

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 control rent extraction 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 formed between 1985 and 2000, we find that their announcement leads to significant abnormal wealth gains for parent shareholders in patterns that confirm model predictions.

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 how they define their boundaries.¹ 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.²

Joint ventures exhibit the following intriguing ownership pattern: the vast majority allocate equal or almost equal equity stakes to the parent firms.³ Large-sample data 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 ownership begs for an explanation of the underlying economic factors that would make symmetric or almost symmetric shareholdings optimal for such a large and diverse group of parent firms. Furthermore, the prevailing legal rules do not seem to favor equal shareholdings because disagreement between the owners might result in permanent legal deadlock and, ultimately, significant welfare losses. To explain the observed ownership patterns and investigate their underlying economic determinants, we develop a simple model of ownership and control in joint ventures. We also relate our results to empirical evidence on wealth creation in two-parent joint ventures and test model predictions.

In our model, two parent firms contribute tangible or intangible resources to a jointly owned but independent corporate entity in an effort to exploit asset complementarities (“synergies”). Ownership provides incentives for resource contribution and 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 rent seeking activities. Hence, parents

¹See Zingales (2000) for a discussion of the changing nature of the firm and its problems to assert control over assets.

²Corporate partnerships are very different from private partnerships in which tradeoffs between risk sharing and incentives are central (see, e.g., Lang and Gordon, 1995). Johnson and Houston (2000) do not find evidence for risk sharing motives in joint ventures. Since firms are 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.

³The management literature has long recognized this puzzle: see, e.g., Bleeke and Ernst (1991).

choose ownership allocations that are optimal in light of their respective contributions and economic attributes so as to mitigate the adverse consequences of control benefits on investment incentives.⁴

We first establish that strong complementarities in parent resources mitigate typical moral hazard in teams problems, 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, which might explain the popularity of this form of corporate cooperation in the presence of strong synergy effects. This result is robust to introducing private control benefits in the sense that strict complementarity still eliminates free-riding incentives although control costs are otherwise responsible for second-best outcomes.

Our main contribution is to show that the observed control regimes - joint control (50-50), 50 plus one share, and outright majority control - each can be optimal for a wide range of parent attributes. If the partners are dissimilar or the net social cost of control small, it is optimal to grant the parent that makes the more valuable resource contribution outright majority control of the joint venture. Synergy effects outweigh control costs and the resulting contribution disincentives for the other party. Conversely, if the parents contribute resources of similar value or control cost are large, control benefit extraction would hurt incentives for the minority partner to a point where joint ownership becomes optimal.

Between these two polar cases, there exists a third arrangement. If control costs are relatively small and resource contributions comparable in value, the parties maximize value creation with 50 plus one share ownership structures. While the parents equally split return rights, they allocate control to the company with the more valuable resource. We again identify resource complementarities as the driving force behind the existence of 50 plus one share ownership arrangements. If parent contributions are substitutes, this particular control regime disappears. Introducing managerial agency conflicts further shows that allocating clear control to one party might be preferable despite the additional scope for control rent extraction.

We also provide an empirical perspective on our results by studying the announcement effect of joint venture formation on the share price of their publicly traded parent companies. Analyzing US joint ventures formed between January 1985 and 2000, we find that joint venture announcements

⁴It is well known since Jensen and Meckling (1976) that capital structures and the control and return rights they embody can serve as incentive devices for stakeholders such as the joint venture's parent firms.

generate significant positive cumulative abnormal returns of between 0.67% and 1.20% depending on event window and sample. These numbers translate into cumulative shareholder wealth gains of between \$30 and \$60 millions. Consistent with our theory, the dominant partner in joint ventures with one-sided control exhibits significantly larger wealth gains on average.

To study the cross-sectional determinants of joint venture formation and test our theory, we estimate discrete choice models of the three prevalent control regimes. The results provide strong evidence in favor of our model predictions. Not only is a measure of parent similarity that we derive from our model statistically highly significant, it also exhibits the exact marginal effects predicted by our analysis. The likelihood of adopting 50-50 ownership falls for less homogeneous parents, while the likelihood of 50 plus one share or outright majority control rises when parents are more heterogeneous. We also find that leverage of the joint venture increases the likelihood of adopting joint control, but decreases the likelihood of one-sided control.

Contrary to the management and industrial organization literature, joint ventures have received relatively little attention in finance. McConnell and Nantell (1985) and Lummer and McConnell (1990) first identified the positive abnormal return reactions by parents' stock prices to the announcement of joint ventures. Their results were subsequently confirmed by Johnson and Houston (2000) who analyze abnormal return reactions in terms of horizontal vs. vertical joint ventures, and by Mohanram and Nanda (1998). However, these studies do not investigate the determinants of ownership structures in joint ventures, which is central to our work.

Prior theoretical work on ownership in joint ventures has mainly focused on contingent control arrangements. Nöldeke and Schmidt (1998) study how the incentives for sequential resource contributions in strategic alliances imply sole ownership arrangements with a buyout option for the other party. Similarly, Chemla *et al.* (2001) in their study of exit choices identify buyout options as important in overcoming incentive problems in joint ventures. An exception are Belleflamme and Bloch (2000) who show how asymmetries in the parent companies' contributions imply asymmetric ownership arrangements. However, all these papers appear at variance with the empirical evidence on ownership patterns in joint ventures, in particular their clustering around equal equity stakes.

Our work is also related to the more general question of strategic alliances. Rey and Tirole (1998) analyze how divergence of parent objectives and governance issues determine the appropriate organizational form of corporate cooperation including joint ventures. Similarly, Dasgupta and

Tao (1998) investigate under which conditions joint ventures are the appropriate form for strategic alliances. Robinson (2000) shows both theoretically and empirically that strategic alliances are the preferred choice for risky ventures to overcome firm-specific commitment problems. Allen and Phillips (2000) also find that corporate share block purchases as commitment devices create a significantly higher abnormal returns in the presence of strategic alliances including joint ventures. Chan *et al.* (1997) analyze announcement effects of strategic alliances without equity components and, as in our case, find effects that are consistent with trade-offs between synergies and control costs.

The paper is organized 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, we describe our data and empirical methodology, while Section 6 summarizes our empirical findings and tests of model predictions. 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 ventures⁵ set up between 1985 and 2000 (about 80% of all recorded joint ventures) whose main activity lies in the US. 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

⁵The 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).

active in the European Union containing 12% 50-plus joint ventures - confirm these ownership patterns.

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. 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 (Hennart, 1988; 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.

