957\%$ and $CAR(-2, 2) = 1.141\%$ with P values of 0.0000. These abnormal returns translate into annualized returns of 62.5% (two-day window for the full sample) to 177.9% (five-day window for the non-contaminated two-parent subsample).

Our findings are broadly in line with the results of earlier studies on the announcement effect of joint ventures. McConnell and Nantell (1985) report a mean cumulative abnormal return for the two-day window from -1 to 0 of 0.73% while Johnson and Houston (2001) find two-day mean cumulative abnormal returns of 1.67%. Mohanram and Nanda (1998) report a mean cumulative abnormal return of 0.49% for the three-day window ranging from -1 to 1 .¹⁴

To see the economic significance of our cumulative abnormal returns, consider the implied wealth effects. Table 7 shows that joint venture announcements create abnormal wealth gains that average between \$45 to \$60 million in the two-parent sample. Our results also suggests that 50-50 joint ventures create among the most wealth for their parents' shareholders over the two-day window from -1 to 0 . Wealth creation generally increases in equity stakes so that, on average, the majority owner experiences larger wealth gains than the minority one, which is consistent with our model (Table 7: two-day window).

Figure 5 suggests a simple test of our model. Regardless of control costs or benefits, the parent homogeneity measure γ^* should be larger for joint ventures with outright majority control than for 50-50 ones. From its estimate $\hat{\gamma}^*(k)$ (see Proposition 4), we can easily construct a one-sided test of this prediction. Table 8 reports the test results for various subsamples with different outlier corrections.¹⁵ Since the P value of the relevant test statistic is 0.0000 for all subsamples, we decisively reject the null hypothesis that γ^* is invariant. Hence, we can conclude that partner attributes in majority-controlled joint ventures are more heterogeneous than in 50-50 ones, as predicted by our model. We also test the model prediction that $\gamma^*(J)$ is close to $\frac{1}{2}$, and find that we cannot reject the null hypothesis $\gamma^*(J) = \frac{1}{2}$, which is, once again, consistent with our model (see Table 8).

¹⁴Our results also correspond to the announcement effects of other forms of corporate cooperation. In a study of announcements reactions to non-equity strategic alliances, thus excluding joint ventures, Chan *et al.* (1996) find an average two-day cumulative abnormal return of 0.82%. Similarly, Johnson and Houston (2000) find two-day average cumulative returns of about 0.73% for announcements of contractual cooperation.

¹⁵Essentially, we control for joint ventures in which both parent wealth gains are very small (or different in sign) so that the relative cost measure $\hat{\gamma}^*(k)$ becomes very large and falls significantly outside the required interval $(0, 1)$.

6.2 Determinants of Ownership Allocation

In light of our three distinct control regimes, it seems natural to specify a discrete choice model of joint venture ownership. It is well known that such specifications arise from latent variables which, in our case, is the value of the joint venture under an optimal ownership structure given the parents' attributes and the net social costs of control. Hence, we let the probability that joint venture j adopts a particular control regime $k = A, J, P$ be governed by

$$\Pr\{REGIME_j = k\} = \Lambda \left(\beta_{1k} \hat{\gamma}^*(k; z)_j + \beta_{2k} LEV_j + \sum_{l=3}^6 \beta_{lk} RELxxx_j^l \right) \quad (9)$$

where Λ is the logistic distribution function, $\hat{\gamma}^*(k; z)_j$ corresponds to our parent homogeneity measure $\hat{\gamma}^*(k)$ derived in Proposition 4, LEV_j is a binary variable indicating leverage of the JV, and $RELxxx_j^k$ a set of four binary SIC or nationality relatedness variables defined by the classification scheme in Figure 6 (e.g., $SICaaa_j$, $SICaca_j$, $SICaab_j$, $SICacb_j$). Of particular importance are the relatedness variables $SICaab_j$ and $NATAab_j$ that identify joint ventures with especially large potential for value diversion.

We estimate the multinomial discrete choice model in equation (9) by full-information Maximum Likelihood. Since the likelihood of observing the 50-plus regime ($k = P$) also depends on the parameter z , we conduct a grid search over z to maximize the log-likelihood function in the subsequent estimation. We use our full two-parent sample but exclude 8 outliers.¹⁶

In light of our theoretical results as summarized by Figure 5 or Proposition 3, we would expect that less homogeneous parents (high γ^*) are less likely to adopt 50-50 ownership and joint control. At the same time, they should be more likely to opt for one-sided control and, specifically, outright majority ownership ($k = A$). Conversely, we should see that joint ventures with large value extraction potential (type $a - a - b$) are more likely to opt for 50-50 ownership and less frequently adopt one-sided control. Hence, we can test our central model predictions in terms of the marginal effect of $\hat{\gamma}^*(z)_j$ on the likelihood of the three ownership regimes: negative for joint control, positive for 50-plus, positive and larger for outright majority control. The corresponding empirical implications for our control cost proxies $SICaab_j$ or $NATAab_j$ require that their marginal effects be positive

¹⁶For these observations, wealth effects are so close to 0 that $\hat{\gamma}^*(k; z)$ falls outside the interval $(-5, 5)$. Since the estimation results are virtually identical for the noncontaminated sample we do not report them.

for 50-50 joint ventures and negative for those with 50-plus or outright majority control.

Both specifications reported in Table 9 show that the $\hat{\gamma}^*(k; z)$ coefficients come out highly significant. More importantly, the marginal effects of the parent homogeneity measure $\hat{\gamma}^*(k)$ correspond exactly to our model predictions. The highly significant negative marginal effect of $\hat{\gamma}^*(z)_j$ in the joint control equation means that the likelihood of observing 50-50 ownership decreases in γ^* , i.e., more heterogeneous parents are less likely to choose joint control. At the same time, the equally significant positive marginal effects of $\hat{\gamma}^*(k; z)$ in the 50-plus and outright majority regime equation indicate that more dissimilar parents are more likely to adopt one-sided control.

We also find that $SICaab_j$ as a proxy for control effects exhibits the predicted marginal effects on ownership choice. Joint ventures with a large potential for value diversion are more likely to have 50-50 shareholdings and joint control, while 50-plus and outright majority control become less likely. This finding is all the more important that $SICaab_j$ is the only relatedness dummy that is statistically significant across all three ownership regimes. Finally, its coefficient has the largest marginal effect in absolute terms in both the equation for 50-50 and outright majority control among the relatedness variables. The results in terms of national origin confirm these control right effects. We interpret our findings on the marginal effects of parent homogeneity and relatedness as strong evidence in favor of our model.

