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"Sharing of Control as a Corporate Governance Mechanism"

by

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Sharing of Control as a Corporate Governance Mechanism

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Abstract

This paper demonstrates that shared control, which occurs when multiple controlling shareholders have veto power over business decisions, protects minority shareholders while preserving valuable private benefits of control. Disagreements among controlling shareholders prevent them from undertaking projects that, although in their collective interest, inefficiently harm minority shareholders. The same disagreements may block efficient investment decisions, though. By solving this trade-off, we show that the likelihood that shared control is efficient increases with three firm characteristics: overinvestment problems, costs of verifying cash flows, and financing requirements. The model contrasts shared control and monitoring, providing testable implications on the role that large shareholders play in corporate governance.

I Introduction

Since Berle and Means (1932), an extensive literature in economics has investigated the consequences to firm value of a separation between ownership and control. In most of this literature, ownership structure matters because part of a firm's value consists of benefits of control that are not enjoyed by outside investors; a controlling group's ability to appropriate corporate assets for personal use, empire building motives in the selection of projects, etc. To preserve private benefits, a controlling shareholder may, for instance, forego a profitable project (e.g., down sizing). Thus, inefficient decisions that are against the interests of minority shareholders may happen if the controlling group is left unchecked.

Accordingly, academics and practioneers have explored alternative mechanisms to protect minority shareholders. In this search, the monitoring of investment decisions by large outside shareholders has been singled out as an important mechanism to protect the value of minority shares. (See Shleifer and Vishny 1986.) Thanks to the size of their equity stakes, these large shareholders have incentives to go to court to overturn business decisions that are against the interests of outside investors, or to mount a proxy fight to replace an unfriendly management team. The presence of a large outside investor, therefore, protects minority shareholders.

Yet, monitoring by outside investors also entails efficiency costs. As Pagano and Roell (1998), Bolton and Von Thadden (1998), and Burkart, Gromb, and Panunzi (1997) have recently argued, excessive monitoring may result. Outside investors have incentives to block business decisions that reduce verifiable cash flow even if this loss is more than offset by higher private benefits of control.

In this paper, we argue that shared control protects minority shareholders while preserving valuable private benefits of control. In a nutshell, shared control occurs when multiple controlling shareholders can veto major corporate decisions, leaving scope for disagreements. We shall show that the likelihood that shared control is efficient increases with three firm characteristics: overinvestment problems, the cost of verifying cash flows, and financing requirements. In addition, we provide testable implications for the role that large shareholders play in corporate governance, contrasting shared control and monitoring as alternative governance mechanisms.

In the model, the governance role of shared control stems from two sources. First, there is an equity effect. Sharing control implies that fewer minority shares have to be sold to satisfy financing needs. Thus, controlling groups internalize firm value to a greater extent, reducing their incentives to implement business decisions that increase private benefits at a high efficiency cost.

The equity effect is not the only reason for why shared control may increase efficiency. Ex-post bargaining problems among controlling shareholders may prevent business decisions that are in the collective interest of the controlling group but harm minority shareholders. Controlling shareholders have strong incentives to avoid costly disagreements, though. Sharing control, therefore, provides a compromise between the excessive monitoring of an outside investor who does not internalize the private benefits, and the excessive discretion of an unchecked controlling shareholder.

Like most compromises, sharing control will not always be efficient. Ex-post bargaining problems among controlling shareholders may result in a corporate paralysis, reducing the firm's overall efficiency and possibly hurting the minority shareholders as well. Still, we shall show that sharing control is an efficient corporate governance mechanism in firms with significant overinvestment problems and large financing requirements.

Perhaps more interestingly, sharing control protects minority shareholders regardless of a court's ability to detect conflicts of interest in business decisions. In contrast, the threat of litigation is an important determinant of the effectiveness of an outside monitor. Hence, the model predicts that, from an efficiency perspective, sharing control is likely to dominate monitoring as a governance mechanism not only in firms with overinvestment problems and large financing requirements, but also when the costs of verifying cash flows are high. In these firms, large shareholders should have a direct participation in the management; fighting to advance their own corporate agenda and yet protecting the cash-flow rights of the minority shareholders.

The model's implications for the role that large shareholders play in corporate governance can be tested. For example, the innovative nature of an R&D project makes it harder to verify its expected return. As such, firms with large R&D investments are good candidates for sharing control to be efficient. In these firms, overinvestment problems and financing requirements are likely to be large, and the difficulty of assessing the returns of R&D investments reduces a monitor's ability to convince a court to overturn the management's decision. The model thus predicts that shared control should be more pervasive in firms with large R&D investments.

Of course, testing this prediction requires a proxy for the presence of multiple controlling shareholders. As it turns out, contractual arrangements among controlling shareholders – the shareholders' agreements – provide us a proxy for shared control. Ex post, controlling shareholders have incentives to trade away the same conflicts that protect the minority shareholders. For instance, seeking to advance their corporate agenda, a coalition of controlling shareholders could try to exclude one or more members of the controlling group from the firm's decisions. Shareholders' agreements can avoid these ex-post incentives by imposing restrictions on the sale of control shares. These restrictions limit the controlling shareholders' ability to form new coalitions. Also, voting agreements can give veto power over major business decisions to each member of the control group, effectively preventing exclusions from the controlling group.