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.⁶ In such cases, the court will let the parties vote their shares and decide according to the respective equity weights. Hence, disagreement in 50-50 joint ventures becomes nearly intractable and might lead to permanent deadlock, unless the two partners have specified a clear, complete and enforceable mechanism to break the impasse.

Since control rights are interpreted by US courts in the narrow equity share sense, the legal environment seems to favor of 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.

⁶See *National Biscuit v. Stroud*, 106 S.E.2d 692 (1959) which articulates the strict majority rule.

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

3.1 Model Description

In the attempt to exploit synergies, two 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 spill-overs 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 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.

An initial agreement specifies the new entity’s capital structure. We take the parties’ contributions to be non-contractible in the sense that contractual provisions in their regard are difficult to verify or enforce. 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. In the context of joint ventures, ownership

⁸The Leontief production function’s elasticity of substitution between the inputs is zero. We analyze the consequences of perfect input substitutability, the other polar case, for joint venture design in Appendix A.

beyond 50% is particularly valuable because it confers private benefits. The controlling party is able to extract 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 through, e.g., the erosion of synergy gains or competition by the dominant parent. The remainder of the company has only a value of $(1 - d)V$ to be distributed according to the ownership stakes. Contractual incompleteness prevents commitment not to engage in such value diversion.⁹ In case of shared control, neither control costs nor benefits accrue.

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*

⁹Private control benefits are in theory limited by the fiduciary duty that each party owes to the other one or to the JV. In practice, value diversion by the controlling party is often unobservable and unverifiable so that residual control benefits are non-contractible. The controlling party can not commit to not divert and, more importantly, it could not contract with the partner on sharing the private control benefits.

optimal share allocations are given by, respectively,

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

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

Proof. See the Appendix. ■

Optimal ownership implies a linear sharing rule γ^* that corresponds to the relative resource costs of the parties. In principle, there is no reason to expect that the optimal equity stakes (2) lead to the first-best value of the joint venture. Team production typically suffer from an externality problem between the partners, first analyzed by Holmström (1982). They face only 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.

This rather strong result provides a theoretical justification for the popularity (and optimality) of all-equity joint ventures as an organizational choice for corporate cooperation. It shows that the partners can use equity allocations - ownership - to decentralize first-best value creation in joint

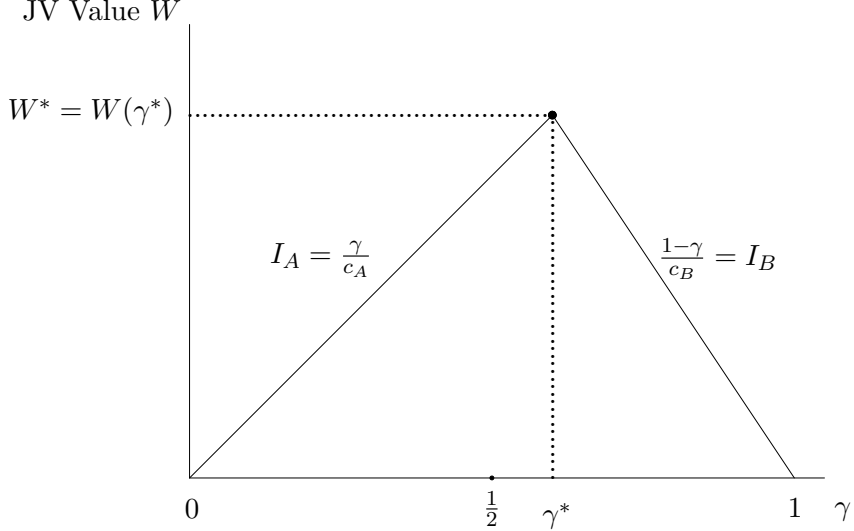


Figure 1: First-Best Incentives, Value and Ownership

ventures with significant synergy effects. Proposition 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. We would expect the requisite strong synergy effects to primarily arise in vertical joint ventures. The finding of Johnston 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.

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 stake 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 shared control, no parent can extract residual control benefits because the threat of a legal stalemate suffices to deter either party from rent seeking activities.

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* intertwine the two rights. As a consequence, an increase in income rights beyond 50% leads to an increase in residual control rights. We consider either control by one of the parties i or joint control (J) and, accordingly, index joint venture related quantities such equity stakes γ^k , gross value 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 (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

$$\delta > \gamma d, \gamma \geq \frac{1}{2} \tag{4}$$

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

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

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 increase A 's stake γ so that investment incentives are equalized and A controls the joint venture.

Proposition 2 *If, for $c_A > c_B$, the parent with the more valuable resource constrains the joint venture's value, 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 second-best efficient majority stakes (6) shows that the presence of control costs and benefits distorts investment incentives. In their absence ($\delta = 0$), 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 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 $d - \delta$.¹⁰

In the other case, control by partner 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 cash flow 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 assumption $c_A > c_B$.

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

¹⁰Nothing in our specification precludes net social costs from being negative, i.e., control benefits δ to outweigh costs d .

JV Value W

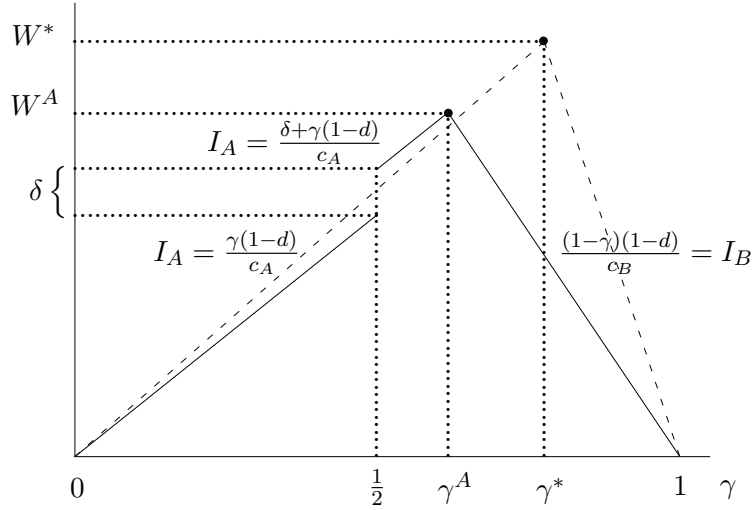


Figure 2: Asymmetric Return and Control Rights (Outright Majority Control)

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

Proof. See the Appendix. ■

4.2 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. Optimality requires that parents choose the share allocation and associated control regime k that maximizes their joint net surplus W^k . 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 joint and outright control by A . In the latter case, it is in the venturers' interest to reduce A 's stake to provide better contribution incentives to parent B . Since the joint venture's output is maximized at $\gamma = \frac{1}{2}$, we need to compare its net value W^k under joint control (50-50) to the corresponding values under outright majority and 50-plus

control.