Our model also implies that the larger the potential for value extraction, the more heterogeneous the parents will be under 50-50 ownership. After adding the interactive variable $\hat{\gamma}^*(k; z)_j \cdot SICaab_j$ to the specification in equation (9), we obtain estimates of marginal effects that are consistent with this prediction (Table 10). For joint ventures susceptible to value diversion ($SICaab_j = 1$), parent heterogeneity ($\hat{\gamma}^*(k; z)$) leads to a significantly smaller reduction in the likelihood of adopting 50-50 ownership. Hence, parents in 50-50 joint ventures with large potential control benefits tend to be more dissimilar. Furthermore, we see that the likelihood of observing 50-plus ownership for heterogeneous parents falls when there is considerable scope for value diversion.

Our results reveal a further interesting marginal effect related to the leverage of joint ventures (about 35% of our two-parent observations). We find that the presence of debt increases the likelihood of adopting 50-50 ownership but decreases it for 50-plus and majority controlled joint ventures (Tables 9 and 10). US GAAP might offer an explanation for this finding. Parents holding

majority stakes have to fully consolidate the joint venture and recognize its liability on their balance sheets in case they guarantee the debt. Unfortunately, our data does not distinguish between guaranteed and nonguaranteed debt so that we cannot further analyze debt-related effects.

6.3 Wealth Effects of Contingent Ownership

It is well known that pure equity arrangements will rarely induce efficient investment between partners in the presence of costly private control benefits.¹⁷ However, there are special circumstances in which contingent ownership arrangements can overcome this problem. For instance, Nöldeke and Schmidt (1998) and Chemla, Habib and Ljungqvist (2001) have suggested the use of sell-out or buy-out options when the parent contributions differ in time or observability. Options can internalize the consequences of control by the dominant party without destroying the partner's investment incentives if, at the time of exercise, the continued investment of one parent is no longer needed.

Explicit provisions for buyout or sellout options are not only evidence of the importance of contractual incompleteness, but also signal that the partners are able to define its nature and duration. Indeed, our sample shows both buyout activity (3.77% and 4.71% for the full and two-parent samples, respectively) and the presence of explicit options to buy out the partner (2.88% and 4.38% for the full and two-parent samples, respectively). Bleeke and Ernst (1991) also report that partners tend to buy out each other. Using our data, we test whether contingent ownership of joint ventures implemented through options improves welfare and is, hence, socially desirable.

Analyzing a subsample of 36 US joint ventures with reported buyout options we find mean cumulative abnormal returns that are substantially higher than for our full US joint venture samples (see Table 11). They range from means of $CAR(-1, 0) = 1.033\%$ to $CAR(-5, 5) = 3.696\%$ as compared to the earlier reported abnormal return means of $CAR(-1, 0) = 0.668\%$ or $CAR(-5, 5) = 0.908\%$ for all joint ventures with at least one publicly traded parent (Table 6).

To verify that these surprisingly strong return reactions are not an artifact of our relatively small sample, we also report the results for a sample of 187 parent firms of worldwide joint ventures with buyout option provisions (including our US sample) in the Thomson Financial Securities Data database. It emerges that worldwide mean cumulative abnormal returns are very comparable

¹⁷See Grossman and Hart (1986).

averaging between 1.896% and 2.947% over 2 and 11 day windows, respectively. They are also statistically highly significant which is unsurprising in light of the larger sample size. On an annualized basis, these numbers translate into abnormal returns ranging from 162% to 2,980%. Hence, the market seems to recognize the positive effects of options in terms of their incentive benefits, their role in overcoming contractual incompleteness, and their ability to constrain rent seeking behavior by the parent companies.

7 Conclusion

This paper develops a simple theory of ownership and control in joint ventures and provides empirical evidence on their determinants. In designing optimal equity allocations, parent firms trade off incentives arising from ownership with disincentives stemming from the extraction of control benefits in the presence of synergies. This trade-off echoes long-standing ideas going back to Jensen and Meckling (1976) and Fama and Jensen (1985) that the need for appropriate incentives determines a firm's capital structure and, indeed, organizational form. We find that the same principles guiding organizational and financial design within the firm also apply across firms.

According to well-known views of the firm, companies define their boundaries by the need to assert property rights over assets (see Grossman and Hart, 1986, or Baker, Gibbons and Murphy, 2001). However, the underlying idea of exclusive ownership of and control over resources proves to be elusive when more than just one firm requires incentives (see Zingales, 2000). We show how the need for two-sided incentives shapes the organization of inter-firm cooperation so as to overcome problems of moral hazard in joint production at a firm's periphery. When firms' resources are highly complementary, ownership alone suffices to induce first-best incentives and, hence, value creation by eliminating typical free-riding in joint production. But only joint ventures offer the incentive benefits of explicit ownership which might explain their popularity as an organizational choice for strategic alliances.

However, common ownership also implies shared control over assets with all the costs and benefits that compromises on the exclusive use of resources typically entail. In the case of joint ventures, we argue that the more important concerns about control rights become, the more frequently will parent firms adopt 50-50 ownership. The underlying rationale is that residual benefits derived

from control rights can lead to distortions in parent incentives that equal ownership stakes avoid. Our central result shows that very different, possibly industry- or firm-specific combinations of parent attributes and costs associated with unilateral control can lead to the optimal clustering of ownership at 50-50 and 50 plus one share equity allocations.

We empirically verify this insight by analyzing the determinants of joint venture ownership. The results identify proxies for parent similarity in terms of resource costs and for the potential of value extraction by a controlling firm as the driving forces behind the choice of control regime. Furthermore, their marginal effects conform precisely to our theoretical predictions. In the presence of relatively minor control costs, even very heterogeneous parents will optimally choose equal ownership stakes. We interpret these findings as strong empirical support for our model and, in particular, our contention that small frictions arising from the one-sided nature of control suffice to generate the observed ownership patterns.

Our results also identify avenues for future research. For instance, one can use our framework to structurally estimate the value of control rights taking into account that firms design their cooperation to minimize potential losses from inefficient ownership arrangements. With information on the parents' contributions, their cost, or the joint venture's asset value, we could derive expected wealth gains directly from the data and the relevant model parameters. A comparison with realized abnormal wealth effects would then yield a measure of the efficiency losses due to control rights. Furthermore, our findings on contingent ownership arrangements and the role of debt in joint venture finance, while exploratory in nature, suggest that other instruments besides equity play a role in their financial and organizational design. However, such an analysis would require a dynamic model of joint venture design, pointing to several possible extensions of our framework to investigate the inter-temporal aspects of corporate cooperation.

Appendix

A Linear Production Function

To show that our main results do not depend on strict resource complementarities or a particular production function, we replicate the analysis for the linear production function (perfect input substitutability) which is the polar opposite to the Leontief specification within the CES class of production functions.¹⁸

We first investigate moral hazard in joint production. Consider our familiar value maximization problem $W(I_A, I_B) = V(I_A, I_B) - \frac{c_A}{2} I_A^2 - \frac{c_B}{2} I_B^2$ with $V(I_A, I_B) = a_A I_A + a_B I_B$ in the absence of control costs or benefits $d = 0 = \delta$. Replicating the analysis in Section 3.2, we obtain first-best parent contributions as $I_i^* = \frac{a_i}{c_i}$. Introducing ownership γ the incentive compatibility conditions for the parents become $I_i = \gamma_i \frac{a_i}{c_i}$, $i = A, B$ and A 's first-best equity stake $\gamma^* = \frac{a_A}{c_A} \left(\frac{a_A}{c_A} + \frac{a_B}{c_B} \right)^{-1}$. Comparing the optimal private investment levels to the socially optimal ones we immediately see that $I_i = \gamma_i \frac{a_i}{c_i} < \frac{a_i}{c_i} = I_i^*$ since $0 < \gamma_i^* < 1$. Both parents will underinvest relative to the first best so that the familiar free-riding problem in joint production arises when resources are substitutes.¹⁹

Now suppose, as before, that the majority owner can extract fractional benefits δ at a social cost of $d > \delta$ for $\gamma > \frac{1}{2}$. The joint net surplus of the partners as a function of ownership becomes

$$W = \begin{cases} \left\{ [\delta + \gamma(1-d)] \frac{a_A^2}{c_A} + (1-\gamma)(1-d) \frac{a_B^2}{c_B} \right\} (1-d+\delta) - \gamma^2 \frac{a_A^2}{c_A} - (1-\gamma)^2 \frac{a_B^2}{c_B} & \text{for } \gamma > \frac{1}{2} \\ \frac{a_A^2}{2c_A} + \frac{a_B^2}{2c_B} - \frac{a_A^2}{4c_A} - \frac{a_B^2}{4c_B} & \text{for } \gamma = \frac{1}{2} \end{cases}$$

Let A again contribute the more valuable resource, i.e., $\frac{a_A}{c_A} > \frac{a_B}{c_B}$ with $\gamma^* > \frac{1}{2}$. Joint control is preferred if $W^J > W^A(\gamma)$ so that we can characterize the relevant cost parameter region by

$$\frac{a_A^2}{4c_A} + \frac{a_B^2}{4c_B} > \left([\delta + \gamma(1-d)] \frac{a_A^2}{c_A} + (1-\gamma)(1-d) \frac{a_B^2}{c_B} \right) (1-d+\delta) - \gamma^2 \frac{a_A^2}{c_A} - (1-\gamma)^2 \frac{a_B^2}{c_B}.$$

Such a region exists for a wide range of parameters, notably if parent contributions $\frac{a_i^2}{c_i}$ are similar in total value, because majority control entails deadweight loss (shirking, contribution disincentives). Hence, we obtain our familiar joint (50-50) and outright majority control regimes.

Contrary to the Leontief technology, 50-plus control does not exist under perfect resource substitutability (linear production). This regime could only exist if two conditions were to hold: first, we require $W^J < W^A(\frac{1}{2})$, i.e., majority control evaluated at $\gamma = \frac{1}{2} + \varepsilon$,

$$\frac{a_A^2}{2c_A} + \frac{a_B^2}{2c_B} > \left(\left[\delta + \frac{(1-d)}{2} \right] \frac{a_A^2}{c_A} + \frac{(1-d)}{2} \frac{a_B^2}{c_B} \right) (1-d+\delta); \quad (10)$$

second, it must be true that outright majority ownership does not increase joint surplus further

¹⁸For $a_0 = 0, a_A = 1 = a_B$ the CES production function $f(I_A, I_B) = (a_0 + a_A I_A^\rho + a_B I_B^\rho)^{\frac{1}{\rho}}$ assumes the familiar Leontief form $f(I_A, I_B) = \min\{I_A, I_B\}$ as $\rho \rightarrow -\infty$ so that the constant elasticity of input substitution $\sigma = \frac{1}{\rho-1} \rightarrow 0$. For $a_0 = 0$ and $\rho \downarrow 1$ the CES function becomes linear and the elasticity of substitution $\sigma = \frac{1}{\rho-1} \rightarrow \infty$.

¹⁹In fact, underinvestment will take place for any production function with input substitutability, e.g., Cobb-Douglas in the CES class, but not for those with strict input complementarity such as the Leontief specification.

under one-sided control, i.e., $\frac{dW^A(\gamma)}{d\gamma} \leq 0$ evaluated at $\gamma = \frac{1}{2}$:

$$\left((1-d)\frac{a_A^2}{c_A} + (1-d)\frac{a_B^2}{c_B} \right) (1-d+\delta) - \frac{a_A^2}{2c_A} + \frac{a_B^2}{2c_B} \leq 0 \quad (11)$$

It is easy to verify that equation (10) can only hold if $\frac{a_A^2}{c_A} > \frac{a_B^2}{c_B}$ whereas equation (11) can only be true if $\frac{a_A^2}{c_A} \leq \frac{a_B^2}{c_B}$, establishing the contradiction.

The intuition behind this result is that 50-plus control can only arise if a further increase in the shareholdings of the controlling parent A would reduce value creation because the minority partner becomes the critical resource constraint. But if the firms' contributions are strongly substitutable, such a resource constraint will not exist. We interpret this last result as a further indication for the importance of resource complementarities (synergies) in the inception and design of joint ventures. Not only do they reduce deadweight losses from free-riding in joint production, they also justify the empirical observation of a cluster point at 50-plus ownership. Our findings also hint at the choice of organizational form for strategic alliances. The more complementary resources are, the more frequently should partners choose joint ventures.

B Proofs

Let $\gamma_i^k, k = A, J, P$ denote i 's ownership stake under outright majority (A), joint, and 50-plus control, respectively ($\gamma_A^k + \gamma_B^k = 1$), W^k the joint venture's surplus, and W_i^k i 's net JV profits.