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 $\gamma^* \in (\frac{1}{2}, \hat{\gamma})$, joint control maximizes joint venture surplus.*

Proof. See the Appendix. ■

Lemma 3 shows that there are two driving forces behind the optimality of joint control. Equal shareholdings not only avoid the net social cost of control $\delta - d$, but also the discontinuity in revenue and, hence, contribution incentives at 50-50. As a consequence, joint control depicted in Figure 3 is optimal in two cases. For comparable resource costs, i.e., γ^* close to $\frac{1}{2}$, or large net social costs of control, equal control rights complement equal return rights. If parents have very dissimilar resource costs ($\gamma^* > \hat{\gamma}$) 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 thresholds $\bar{\gamma}$ and $\hat{\gamma}$ established in Lemma 2 and 3 are both functions of the net social cost of control $d - \delta$. When these costs are relatively small, three control regimes exist. 50-plus control combines equal return rights with control for the parent contributing the more valuable resource (A). The following proposition summarizes our central result and 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. ■

Figure 4 indicates how 50-plus control optimally re-equilibrates investment incentives in the presence of mildly heterogeneous parents, i.e., for γ^* close to the outright majority threshold $\bar{\gamma}$, and relatively small net social costs of control. When the latter are large, only two control regimes exist because the overriding parent concern becomes either the large efficiency losses from control or the need for contribution incentives induced by the venturers' dissimilarity.

JV Value W

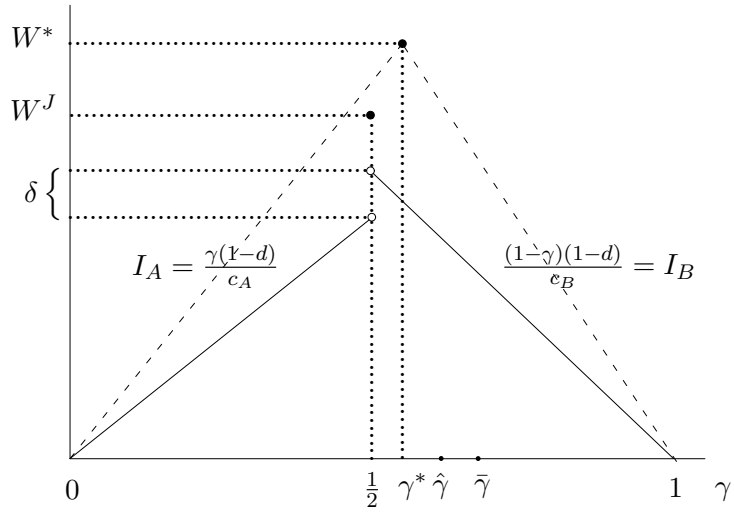


Figure 3: Symmetric Return and Control Rights (50-50)

JV Value W

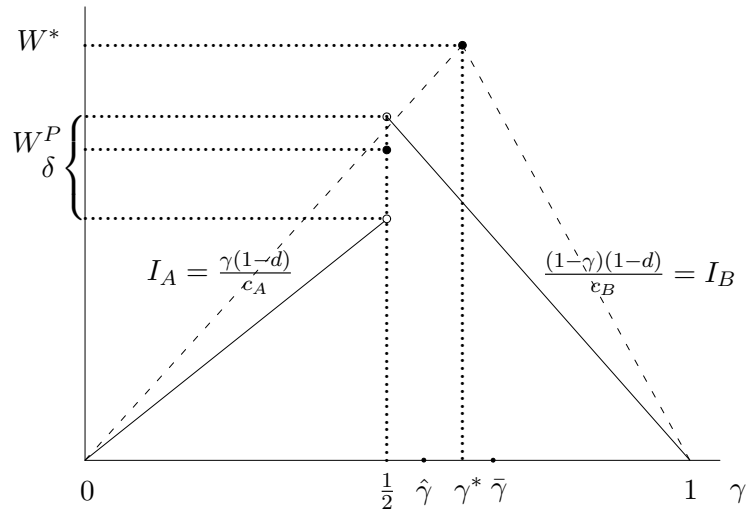


Figure 4: Symmetric Return and Asymmetric Control Rights (50-plus)

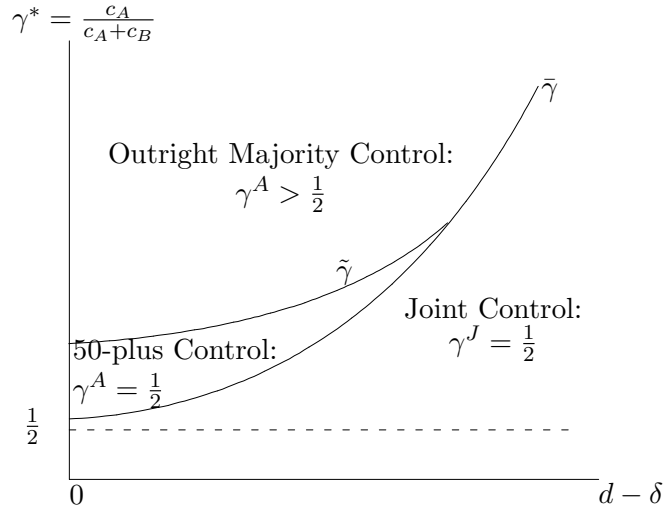


Figure 5: Ownership and Control

Figure 5 summarizes our main results and testable implications that follow from the fact that optimal ownership arrangements vary with parent homogeneity and control cost parameters γ^* and $d - \delta$. From a cross-sectional perspective, a wide set of parameter combinations can generate the observed ownership 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 ownership clustering around 50-50. The higher the net social cost of control, the more dissimilar the parties can be under 50-50 equity stakes in terms of resource costs. 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 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.

4.3 Managerial Agency Conflict

While 50-50 ownership and shared 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 shared 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 circumstances in which each of the three regimes is optimal, in particular the distribution of 50-50 and 50-plus in the critical region $(\frac{1}{2}, \bar{\gamma})$ derived in Lemma 2. We now derive the new joint control threshold $\hat{\gamma}_m$ in terms of parent homogeneity γ^* . Joint control in the face of managerial agency conflict is still preferable to control by A if $W^J = (1 - m)^2 \frac{3c_A - c_B}{8c_A^2} > W^A = \frac{(1-d+\delta)^2}{2(c_A+c_B)}$. Proceeding as in the proof of Proposition 3, we obtain the new threshold $\hat{\gamma}_m$ as

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

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 conflicts (increase in m) and decreases in the net control costs $d - \delta$ because of the governance

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 (1998).

improvements it offers. 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 shared control.