Proof of Lemma 1. Given their shares, the parties will contribute investments I_A and I_B to the joint venture that maximize their net returns $V_A = \gamma V(I_A, I_B) - \frac{c_A}{2} I_A^2$ and $V_B = (1-\gamma)V(I_A, I_B) - \frac{c_B}{2} I_B^2$, respectively. The corresponding first order conditions yield incentive compatible investment levels

$$I_A = \frac{\gamma}{c_A} \quad \text{and} \quad I_B = \frac{1-\gamma}{c_B}$$

To find the optimal shareholdings, we maximize the joint venture's value with respect to γ subject to the preceding incentive constraints, i.e.,

$$\begin{aligned} & \max_{\gamma} \left\{ \min \{I_A, I_B\} - \frac{c_A}{2} I_A^2 - \frac{c_B}{2} I_B^2 \right\} \\ & \text{subject to } I_A = \frac{\gamma}{c_A} \quad \text{and} \quad I_B = \frac{1-\gamma}{c_B} \end{aligned}$$

which becomes upon substitution of the incentive compatibility conditions

$$\max_{\gamma} \left\{ \min \left\{ \frac{\gamma}{c_A}, \frac{1-\gamma}{c_B} \right\} - \frac{c_A}{2} \left(\frac{\gamma}{c_A} \right)^2 - \frac{c_B}{2} \left(\frac{1-\gamma}{c_B} \right)^2 \right\}.$$

At an optimum, resources will be used efficiently, i.e. the partners' incentive compatible contributions coincide, $I_A = \frac{\gamma}{c_A} = \frac{1-\gamma}{c_B} = I_B$. First-best shareholdings follow as

$$\gamma^* = \frac{c_A}{c_A + c_B}, \quad 1 - \gamma^* = \frac{c_B}{c_A + c_B}. \quad \blacksquare$$

Proof of Proposition 1. The result is a consequence of Lemma 1. Given optimal ownership stakes $\gamma^* = \frac{c_A}{c_A + c_B}$, we have from the incentive compatibility constraints (1) that $I_A^* = \frac{\gamma^*}{c_A} = \frac{1}{c_A + c_B} =$

$\frac{1-\gamma^*}{c_B} = I_B^*$ so that the partners' contribute first-best resource levels. The JV's net equilibrium value becomes $W(\gamma^*) = \frac{1}{2} \frac{1}{c_A+c_B}$, which is exactly the first best value of the firm, W^* . Since the net value of the parents' respective stakes are $W_i(\gamma^*) = \frac{1}{2} \frac{c_i}{(c_A+c_B)^2} > 0$, this solution satisfies the participation constraints, too. ■

Proof of Proposition 2. The JV's output V^A under control by A follows from the joint production function as

$$V^A(\gamma) = \min \left\{ \frac{\delta + \gamma(1-d)}{c_A}, \frac{(1-\gamma)(1-d)}{c_B} \right\}.$$

By assumption, A constrains total output to $V^A(\gamma) = \min \left\{ \frac{\delta + \gamma(1-d)}{c_A}, \frac{(1-\gamma)(1-d)}{c_B} \right\} = \frac{\delta + \gamma(1-d)}{c_A}$. Choosing A 's stake so that investment incentives are equalized, i.e.,

$$\frac{\delta + \gamma(1-d)}{c_A} = \frac{(1-\gamma)(1-d)}{c_B},$$

and solving for γ yields the (second-best) optimal ownership distribution under control by A : $\gamma^A = \frac{(1-d)c_A - \delta c_B}{(1-d)(c_B + c_A)} = \gamma^* - \frac{\delta}{(1-d)}(1 - \gamma^*)$. ■

Proof of Lemma 2. Suppose that γ^* is sufficiently close to $\frac{1}{2}$ so that granting control to A would constrain the JV output to

$$V^A(\gamma) = \min \left\{ \frac{\delta + \gamma(1-d)}{c_A}, \frac{(1-\gamma)(1-d)}{c_B} \right\} = \frac{(1-\gamma)(1-d)}{c_B}$$

for $\gamma \in (\frac{1}{2}, \gamma^*)$. Control by A under $c_A > c_B$ is optimal as long as there exists $\gamma \geq \frac{1}{2}$ such that both partners have equal investment incentives, $\frac{\delta + \gamma(1-d)}{c_A} = \frac{(1-\gamma)(1-d)}{c_B}$. But, this is only possible if

$$\frac{\delta + \frac{1}{2}(1-d)}{c_A} \leq \frac{\frac{1}{2}(1-d)}{c_B}. \quad (12)$$

Simple algebraic manipulation using $\gamma^* = \frac{c_A}{c_A+c_B}$ now yields the critical threshold $\bar{\gamma} = \frac{(1-d)/2+\delta}{1-d+\delta}$ so that for $\gamma^* > \bar{\gamma}$ optimal asymmetric equity stakes γ^A (see Proposition 2) are feasible while for $\frac{1}{2} < \gamma^* < \bar{\gamma}$ equation (12) is violated and B indeed contributes less. ■

Proof of Lemma 3. Let γ' denote the equity allocation that would equalize investment incentives if A held all control rights regardless of her equity stake, i.e. $\frac{\delta + \gamma'(1-d)}{c_A} = \frac{(1-\gamma')(1-d)}{c_B}$ for $\gamma' \in (0, 1)$. But then we have $W^A(\gamma') > W^A(\gamma)$ for any $\gamma \neq \gamma'$ and, in particular, $W^A(\gamma') > W^A(\frac{1}{2}) = W^P$, the JV's surplus under 50-plus ownership. Consequently, $W^A(\gamma')$ defines an upper bound for net joint venture surplus under any equity allocation different from joint ownership. Hence, we have to show that $W^J > W^A(\gamma')$ for all $\gamma^* < \hat{\gamma} = \frac{1 + \sqrt{1 - (1-d+\delta)^2}}{2(1-d+\delta)^2}$ to prove the lemma.

Consider the JV's net values for $\gamma = \frac{1}{2}$ and $\gamma = \gamma'$. Since $\gamma = \frac{1}{2}$ implies joint control and parent A makes the smaller contribution by $c_A > c_B$, we have $I_A = I_B = \frac{1}{2c_A}$ so that

$$W^J = \frac{1}{2c_A} - \frac{(c_A + c_B)}{2} \frac{1}{4c_A^2} = \frac{3c_A - c_B}{8c_A^2}. \quad (13)$$

For $\gamma = \gamma'$, contribution incentives are equalized so that $\frac{\gamma'(1-d)+\delta}{c_A} = \frac{(1-\gamma')(1-d)}{c_B}$. Solving out for

$\gamma' = \frac{(1-d)c_A - \delta c_B}{(1-d)(c_A + c_B)}$, we find $W^A(\gamma')$ as

$$W^A(\gamma') = (1-d+\delta) \frac{\gamma'(1-d) + \delta}{2c_A} = \frac{(1-d+\delta)^2}{2(c_A + c_B)}. \quad (14)$$

For $W^J \geq W^A(\gamma')$ to hold, we require from equations (13) and (14) with $\gamma^* = \frac{c_A}{c_A + c_B}$ and $\frac{c_B}{c_A} = \frac{1-\gamma^*}{\gamma^*}$ that

$$\frac{3}{4} - \frac{1}{4} \frac{1-\gamma^*}{\gamma^*} \geq (1+\delta-d)^2 \gamma^*$$

or, equivalently, $(1-d+\delta)^2 (\gamma^*)^2 - \gamma^* + \frac{1}{4} \leq 0$. Hence, $\hat{\gamma}$ is the root larger than $\frac{1}{2}$ of

$$(1-d+\delta)^2 \hat{\gamma}^2 - \hat{\gamma} + \frac{1}{4} = 0$$

yielding the threshold for joint control $\hat{\gamma}$ as

$$\hat{\gamma} = \frac{1 + \sqrt{1 - (1-d+\delta)^2}}{2(1-d+\delta)^2}.$$

By construction, we have $W^J > W^A(\gamma')$ for $\gamma^* < \hat{\gamma}$ and $W^J \leq W^A(\gamma')$ otherwise, establishing the result. ■

Proof of Proposition 3. Since the relative size of thresholds $\hat{\gamma}$ and $\bar{\gamma}$ determines the number of ownership regimes we take each case in turn.

Two regimes: $\hat{\gamma} \geq \bar{\gamma}$. By Lemma 3, parents prefer joint control for all $\gamma^* \leq \hat{\gamma}$; in the case of $\gamma^* > \hat{\gamma}$ outright majority control is feasible (by Lemma 2 since $\gamma^* > \bar{\gamma}$) and optimal (Lemma 3).

Three regimes: $\hat{\gamma} < \bar{\gamma}$. Lemma 3 establishes that, for all $\gamma^* > \bar{\gamma}$, outright majority control is optimal while 50-50 ownership is preferable for $\gamma^* < \hat{\gamma}$. In the remaining interval $[\hat{\gamma}, \bar{\gamma}]$, only 50-50 or 50-plus ownership are feasible by Lemma 2. So, consider

$$G(\gamma^*) := \frac{W^P(\gamma^*)}{W^J(\gamma^*)} = (1-d) \frac{4(1-d+\delta)(1-\gamma^*) - (1-d)}{4\gamma^* - 1} \frac{(\gamma^*)^2}{(1-\gamma^*)^2} \quad (15)$$

that results from dividing $c_A W^J$ (see equation (13)) into $c_B W^P = (1-d+\delta) \frac{1-d}{2} - \frac{(1-d)^2}{8(1-\gamma^*)}$ and rearranging. Clearly, $G(\gamma^*)$ is continuously differentiable on $[\hat{\gamma}, \bar{\gamma}]$. Furthermore, we have $G(\hat{\gamma}) < 1$, since, by Lemma 3, $W^J = W^A(\gamma') > W^P$ if $\gamma^* = \hat{\gamma}$, and, similarly, $G(\bar{\gamma}) > 1$ because Lemma 2 implies $W^P = W^A(\gamma'') > W^J$ if $\gamma^* = \bar{\gamma}$ for some γ' and γ'' equalizing incentives if A had control regardless of her equity stake equation (see Lemma 3). By the Intermediate Value Theorem, there exists at least one value $\tilde{\gamma} \in (\hat{\gamma}, \bar{\gamma})$ so that $G(\tilde{\gamma}) = 1$ or, equivalently, $W^P(\tilde{\gamma}) = W^J(\tilde{\gamma})$, which, if unique, is our desired threshold for 50-plus control. Hence, to complete the proof, we have to establish the uniqueness of $\tilde{\gamma}$ by showing that $\frac{dG}{d\gamma^*} > 0$ on $[\hat{\gamma}, \bar{\gamma}]$.

Differentiating (15) we obtain

$$\frac{dG}{d\gamma^*} = 2(1-d) \gamma^* \frac{12\gamma^*(1-d)(1-\gamma^*) + 2\delta(5\gamma^* - 2)(1-\gamma^*) - 3(1-d)}{(4\gamma^* - 1)^2 (1-\gamma^*)^3} \quad (16)$$

so that $\left. \frac{dG}{d\gamma^*} \right|_{\gamma^* = \frac{1}{2}} = 4\delta(1-d) > 0$ and $\left. \frac{dG}{d\gamma^*} \right|_{\gamma^* = \bar{\gamma}} = 4(1-d+2\delta) \delta \frac{(1-d+\delta)^2}{(1-d+3\delta)^2} > 0$ by condition (4),

i.e., $\delta > \frac{1}{2}d$, and $d, \delta \in (0, 1)$. Furthermore, $G(\gamma^*)$ has two extrema at $\gamma_{1,2}^* = \frac{6(1-d)+7\delta \pm \sqrt{9\delta^2+6\delta(1-d)}}{2(6(1-d)+5\delta)}$ which are simply the roots of the numerator in equation (16). It is easily verified that $\gamma_1^* < \frac{1}{2} < \bar{\gamma} < \gamma_2^*$ so that γ_1^* must be a minimum, γ_2^* a maximum and, hence, $\frac{dG}{d\gamma^*} > 0$ on $[\hat{\gamma}, \bar{\gamma}]$ establishing the uniqueness of the threshold $\tilde{\gamma}$. ■

Proof of Proposition 4. Under control by A , the net value of i 's equity stake is $W_i^A = (1 + \delta - d)^2 W_i^*$ for first-best JV value $W_i^* = \frac{1}{2}\gamma_i^* V^*$ so that $\frac{c_A^A}{c_B^A} = \frac{\gamma_A^*}{\gamma_B^*} = \frac{W_A^A}{W_B^A}$ and, hence, $\gamma^*(A) = \frac{W_A^A}{W_A^A + W_B^A}$. If markets are informationally efficient we can replace W_i^A with $w_i(\tau_1, \tau_2)$ in the expression while preserving the asymptotic distributional properties. Repeating the preceding argument for joint control, the net values of the equity stakes are $W_A^J = \frac{1}{8}\frac{1}{c_A}$ and $W_B^J = \frac{2c_A - c_B}{8c_A^2}$. Solving for the cost ratio $\frac{c_B^J}{c_A^J} = 2 - \frac{W_B^J}{W_A^J}$, we obtain $\gamma^*(J) = \frac{W_A^J}{3W_A^J - W_B^J}$ so that replacing W_i^J with $w_i(\tau_1, \tau_2)$ again yields the desired result.

For 50-plus control, we have $W_A^P = \frac{(1-d)}{2c_B} \left(\delta + \frac{1}{2}(1-d) \left(1 - \frac{c_A}{2c_B} \right) \right)$ and $W_B^P = \frac{(1-d)^2}{8c_B}$. Using $\frac{c_A}{c_B} = \frac{\gamma^*}{1-\gamma^*}$, we obtain

$$\frac{W_A^P}{W_B^P} = \frac{4\delta}{1-d} + 2 - \frac{\gamma^*}{1-\gamma^*}$$

which depends on the social cost term $\frac{4\delta}{1-d}$. Hence, we will parameterize our model to derive a closed form solution independent of the unobservable control costs and benefits. Let $\frac{4\delta}{1-d} = z$ for some parameter $z > 0$ so that $\delta = \frac{1-d}{4}z$. We then have that $\frac{W_A^P}{W_B^P} = z + 2 - \frac{\gamma^*}{1-\gamma^*}$ whence

$$\gamma^*(P) = \frac{(2+z)W_B^P - W_A^P}{(3+z)W_B^P - W_A^P}$$

which is greater than $\frac{1}{2}$ for $(1+z)W_B^P > W_A^P$. We need to verify that the parameter restrictions for δ, d and $\hat{\gamma} < \bar{\gamma}$ hold for some value of z . One condition that insures the existence of three control regimes is $d = \frac{21}{20}\delta, \delta > \frac{1}{8}$ while privately valuable control requires $\delta > \gamma d, \gamma \geq \frac{1}{2}$. However, it is easily verified that $\delta = 20\frac{z}{80+21z}, d = 21\frac{z}{80+21z}$ satisfy not only the three regimes and parameterization conditions but also the restriction for privately valuable control. Note that an estimate of z allows us to infer relative costs of control in the 50-plus regime as $\frac{\delta}{1-d} = \frac{z}{4}$.