5 Methodology and Data Description

To provide an empirical perspective on our results, we next analyze the parent stock price reaction to joint venture announcements.

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 as summarized in McKinlay (1997).

We compute daily abnormal returns using a linear market model for the normal stock returns R_i in terms of market returns R_m

$$R_{it} = \beta_{0i} + \beta_{1i}R_{mt} + \epsilon_{it}$$

that we estimate with a correction for non-synchronous trading effects (see Scholes and Williams, 1977). 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. If we have more than one unrelated joint venture announcement by the same parent during this window, we only include the first one.

To relate the empirical evidence to our theoretical results, we use the cumulative abnormal wealth created by joint venture announcements that, under the assumption of informationally

efficient markets, should correspond to $W_i, i = A, B$. We estimate parent wealth effects 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 parent 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.¹² 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. It turns out that we can express this unobservable cost parameter in terms of observable parent wealth gains (7) given the joint venture's 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 $\widehat{\gamma}^*(k)$ where*

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

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 preceding expressions allow us to test model predictions on the basis of our data on joint venture formation.

5.2 Data Description

We start with our sample of US joint ventures with at least one publicly quoted parent drawn from the Joint Ventures and Strategic Alliances database of Thomson Financial Securities Data.

¹²Working with cumulative wealth instead of abnormal returns has the additional benefit that we can easily aggregate wealth effects and avoid size related biases that would result if one of the venturers had a systematically different market capitalization.

Whenever available, we match venturers with stock price and other financial information from the FactSet database family. To improve the data quality, we cross-check 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 quoted companies (297 joint ventures with 594 parent observations). As a robustness check, 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.

Table 1 in Appendix C indicates that ownership patterns in our samples closely correspond to the ones observed in the larger datasets: about two thirds of parents hold 50% equity stakes and share control. From Table 2 we see that, on the basis of Standard Industry classification (SIC) codes, most joint ventures occur in Transportation, Communications, Gas, Electricity, Manufacturing, Wholesale Trade and Services. Parent firm characteristics vary quite substantially (see Table 3). 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 quoted 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 4 shows that the vast majority of venturers are American companies (73%), followed by Japanese (14%), British and Canadian parent firms.

As a rough measure of scope for complementarities, parent conflicts, and monitoring capabilities, we use two-digit SIC codes and national origin to classify parents and joint ventures in terms of their relatedness. Figure 6 summarizes the possible combinations between parents and their joint venture. The SIC relatedness classification attempts to capture industry effects such as synergy effects and parent conflict (unrelated parents) or monitoring capabilities (related joint venture). The national origin classification represents monitoring, legal and operational effects.

6 Empirical Evidence

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

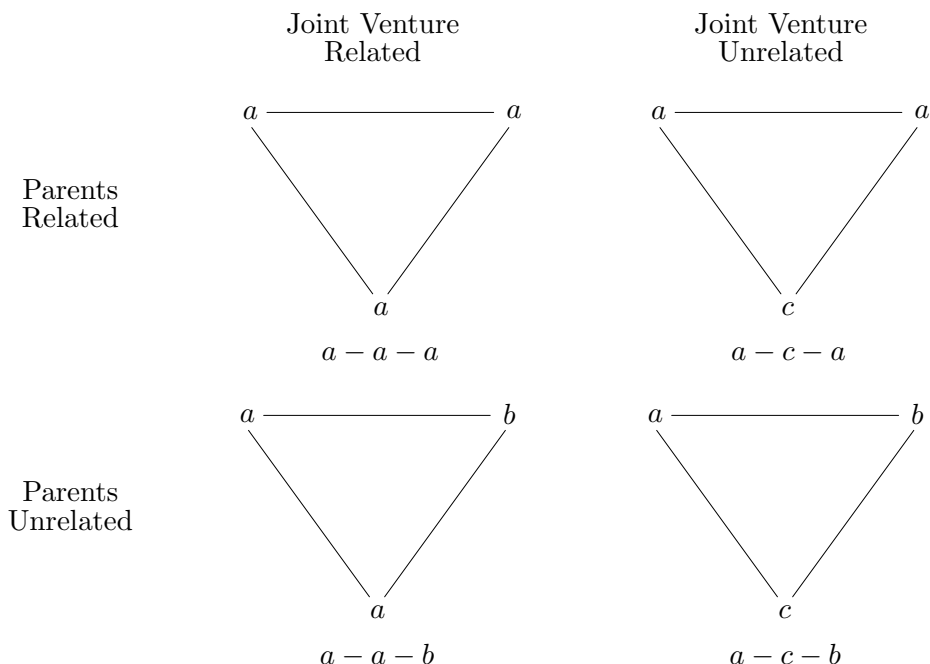


Figure 6: Classification Matrix for Joint Venture - Parents Relatedness

6.1 Shareholdings and Wealth Creation

Table 5 in the Appendix provides 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, 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 returns 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 an average cumulative abnormal return for the two-day window from -1 to 0 of 0.73% while Johnson and Houston (2001) find 2 day average cumulative abnormal returns of 1.67%. Mohanram and Nanda (1998) report a cumulative abnormal return of 0.49% for the three-day window ranging from -1 to 1 .¹³

¹³Our 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.

To see the economic significance of our cumulative abnormal returns, consider the implied wealth effects. Table 6 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 6, 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 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 7 reports the test results for various subsamples with different outlier corrections.¹⁴ 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. Testing the model prediction that $\gamma_A^*(J)$ is close to $\frac{1}{2}$, we find a P values that do not permit us to reject the hypothesis, which is, once again, consistent with our model (see Table 7).

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

$$\Pr\{REGIME_j = k\} = \Lambda \left(\beta_{1k}GSTAR(z)_j + \beta_{2k}LEV_j + \sum_{l=3}^6 \beta_{lk}REL_j^l \right) \quad (8)$$

where Λ is the logistic distribution function, LEV_j a binary variable indicating leverage of the JV, and REL_j^k a set of four binary SIC or nationality relatedness variables defined by the classification

¹⁴Essentially, 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 $(0, 1)$.

scheme in Figure 6. $GSTAR(z)_j$ corresponds to our parent homogeneity measure $\hat{\gamma}^*(k)$ derived in Proposition 4 and is given by

$$GSTAR(z)_j = \mathbf{1}_{\{k_j=A\}}\hat{\gamma}^*(A)_j + \mathbf{1}_{\{k_j=J\}}\hat{\gamma}^*(J)_j + \mathbf{1}_{\{k_j=P\}}\hat{\gamma}^*(P; z)_j$$

where $\mathbf{1}$ is an indicator variable taking 1 for the relevant control regime and 0 otherwise.