The last part of the proposition is a simple consequence of the preceding expressions for parents' wealth gains from the joint venture. For outright control, we have $W_A^A = (1 + \delta - d)^2 \frac{1}{2}\gamma^* V^* > (1 + \delta - d)^2 \frac{1}{2}(1 - \gamma^*) V^* = W_B^A$ by $\gamma^* > \frac{1}{2}$. Similarly, for joint and 50-plus control we find $W_A^J = \frac{1}{8}\frac{1}{c_A} < \frac{2c_A - c_B}{8c_A^2} = W_B^J$ and $W_A^P > W_B^P$ by $c_A > c_B$, respectively. Replacing model quantities with observed ones again yields the desired result. ■

C Tables

Table 1: **Ownership Distribution in Two-Parent Joint Ventures**

“1 Public Firm” and “2 Public Firms” refer to two-parent joint ventures with at least one or two publicly traded parents, respectively, while “EU” indicates a comparator sample of two-parent European JVs.

Majority Stake (in %)	All US JVs		1 Public Firm: US		2 Public Firms: US		1 Public Firm: EU	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
50-50	1,931	71.04	1,296	67.78	193	64.98	1,257	62.72
50+ to 51	210	7.73	154	8.05	27	9.09	245	12.23
51+ to 60	192	7.06	150	7.85	30	10.10	151	7.53
60+ to 67	60	2.21	47	2.46	8	2.69	63	3.14
67+ to 75	135	4.90	106	5.54	17	5.72	160	7.98
75+ to 80	100	3.68	80	4.18	9	3.03	56	2.79
80+ to 90	57	2.10	43	2.25	9	3.03	33	1.65
90+ to 100	33	1.21	36	1.88	4	1.35	39	1.95
Total	2,718	100.00	1,912	100.00	294	100.00	2,004	100.00

Table 2: **Two-Parent Joint Venture Ownership Structure by Venturer Similarity**

We classify joint venture parents as similar (“Sim.”) if they belong to the same two-digit SIC code, are from the same country, or fall within 30% of the average of their market value, total sales or number of employees, and dissimilar (“Dissim.”) otherwise.

Parent Attribute	Two-digit SIC		National Origin		Market Value		Total Sales		Employees	
	Sim.	Dissim.	Sim.	Dissim.	Sim.	Dissim.	Sim.	Dissim.	Sim.	Dissim.
Joint ventures	45.1%	54.9%	44.4%	55.6%	29.2%	70.8%	30.0%	70.0%	13.9%	86.1%
of which:										
50-50	62.7%	66.9%	68.9%	61.8%	77.0%	59.8%	72.4%	61.6%	65.5%	65.4%
50-plus	7.5%	11.0%	6.8%	11.5%	5.4%	11.2%	5.3%	11.3%	3.4%	10.1%
Outright majority	29.9%	22.1%	24.2%	26.7%	17.6%	29.1%	22.4%	27.1%	31.0%	24.6%
Total	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

Table 3: **Industry Distribution of US Joint Venture Parents**

SIC Code 1 digit	Description	At least One Public Parent		Two Public Parents	
		Number	Frequency	Number	Frequency
4xxx	Transp., Comm., Gas, Elect.	484	31.33%	232	39.06%
3xxx	Manufacturing	269	17.41%	122	20.54%
5xxx	Wholesale Trade	198	12.82%	66	11.11%
8xxx	Services	173	11.20%	62	10.44%
7xxx	Finance, Insurance, Real E.	119	7.70%	24	4.04%
2xxx	Construction	108	6.99%	30	5.05%
6xxx	Retail Trade	72	4.66%	18	3.03%
1xxx	Mining	65	4.21%	22	3.70%
Others		57	3.69%	18	3.03%
Total		1,545	100.00%	594	100.00%

Table 4: **Parent Attributes in Two-Parent Sample: Averages by Stake**

Equity Stake (in %)	Market Value (in m)	Assets (in m)	Sales (in m)	Op. Cash Flow (in m)	Employees	Inside Owner- ship (in %)
0 to 20	6925.82	9325.23	11171.03	607.17	120784	13.06
20+ to 40	12034.38	20323.68	25112.38	1069.50	52257	18.93
40+ to 49-	4010.84	8970.65	8757.35	807.46	90717	8.07
49 to 50-	3479.06	17711.28	13971.93	427.59	29147	30.85
50-50	7081.46	12452.68	10449.81	706.42	103971	13.20
50+ to 51	6111.11	14717.78	9480.42	543.38	98693	12.31
51+ to 60-	3497.04	2417.33	2504.05	243.11	23138	2.84
60 to 80-	6427.70	12055.28	10007.32	565.41	105201	12.52
80 to 100	6579.89	8859.21	10612.49	576.79	120784	13.06
Average all	7164.91	13065.11	11723.26	695.06	96189	14.29
Maximum all	68741.87	194881.00	192548.50	9627.00	813000	82.26
Minimum all	1.00	4.67	0.00	-1303.55	34.0	0.025

Table 5: **Country Origin of Parents by Headquarter Location**

Country	At least One Public Parent		Two Public Parents	
	Number	Frequency	Number	Frequency
US	1,124	72.75%	403	67.85%
Japan	214	13.85%	106	17.85%
UK	45	2.91%	14	2.36%
Canada	44	2.85%	11	1.85%
Germany	26	1.68%	18	3.03%
France	19	1.23%	7	1.18%
Australia	12	0.78%	6	1.01%
Others	61	3.95%	29	4.88%
Total	1,545	100.00%	594	100.00%