We estimate the above multinomial discrete choice model (8) 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 gridsearch over z to maximize the log-likelihood function in the subsequent estimation. We use our full two-parent sample¹⁵ but exclude 8 outliers, for which the wealth effects are close to 0 so that their value of $GSTAR(z)_j$ falls outside the interval $(-5, 5)$.

In light of our theoretical results and, especially, 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. Conversely, they should be more likely to opt for one-sided control and, specifically, outright majority ownership ($k = A$). Hence, we can test our central model predictions in terms of the marginal effect of $GSTAR(z)_j$ on the likelihood of the three ownership regimes: negative for joint control, positive for 50-plus, positive and larger for outright majority control. Note that these predictions apply regardless of the net social cost of control because we phrase them in terms of marginal effects on the respective likelihoods of the three regimes.

Both specifications reported in Table 8 show that the $GSTAR(z)_j$ 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 $GSTAR(z)_j$ 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 $GSTAR(z)_j$ in the 50-plus and outright majority regime equation indicate that more dissimilar parents are more likely to adopt one-sided control. Also, the positive marginal effect of $GSTAR(z)_j$ increases from 50-plus to outright majority control which is a further prediction of our model. We interpret these findings as strong evidence in favor of our model.

¹⁵The results are virtually identical for the noncontaminated sample so that we do not report them.

Our results reveal a further interesting marginal effect related to the leverage of joint ventures (about 1/3 of our 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. 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 have guaranteed the debt. Unfortunately, our data does not distinguish between guaranteed and nonguaranteed debt so that we cannot further analyze this effect.

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.¹⁶ However, there are special circumstances in which contingent ownership arrangements can overcome this problem. For instance, Nöldeke and Schmidt (1998) and Chemla *et al.* (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 cumulative abnormal returns that are substantially higher than for our full US joint venture samples (see Table 9). They range from $CAR(-1, 0) = 1.033\%$ to $CAR(-5, 5) = 3.696\%$ as compared to the earlier reported abnormal returns of $CAR(-1, 0) = 0.668\%$ or $CAR(-5, 5) = 0.908\%$ for all joint ventures with at least one publicly quoted parent (Table 5).

To verify that these surprisingly strong return reactions are not an artifact of our relatively small

¹⁶See Grossman and Hart (1986).

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. While worldwide cumulative abnormal returns are very comparable ranging from $CAR(-1, 0) = 1.896\%$ and $CAR(-5, 5) = 2.947\%$ they are 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 recognizes the beneficial effect of options in terms of the incentive effects, 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 the wealth effects arising from such corporate cooperation. Our central result is that three ownership regimes for joint ventures - equal ownership stakes, 50 plus one share, and outright majority control - coexist in equilibrium. Very different, possibly industry- or firm-specific combinations of parent attributes and net social costs of control could lead to their optimal adoption. In addition, we are able to explain the observed clustering of ownership stakes around 50-50 shareholdings for a large cross-section of parent firms who trade off control costs with investment incentives. We also establish that joint ventures are the optimal organizational form for corporate cooperation in the presence of strong synergy effects because ownership alone is sufficient to constrain moral hazard in resource contribution.

Using a large sample of US joint ventures, we confirm that their announcements have significant economic effects in terms of wealth gains for parent firms. To analyze the determinants of ownership in joint venture and test theoretical predictions, we recover unobservable model parameters in terms of observable parent wealth gains and specify two discrete choice models for the adoption of the different control regimes. The results identify relative resource costs that, in our model, are a proxy for parent attributes and homogeneity as the driving force behind the choice of control regime. The empirical findings offer strong support for our theoretical prediction that more homogeneous parents are more likely to choose 50-50 ownership allocations while more heterogeneous parents adopt one-sided control.

Our findings also identify several avenues for future research. In particular, we would expect that 50-50 and 51-49 ownership structures are more frequent when synergies are significant but the controlling party can more easily extract private benefits. Hence, one might relate the type of joint venture - manufacturing, OEM, licensing, R&D, distribution, etc. - to industry- and firm-specific conflicts of interest between the parties. Similarly, it would be interesting to contrast synergy gains with potential wealth losses from one-sided control. If we had precise 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 social cost of control.

Finally, our empirical results 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 capital structure design for joint ventures which is beyond the scope of the present paper.

Appendix

A Linear Production Function

To show that our main results are robust to the choice of the Leontief production function (perfect input complementarity, no substitutability), we replicate the analysis with the linear production function (perfect input substitutability, no complementarity) which is the polar opposite of the Leontief specification in the CES production function family.¹⁷

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 $\delta = 0 = d$. Replicating the analysis in Section 3.2, we see that the incentive compatibility conditions for the parents become $I_i = \gamma_i \frac{a_i}{c_i}$. Upon substitution into the joint objective function, the parties maximize joint value by choice of shareholdings γ , i.e.,

$$\max_{\gamma} \left\{ \gamma \frac{a_A^2}{c_A} + (1 - \gamma) \frac{a_B^2}{c_B} - c_A \frac{a_A^2 \gamma^2}{2c_A^2} - c_B \frac{a_B^2 (1 - \gamma)^2}{2c_B^2} \right\}.$$

This problem is strictly concave, and its maximum, therefore, unique. From its first-order condition we solve for optimal shareholdings γ^*

$$\gamma^* = \frac{\frac{a_A^2}{c_A}}{\frac{a_A^2}{c_A} + \frac{a_B^2}{c_B}}$$

which become for $a_A = a_B$ just the inverse of the Leontief solution: $\gamma^* = \frac{c_B}{c_A + c_B}$.

Since resources are perfectly substitutable, the familiar free-riding problem in team production arises so that the parties are not able to reach first-best, contrary to the Leontief specification. To see this, compare the first-order conditions of the joint surplus maximization $\max_{I_A, I_B} W(I_A, I_B)$

$$I_A^{**} = \frac{a_A}{c_A}$$

with the private investment optima of the two parents, $I_i^* = \gamma_i^* \frac{a_i}{c_i}$: since $0 < \gamma_i^* < 1$, clearly $I_A^* < I_A^{**}$ and $I_B^* < I_B^{**}$ so both parents will underinvest relative to the first-best.¹⁸

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

$$W = \begin{cases} \left([\delta + \gamma(1 - d)] \frac{a_A^2}{c_A} + (1 - \gamma)(1 - d) \frac{a_B^2}{c_B} \right) (1 - d + \delta) - \gamma^2 \frac{a_A^2}{c_A} - (1 - \gamma)^2 \frac{a_B^2}{c_B} & \text{for } \gamma > \frac{1}{2} \\ \frac{a_A^2}{2c_A} + \frac{a_B^2}{2c_B} - \frac{a_A^2}{4c_A} - \frac{a_B^2}{4c_B} & \text{for } \gamma = \frac{1}{2} \end{cases} \quad (9)$$

¹⁷Both production functions are a special case of the constant elasticity of substitution production function family $f(I_A, I_B) = (a_0 + a_A I_A^\rho + a_B I_B^\rho)^{\frac{1}{\rho}}$. For $a_0 = 0, a_A = 1 = a_B$ the CES production function assumes the familiar Leontief form $f(I_A, I_B) = \min\{I_A, I_B\}$ as $\rho \rightarrow -\infty$ so that the 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 (input) substitution $\sigma = \frac{1}{\rho-1} \rightarrow \infty$. As $\rho \rightarrow 0$, we obtain the Cobb-Douglas function with $\sigma = 1$.

¹⁸By a similar argument, we can verify that underinvestment will take place for any member of the CES production function family except for the limiting case of the Leontief production function.

where we again assume that A contributes the more valuable resource, i.e., $\frac{a_A^2}{c_A} > \frac{a_B^2}{c_B}$, implying $\gamma^* > \frac{1}{2}$. Joint control is preferred if $W^J > W^A(\gamma)$ or, in terms of the parameters, for

$$\frac{a_A^2}{4c_A} + \frac{a_B^2}{4c_B} > \left([\delta + \gamma(1-d)] \frac{a_A^2}{c_A} + (1-\gamma)(1-d) \frac{a_B^2}{c_B} \right) (1-d+\delta) - \gamma^2 \frac{a_A^2}{c_A} - (1-\gamma)^2 \frac{a_B^2}{c_B}. \quad (10)$$

Such a region exists for a wide range of parameters, notably if the resource contributions $\frac{a_A^2}{c_A}$ and $\frac{a_B^2}{c_B}$ are similar, or if γ^* is close to one half, because of the deadweight loss that majority control entails (shirking, contribution disincentives). Hence, we obtain our familiar joint and outright majority control regimes.

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

$$\frac{a_A^2}{2c_A} + \frac{a_B^2}{2c_B} > \left(\left[\delta + \frac{(1-d)}{2} \right] \frac{a_A^2}{c_A} + \frac{(1-d)}{2} \frac{a_B^2}{c_B} \right) (1-d+\delta). \quad (11)$$

and, second, it must be true that the joint surplus under majority control would not increase further by moving to outright majority control, or $\frac{dW^A(\gamma)}{d\gamma} \leq 0$ evaluated at $\gamma = \frac{1}{2}$:

$$\left((1-d) \frac{a_A^2}{c_A} + (1-d) \frac{a_B^2}{c_B} \right) (1-d+\delta) - \frac{a_A^2}{2c_A} + \frac{a_B^2}{2c_B} \leq 0 \quad (12)$$

It is easy to verify that (11) can only hold if $\frac{a_A^2}{c_A} > \frac{a_B^2}{c_B}$ whereas (12) can only be true if $\frac{a_A^2}{c_A} \leq \frac{a_B^2}{c_B}$, establishing the contradiction.

The intuition for this result is that a 50-plus control region will only exist if a further increase in the equity share of the partner having control (partner A) would negatively affect production, e.g., if the minority partner is the critical resource constraint. But if the partners' assets are strongly substitutable, such a resource constraint will not exist. An increase in either partner's share will raise output, while the accompanying decrease in the other partner's reduces output. Once the partners' resource contributions are sufficiently asymmetric that joint control is no longer optimal, they will already be in the region where the optimal ownership structure has to be asymmetric, too.

We interpret this last result as a further indication for the role of complementarities in the inception and design of joint ventures. Not only do they reduce deadweight losses due to free-riding in team production, they also justify the empirical observation of a cluster point at 50-plus ownership. Our results also hint at the choice of organizational form for strategic alliances. The more complementary resources are, the more likely joint ventures should be. Conversely, the more substitutable they are, the more likely should other forms of corporate cooperation such as contracts with or without equity participations, or M&A.

B Proofs

Recall that $W^k, k = A, J, P$ is the net surplus of the joint venture under asymmetric, joint, and 50-plus control.

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.,

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

which becomes upon substitution of the incentive compatibility conditions

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

Assuming the efficient use of resources the partners' incentive compatible contributions coincide at an optimum, i.e., $I_A = \frac{\gamma}{c_A} = \frac{1-\gamma}{c_B} = I_B$. 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 proposition 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. \blacksquare

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

$$V^A(\gamma) = \min \left\{ \frac{\delta + \gamma(1-d)}{c_A}, \frac{(1-\gamma)(1-d)}{c_B} \right\}. \quad (13)$$

so that, by assumption, A constrains its gross value to $V^A(\gamma) = \min \left\{ \frac{\delta + \gamma(1-d)}{c_A}, \frac{(1-\gamma)(1-d)}{c_B} \right\} = \frac{\delta + \gamma(1-d)}{c_A}$. Increasing 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 : $\gamma^A = \frac{(1-d)c_A - \delta c_B}{(1-d)(c_B + c_A)} = \gamma^* - \frac{\delta}{(1-d)}(1 - \gamma^*)$. \blacksquare

Proof of Lemma 2. Suppose that the parties are quite similar so that $c_A - c_B$ is not too large and γ^* close to $\frac{1}{2}$. By assumption, giving control to A would constrain the JV output to

$$V^A(\gamma) = \min \left\{ \frac{\delta + \gamma(1-d)}{c_A}, \frac{(1-\gamma)(1-d)}{c_B} \right\} = \frac{(1-\gamma)(1-d)}{c_B} \quad (14)$$

for $\gamma \in (\frac{1}{2}, \gamma^*)$. Control by A with $c_A > c_B$ is optimal as long as there exists $\gamma \geq \frac{1}{2}$ such that both

partners have equal investment incentives, $\frac{\delta + \gamma(1-d)}{c_A} = \frac{(1-\gamma)(1-d)}{c_B}$. This is only possible if

$$\frac{\delta + \frac{1}{2}(1-d)}{c_A} \leq \frac{\frac{1}{2}(1-d)}{c_B} \quad (15)$$

Simple algebraic manipulation to solve for $\gamma = \frac{c_A}{c_A + c_B}$ now yields the critical threshold $\bar{\gamma} = \frac{\delta + (1-d)/2}{\delta + (1-d)}$ so that for $\gamma^* > \bar{\gamma}$ optimal asymmetric equity stakes γ^A (see Proposition 2) are feasible while for $\gamma^* < \bar{\gamma}$ equation (15) is violated and we have