Table 6: **Mean Abnormal and Cumulative Abnormal Returns**

AR, CAR	At Least One Publicly Traded Parent		Two Publicly Traded Parents: Full Sample		Two Publicly Traded Parents: Uncontaminated	
	Returns	P value	Returns	P value	Returns	P value
AR_{-2}	0.119%	0.1915	0.163%	0.1523	0.167%	0.1606
AR_{-1}	0.208%**	0.0221	0.237%**	0.0380	0.318%***	0.0076
AR_0	0.460%****	0.0000	0.438%****	0.0001	0.542%****	0.0000
AR_1	0.010%	0.9090	0.075%	0.5103	0.081%	0.4961
AR_2	-0.125%	0.1683	0.039%	0.7335	0.032%	0.7876
$CAR(-1, 0)$	0.668%****	0.0000	0.675%****	0.0000	0.860%****	0.0000
$CAR(-1, 1)$	0.678%****	0.0000	0.750%****	0.0002	0.941%****	0.0000
$CAR(-2, 2)$	0.672%****	0.0009	0.952%****	0.0002	1.141%****	0.0000
$CAR(-5, 5)$	0.908%***	0.0026	0.748%*	0.0532	0.671%*	0.0968
$CAR(-1, 0) > 0$ Observations	53.20% of observations 1,545		53.53% of observations 594		54.36% of observations 550	

Significance level: **** significant at 0.1%, *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 7: Mean Cumulative Wealth Effects (USD millions)

Two Public Parents by Stake: Noncontaminated Sample					
Equity Stake in %	Obs.	$w(-1, 0)$	$w(-1, 1)$	$w(-2, 2)$	$w(-5, 5)$
0 to 20	19	-9.05	-165.25	-27.25	-72.70
20+ to 40	47	11.82	21.45	166.35	-190.50
40+ to 49-	6	596.18	1377.43***	1240.11**	919.39
49 to 50-	24	33.54**	32.92	30.63	-1.77
50-50	358	62.44**	43.08	38.01	-14.77
50+ to 51	24	62.05	73.06	44.66	25.64
51+ to 60-	6	-59.70	-71.81	-254.34	-632.34
60 to 80-	47	67.72*	131.46***	169.36***	71.37
80 to 100	19	80.00	18.69	63.95	181.90

Two Public Parents: Noncontaminated Sample					
Mean all	550	56.1932**	45.48*	59.84*	-17.87
(<i>P</i> value)		(0.0126)	(0.0997)	(0.0950)	(0.7401)

At least One Public Parent: Full Sample					
Mean all	1,475	30.3641**	36.7665**	39.1391*	0.78
(<i>P</i> value)		(0.0263)	(0.0284)	(0.0720)	(0.9809)

Significance level: **** significant at 0.1%, *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 8: Model Tests Based on Relative Costs $\gamma^*(k)$

Testing our model prediction that parents are less homogeneous in JVs with outright majority control $k = A$ than in 50-50 JVs ($k = J$), we conduct the following one-sided hypothesis test, for which we wish to reject the null, in terms of the sample means of $\hat{\gamma}^*(A)$ and $\hat{\gamma}^*(J)$:

$$H_0 : \gamma^*(A) = \gamma^*(J), H_1 : \gamma^*(A) > \gamma^*(J)$$

Similarly, we investigate the prediction that parents are homogeneous in 50-50 JVs by testing $H_0 : \gamma_A^*(J) = \frac{1}{2}$ against the alternative $H_1 : \gamma^*(J) \neq \frac{1}{2}$. The relevant test statistics are asymptotically normally distributed with *P* values $\Pr\{Z \leq z | H_0\}$ for the test of $\gamma^*(A) > \gamma^*(J)$, and $\Pr\{|Z| \leq z | H_0\}$ for testing whether $\gamma_A^*(J) = \frac{1}{2}$, respectively. We use the full sample with various outlier corrections for observations with wealth gains close to 0.

Majority Control vs. 50-50 JVs: $H_0 : \gamma^*(A) = \gamma^*(J), H_1 : \gamma^*(A) > \gamma^*(J)$			
Sample mean $\overline{\gamma^*}(J)$	0.2803	0.2995	0.2673
Sample mean $\overline{\gamma^*}(A)$	0.6057	0.8164	0.5822
Test statistic z	921.0961	163.4085	685.3361
<i>P</i> value: $\Pr\{Z \leq z H_0\}$	0.0000	0.0000	0.0000
Model Prediction		Reject H_0 in favor of H_1	

50-50 JVs: $H_0 : \gamma^*(J) = \frac{1}{2}, H_1 : \gamma^*(J) \neq \frac{1}{2}$			
Sample mean $\overline{\gamma^*}(J)$	0.2803	0.2995	0.2673
Test statistic z	-1.3758	-0.2323	-0.5504
<i>P</i> value: $\Pr\{ Z \leq z H_0\}$	0.1689	0.8163	0.5821
Model Prediction		Fail to Reject H_0	

Sample selection	$\hat{\gamma}^*(k) \in (0, 1)$	$\hat{\gamma}^*(k) \in (-1, 5), w_i > 0$	$\hat{\gamma}^*(k) \in (-1, 5)$
Observations	194	70	258

Table 9: **Determinants of JV Ownership and Control**

$$\Pr \{REGIME_j = k\} = \Lambda \left(\beta_{1k} \hat{\gamma}^*(k; z)_j + \beta_{2k} LEV_j + \sum_{l=3}^6 \beta_{lk} RELxx_j^l \right)$$

for JVs $j = 1, \dots, N$ and control regime $k = A, J, P$ where Λ is the logistic distribution function $\Lambda(\mathbf{x}'_{jk} \beta_k) = (1 + e^{-\mathbf{x}'_{jk} \beta_k})^{-1}$, $\hat{\gamma}^*(k; z)_j$ our parent similarity variable $\hat{\gamma}^*(k)$, LEV_j a binary variable for JV leverage, and $RELxx_j^l$ measures JV and parent relatedness (see Figure 6) in terms of SIC codes ($SICxx$) or national origin ($NATxx$). Our proxies for value diversion are $SICaab$ and $NATAab$. We estimate the specifications by full-information Maximum Likelihood with a grid search over z for the 50-plus regime, and exclude 8 outliers from our sample so that $\hat{\gamma}^*(k; z) \in (-5, 5)$. In the second specification, we drop the $NATbab$ variable because of insufficient observations in the $k = P$ regime. We estimate marginal effects by evaluating $\frac{\partial \Pr_j}{\partial x_{jk}} = \Lambda'(\mathbf{x}'_{jk} \beta_k) \beta_k$ at the sample means of the regressors and report their P values in parentheses below. Since probabilities sum to 1, the coefficients of the $k = J$ equation are normalized to 0 to remove the resulting indeterminacy.

Specification	1			2		
	$k = J$	$k = P$	$k = A$	$k = J$	$k = P$	$k = A$
Regime						
z		26.41			26.42	
$\hat{\gamma}^*(k; z)$		1.6842****	0.7559***		1.4541****	0.7457***
Marg. Effect	-0.2014****	0.0912****	0.1101**	-0.1949****	0.0881****	0.1068**
(P value)	(0.0004)	(0.0001)	(0.0275)	(0.0003)	(0.0002)	(0.0212)
LEV		-1.6514***	-1.7728****		-2.0471****	-1.7131****
Marg. Effect	0.3672****	-0.0736**	-0.2936****	0.3803****	-0.1126****	-0.2677****
(P value)	(0.0000)	(0.0292)	(0.0000)	(0.0000)	(0.0007)	(0.0000)
$SICaaa$		-2.5554****	-0.3856			
Marg. Effect	0.1803***	-0.1502****	-0.0300			
(P value)	(0.0013)	(0.0000)	(0.5417)			
$SICaca$		-2.5873****	-0.7264*			
Marg. Effect	0.2378***	-0.1469****	-0.0909			
(P value)	(0.0029)	(0.0007)	(0.2019)			
$SICaab$		-2.4761****	-1.1567****			
Marg. Effect	0.3035****	-0.1335****	-0.1700***			
(P value)	(0.0000)	(0.0000)	(0.0012)			
$SICacb$		-2.0402****	-0.6532**			
Marg. Effect	0.2007***	-0.1146****	-0.0861			
(P value)	(0.0015)	(0.0002)	(0.1290)			
$NATAaa$					-2.3592****	-0.8475***
Marg. Effect				0.2584****	-0.1491****	-0.1092**
(P value)				(0.0000)	(0.0000)	(0.0130)
$NATAab$					-1.9499****	-0.7880***
Marg. Effect				0.2275****	-0.1217****	-0.1057***
(P value)				(0.0000)	(0.0000)	(0.0088)
$NATbac$					-2.4252**	-0.9139
Marg. Effect				0.2724*	-0.1526**	-0.1198
(P value)				(0.0579)	(0.0480)	(0.3426)
Log-likelihood		-210.52			-216.11	
Pseudo R^2		0.14			0.117	
Log-likelihood Ratio		68.37****			57.21****	
(P value)		(0.0000)			(0.0000)	
Observations		289			289	

Significance level: **** significant at 0.1%, *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 10: Parent Similarity and Value Diversion

$$\Pr \{REGIME_j = k\} = \Lambda \left(\beta_{1k} \hat{\gamma}^*(k; z)_j + \beta_{2k} \hat{\gamma}^*(k; z)_j \cdot SICaab_j + \beta_{3k} LEV_j + \sum_{l=4}^7 \beta_{lk} RELxxx_j^l \right)$$

where we add to the specification in equation (9) the interactive variable $\hat{\gamma}^*(k; z)_j \cdot SICaab_j$ to test the model prediction that parents are more heterogeneous under 50-50 ownership when the potential for value extraction is larger. All other variables remain unchanged, as do the sample selection and estimation procedures (see Table 9 for further explanations).

Specification	1			2		
Regime	$k = J$	$k = P$	$k = A$	$k = J$	$k = P$	$k = A$
z		26.41			26.42	
$\hat{\gamma}^*(k; z)$		2.5677****	1.1334***		1.9373****	1.2167****
Marg. Effect	-0.2987****	0.1311****	0.1676**	-0.2940****	0.1123****	0.1817***
(P value)	(0.0003)	(0.0002)	(0.0193)	(0.0001)	(0.0003)	(0.0034)
$\hat{\gamma}^*(k; z) \cdot SICaab$		-1.5415**	-0.7253		-0.8433*	-0.9207**
Marg. Effect	0.1868*	-0.0780**	-0.1087	0.1903**	-0.0422	-0.1480*
(P value)	(0.0873)	(0.0479)	(0.2695)	(0.0332)	(0.1840)	(0.0597)
LEV		-1.6353***	-1.8067****		-2.1128****	-1.7713****
Marg. Effect	0.3706****	-0.0678**	-0.3028****	0.3915****	-0.1149****	-0.2765****
(P value)	(0.0000)	(0.0353)	(0.0000)	(0.0000)	(0.0005)	(0.0000)
$SICaaa$		-3.0278****	-0.4619			
Marg. Effect	0.2069****	-0.1673****	-0.0395			
(P value)	(0.0004)	(0.0000)	(0.4441)			
$SICaca$		-3.1357****	-0.8890**			
Marg. Effect	0.2825****	-0.1673****	-0.1152			
(P value)	(0.0009)	(0.0002)	(0.1277)			
$SICaab$		-2.0084****	-0.1021***			
Marg. Effect	0.2560****	-0.1006***	-0.1554***			
(P value)	(0.0000)	(0.0011)	(0.0060)			
$SICacb$		-2.6253****	-0.7979**			
Marg. Effect	0.2454****	-0.1393****	-0.1061*			
(P value)	(0.0003)	(0.0001)	(0.0829)			
$NATaaa$					-2.4580****	-0.9333****
Marg. Effect				0.2758****	-0.1528****	-0.1229***
(P value)				(0.0000)	(0.0000)	(0.0055)
$NATaab$					-1.9925****	-0.8044***
Marg. Effect				0.2311****	-0.1231****	-0.1080***
(P value)				(0.0000)	(0.0000)	(0.0079)
$NATbac$					-2.6824**	-1.1328
Marg. Effect				0.3192**	-0.1648**	-0.1543
(P value)				(0.0312)	(0.0348)	(0.2316)
Log-likelihood		-208.07			-213.73	
Pseudo R^2		0.15			0.127	
Log-likelihood Ratio		73.29****			61.95****	
(P value)		(0.0000)			(0.0000)	
Observations		289			289	

Significance level: **** significant at 0.1%, *** significant at 1%, ** significant at 5%, * significant at 10%.

Table 11: **Return Performance of Contingent Ownership**

This table reports the mean abnormal and mean cumulative abnormal returns for joint ventures with explicit buyout options. Since our US sample contains only 36 such datapoints, we replicate the analysis for a worldwide sample of 187 joint ventures with buyout provisions, including the 36 American ones.

<i>AR, CAR</i>	US Joint Ventures	Worldwide JVs
	Returns	Returns
AR_{-5}	0.080%	0.482%
AR_{-4}	0.768%**	0.356%
AR_{-3}	0.030%	-0.059%
AR_{-2}	0.653%	0.245%
AR_{-1}	-0.359%	0.795%**
AR_0	1.392%**	0.856%**
AR_1	0.311%	-0.058%
AR_2	0.211%	-0.162%
AR_3	0.367%	0.381%
AR_4	-0.586%	-0.126%
AR_5	0.828%*	-0.024%
$CAR(-1, 0)$	1.033%**	1.896%****
$CAR(-1, 1)$	1.344%	1.593%**
$CAR(-2, 2)$	2.209%**	2.000%**
$CAR(-5, 5)$	3.696%**	2.947%***
Observations	36	187

Significance levels: **** significant at 0.1%, *** significant at 1%, ** significant at 5%, * significant at 10%.

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