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

Proof of Lemma 3. We need to show that $W^J > \max\{W^A, W^P\}$ for all $\gamma^* < \hat{\gamma} = \frac{1 + \sqrt{1 - (1-d+\delta)^2}}{2(1-d+\delta)}$. As a preliminary step, we derive the JV's net value expressions under the three control regimes $k = A, J, P$. In the case of joint control, parent A makes the marginal contribution so that $I_A = I_B = \frac{1}{2c_A}$ and

$$W^J = \frac{1}{2c_A} - \frac{(c_A + c_B)}{2} \frac{1}{4c_A^2} = \frac{3c_A - c_B}{8c_A^2} \quad (16)$$

Under 50-plus control, B makes the critical contribution so that

$$W^P = (1-d+\delta) \frac{1-d}{2c_B} - \frac{(c_A + c_B)}{2} \frac{(1-d)^2}{4c_B^2} \quad (17)$$

In the case of outright majority control by A , investment incentives are equalized so that from $\frac{\gamma^A(1-d)+\delta}{c_A} = \frac{(1-\gamma^A)(1-d)}{c_B}$ and $\gamma^A = \frac{(1-d)c_A - \delta c_B}{(1-d)(c_A + c_B)}$ we find W^A as

$$W^A(\gamma^A) = (1-d+\delta) \frac{\gamma^A(1-d) + \delta}{2c_A} = \frac{(1-d+\delta)^2}{2(c_A + c_B)}. \quad (18)$$

We next verify that $\gamma^* < \hat{\gamma} \Leftrightarrow W^J \geq W^A(\gamma^A) > W^A(\gamma')$, for $\gamma' \neq \gamma^A$. From the expressions above, this is the case if

$$W^J \geq W^A(\gamma^A) \Leftrightarrow \frac{3c_A - c_B}{8c_A} \geq (1+\delta-d)^2 \frac{c_A}{2(c_A + c_B)}.$$

The last inequality is identical to

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

where we have made use of the relation $\gamma^* = \frac{c_A}{c_A + c_B}$, which implies that $\frac{c_B}{c_A} = \frac{1-\gamma^*}{\gamma^*}$. Hence, $W^J = W^A$ is equivalent to

$$(1-d+\delta)^2 \gamma^{*2} - \gamma^* - \frac{1}{4} = 0 \quad (19)$$

(19) is a quadratic expression in γ^* with a unique real root larger than $\frac{1}{2}$, given by

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

This shows that $\gamma^* < \hat{\gamma} \Leftrightarrow W^J > W^A(\gamma^A)$.

We show that this implies also $W^J \geq W^P$ for all $\gamma^* < \hat{\gamma}$. For the sake of the proof, we extend the definition range of the function $W^A(\gamma)$ to all $\gamma \in (\frac{1}{2}, 1)$. Then, since $W^A(\gamma^A) > W^A(\gamma')$, for all $\gamma' \neq \gamma^A$, we have notably

$$\begin{aligned} W^A(\gamma^A) &> W^A\left(\frac{1}{2}\right) = (1-d+\delta) \frac{\frac{1-d}{2} + \delta}{c_A} - \frac{(c_A + c_B)}{2} \left(\frac{\frac{1-d}{2} + \delta}{c_A}\right)^2 \\ &> (1-d+\delta) \frac{1-d}{2c_B} - \frac{(c_A + c_B)}{2} \left(\frac{1-d}{2c_B}\right)^2 = W^P, \end{aligned}$$

where the second inequality follows from

$$\frac{\frac{1-d}{2} + \delta}{c_A} > \frac{1-d}{2c_B} \Leftrightarrow \gamma^* < \hat{\gamma},$$

by the definition of $\bar{\gamma}$, and that $(1-d+\delta) > \frac{(c_A+c_B)}{2}$ is implied by the parents' maximization problem. ■

Proof of Proposition 3. We consider the relative size of thresholds $\hat{\gamma}$ and $\bar{\gamma}$ that determine the number of ownership regimes and take each case in turn.

Two regimes: $\hat{\gamma} \geq \bar{\gamma}$. Lemma 3 shows that $\gamma^* < \hat{\gamma} \Leftrightarrow W^J > W^A(\gamma^A) > W^P$. Therefore, joint control is preferred for all $\gamma^* < \bar{\gamma}$. For all $\gamma^* > \bar{\gamma}$ note that 50-plus control can never be optimal since then $\gamma^A > \frac{1}{2}$ and hence asymmetric control does better as $\frac{dW^A}{d\gamma} > 0$ for $\frac{1}{2} < \gamma \leq \gamma^A$. If $\gamma^* > \hat{\gamma}$, then again by Lemma 3, asymmetric control is preferred.

Three regimes: $\hat{\gamma} < \bar{\gamma}$. For all $\gamma^* > \bar{\gamma}$, we have that $W^A(\gamma^A) > W^P$ since $\gamma^A > \frac{1}{2}$ and hence asymmetric control is again preferred. Moreover, we have that for all $\gamma^* > \bar{\gamma}$, $W^J > W^A(\gamma^A)$ from Lemma 3. Next, suppose $\gamma^* < \hat{\gamma}$, so that joint control is preferred since $W^J > W^A(\gamma^A) > W^P$ by Lemma 3, just as in the previous argument.

Finally, consider the interval $\gamma^* \in (\hat{\gamma}, \bar{\gamma})$. By Lemma 2, only joint or 50-plus control are feasible. Within this interval, consider then a sequence $\gamma_n^* \rightarrow \hat{\gamma}$. Clearly, since both W^J and W^P are continuous functions of c_A and c_B and since $W^J > W^P$ for $\gamma^* = \hat{\gamma}$, there must be a neighborhood of γ around $\hat{\gamma}$ where $W^J > W^P$ along this sequence. Next, consider a similar sequence such that $\gamma_m^* \rightarrow \bar{\gamma}$. Again, by continuity of W^J and W^P and since $W^P > W^J$ for $\gamma^* = \bar{\gamma}$, there must be a neighborhood of γ around $\bar{\gamma}$ where $W^P > W^J$ along this sequence. Rewrite Equations (16) and (17) as

$$\begin{aligned} W^J \cdot c_A &= \frac{3}{8} - \frac{1}{8} \frac{1-\gamma^*}{\gamma^*} \\ W^P \cdot c_B &= (1-d+\delta)(1-d) - \frac{(1-d)^2}{8(1-\gamma^*)^2} \end{aligned}$$

Dividing both expressions into each other and multiplying by $\frac{c_B}{c_A} = \frac{1-\gamma^*}{\gamma^*}$ yields after some manipulations

$$\frac{W^P}{W^J} = (1-d) \frac{8(1-d+\delta)(1-\gamma^*) - (1-d)}{4\gamma^* - 1}. \quad (20)$$

Taking the derivative of Equation (20), we observe that

$$\frac{d}{d\gamma^*} \left(\frac{W^P}{W^J} \right) = \frac{-8(4\gamma^* - 1)(1 - d + \delta)(1 - d) - 32(1 - d + \delta)(1 - d)}{(4\gamma^* - 1)^2} < 0$$

so that, by the strict monotonicity of the ratio and continuity, there can be at most one value of γ^* where $W^P = W^J$. This value must be the third 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 two 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 for an estimate of the relative cost of control 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 yields the desired result. ■

C Tables

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

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

“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.

Table 2: **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 3: **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 (in thsds)	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 4: **Geographical 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 5: **Average Abnormal and Cumulative Abnormal Returns**

AR, CAR	At Least One Publicly Quoted Public Parent Returns		Two Publicly Quoted Parents: Full Sample		Two Publicly Quoted Parents: Uncontaminated	
	Returns	P value	Returns	P value	Returns	P value
AR_{-5}	-0.020%	0.8249	-0.025%	0.8275	-0.064%	0.5940
AR_{-4}	0.161%*	0.0770	0.018%	0.8762	-0.043%	0.7184
AR_{-3}	-0.024%	0.7950	-0.077%	0.5007	-0.153%	0.2022
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
AR_3	0.029%	0.7516	-0.004%	0.9717	-0.034%	0.7755
AR_4	0.048%	0.5951	-0.052%	0.6497	-0.086%	0.4713
AR_5	0.042%	0.6437	-0.064%	0.5724	-0.090%	0.4489
$CAR(-1, 0)$	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
$CAR(-1, 0) > 0$	53.20% of observations		53.53% of observations		54.36% of observations	
Observations	1,545		594		550	

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

Table 6: Cumulative Average 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					
Total Average	550	56.1932**	45.48*	59.84*	-17.87
P value		0.0126	0.0997	0.0950	0.7401
At least One Public Parent: Full Sample					
Total Average	1,475	30.3641**	36.7665**	39.1391*	0.78
P 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 7: Model Tests Based on Relative Cost Parameters $\gamma^*(k)$

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 report results for various subsamples that differ in terms of outlier corrections. Since the tests come out virtually identical for our full and noncontaminated two-parents samples, we only report the full sample results. We also remove the 50-plus observations from all test samples.

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
P 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
P 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 8: Discrete Choice Models of JV Ownership and Control

$$\Pr \{REGIME_j = k\} = \Lambda \left(\beta_{1k} GSTAR(z)_j + \beta_{2k} LEV_j + \sum_{l=3}^6 \beta_{lk} REL_j^l \right)$$

for joint ventures $j = 1, \dots, N$ and control regime $k = A, J, P$ where the logistic distribution function Λ is given by $\Lambda(\mathbf{x}'_k \beta_k) = (1 + e^{-\mathbf{x}'_k \beta_k})^{-1}$, and $GSTAR_j$ corresponds to our $\hat{\gamma}^*(k)$ variable, LEV_j is a binary variable indicating leverage of the JV, and REL_j^k measures JV and parent relatedness in terms of SIC codes or geographical origin. We estimate the specifications by full information Maximum Likelihood with a grid search over z for the 50-plus regime. Our sample excludes 8 outliers in terms of $GSTAR_j$ so that $GSTAR_j \in (-5, 5)$. We derive the marginal effects as $\frac{\partial \Pr_j}{\partial x_{jk}} = \Lambda'(\mathbf{x}'_k \beta_k) \beta_k$ evaluated at the sample means of the regressors. We also drop the *NATbab* variable because of insufficient observations in the $k = P$ regime. Since probabilities sum to 1, the coefficients of the $k = J$ equation are normalized to 0 to remove the resulting indeterminacy so we only report marginal effects for the joint control regime.

Specification	1			2		
	$k = J$	$k = P$	$k = A$	$k = J$	$k = P$	$k = A$
z		26.41			26.42	
$GSTAR(z)$		1.6842****	0.7559***		1.4541****	0.7457***
(P value)		(0.0000)	(0.0084)		(0.0000)	(0.0061)
Marg. Effect	-0.2014****	0.0912****	0.1101**	-0.1949****	0.0881****	0.1068**
LEV		-1.6514***	-1.7728****		-2.0471****	-1.7131****
(P value)		(0.0078)	(0.0000)		(0.0004)	(0.0000)
Marg. Effect	0.3672****	-0.0736**	-0.2936****	0.3803****	-0.1126****	-0.2677
$SICaaa$		-2.5554****	-0.3856			
(P value)		(0.0000)	(0.1657)			
Marg. Effect	0.1803***	-0.1502****	-0.0300			
$SICaca$		-2.5873****	-0.7264*			
(P value)		(0.0001)	(0.0767)			
Marg. Effect	0.2378***	-0.1469****	-0.0909			
$SICaab$		-2.4761****	-1.1567****			
(P value)		(0.0000)	(0.0003)			
Marg. Effect	0.3035****	-0.1335****	-0.1700***			
$SICacb$		-2.0402****	-0.6532**			
(P value)		(0.0000)	(0.0491)			
Marg. Effect	0.2007***	-0.1146****	-0.0861			
$NATaaa$					-2.3592****	-0.8475***
(P value)					(0.0000)	(0.0014)
Marg. Effect				0.2584****	-0.1491****	-0.1092**
$NATaab$					-1.9499****	-0.7880***
(P value)					(0.0000)	(0.0015)
Marg. Effect				0.2275****	-0.1217****	-0.1057***
$NATbac$					-2.4252**	-0.9139
(P value)					(0.0310)	(0.2157)
Marg. Effect				0.2724*	-0.1526**	-0.1198
L-likelihood		-210.52			-216.11	
L-lhd 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%. Industry classification: the middle letter refers to the JV's 2 digit SIC code, while the outer ones indicate the SIC classification of the parent companies. $a - a - a$ denotes a JV with two parents all in the same industry (completely related) while $a - c - b$ refers to a joint venture where all three entities are in different industries (completely unrelated). National origin classification: a signifies a US entity while b, c refer to foreign ones with the outer letters referring to the parents, the middle one to the JV.

Table 9: **Return Performance of Contingent Ownership**

This table reports the abnormal and 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, including the 36 American ones, with such buyout provisions.

Day, Window	US Joint Ventures	Worldwide JVs
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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