Although we are not aware of any empirical study of the use of shareholders' agreements in the U.S., the Securities and Exchange Commission (SEC) requires that firms with publicly traded securities disclose the presence of shareholders' agreements, making them available in their EDGAR database. The existence of shareholders' agreements in a firm, therefore, can be used as a proxy of shared control.[1] Thus, the model predicts that shareholders' agreements should be more pervasive in firms with large R&D investments.

The papers closest to ours are Bennedsen and Wolfenzon (2000) and Aghion and Bolton (1992). Bennedsen and Wolfenzon show that the presence of large shareholders outside the control group increases firm value. In their paper, a large outside shareholder forces the controlling group to amass a greater equity stake or else control may be lost. The larger equity stake increases efficiency because it makes the controlling group internalize more of the firm's value.[2] Instead, we focus on the bargaining problems among controlling shareholders and ignore the coalition games that determine the controlling group.

As in our paper, Aghion and Bolton (1992) consider the consequences of sharing control to the value of a firm whose initial shareholder is credit constrained. Our paper departs from Aghion and Bolton by letting the controlling shareholders exchange shares, while bargaining

[1]Black and Gilson (1997) report that shareholders' agreements are often present in the venture capital industry.

[2]Harris and Raviv (1988) and Stulz (1988) also focus on the equity stake of a controlling group. In these papers, the goal is to investigate the capital-structure implications of a controlling group's attempt to defeat a control contest.

over an investment decision under imperfect information (by their very nature, private benefits are likely to be privately known). Allowing for transfers of shares captures the idea that a shareholder is not limited to monetary side-payments when trying to convince other shareholders to support a certain corporate agenda. In this setting, we obtain new trade-offs that link firm characteristics to the choice of governance mechanisms, showing that, in constrast to Aghion and Bolton (1992), shared control may be an efficient mechanism to protect minority shareholders.

The remainder of the paper is organized as follows. Section II describes the model. Section III proves that sharing control is an efficient governance mechanism in firms with over-investment problems and large financing requirements. Section IV shows that a high cost of verifying cash flows increases the chances that sharing control dominates monitoring as a governance mechanism. Section V discusses the stability of an ownership structure with multiple controlling shareholders. Section VI discusses the empirical implications and works out some extensions to the model. A conclusion then follows. Proofs of the propositions that are not present in the text can be found in the appendix.

II Framework

Our starting point is a firm whose single shareholder seeks outside investors to finance new projects. For simplicity, all agents are risk-neutral and the risk-free interest rate is zero.

A Timing

Figure 1: Timing of events

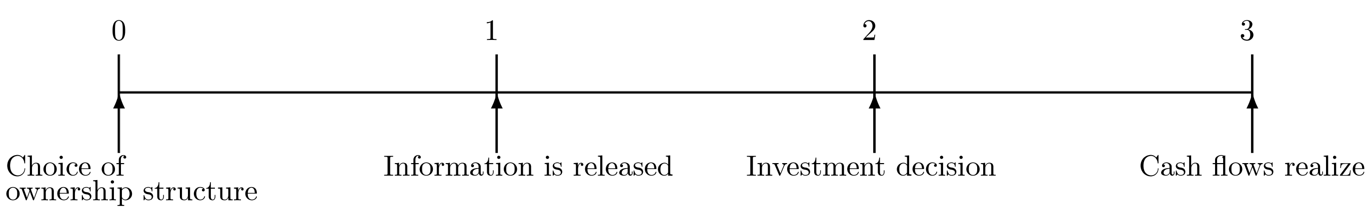

Figure 1 summarizes the timing and the main events of the model. At time $t = 0$, an investment opportunity becomes available and the initial shareholder looks for outside investors to finance the cost I of the project. To create a link between the investment opportunity and the firm's ownership structure, we assume that both the entrepreneur and the firm have exhausted their debt capacities. Financing the project thus requires attracting new shareholders.[3]

Additional information about the project's payoff is released at time $t = 1$, and the final decision on the investment is made at time $t = 2$. Cash flows realize at $t = 3$, when the firm is liquidated.

B Ownership structure

The initial shareholder's problem is to choose an ownership structure that maximizes the firm's value conditioned on raising the investment requirement I. To finance the project, the initial shareholder may search for two types of investors: another large shareholder who will gain control over business decisions, and minority shareholders.

We model control by the authority to veto projects. In case of shared control, therefore, a project will be undertaken if and only if both controlling shareholders agree with the investment. (Section V discusses mechanisms that give veto power to the controlling shareholders.)[4] Also, we assume that, to keep control, individual shareholders must hold an equity stake that is at least equal to $\underline{\alpha} > 0$. Calling α_1 the fraction of shares held by the initial shareholder and α_2 the fraction of shares held by the second controlling shareholder, sharing control thus requires that $\alpha_i \geq \underline{\alpha}$ for $i \in \{1, 2\}$.

In most of our paper, minority shareholders are dispersed with no incentives to interfere in business decisions. Hence, actions of minority shareholders that aim to overturn investment decisions are ruled out, unless a minority shareholder amasses an equity stake that is sufficiently large to elicit incentives for him to monitor the control group. In section IV we introduce in

[3]For simplicity, we also assume that the debt becomes riskless after the firm issues equity in the amount I. With this assumption, the investment decision does not imply transfers of wealth between shareholders and debt holders, letting us ignore the firm's existing debt in the analysis.

[4]Although all the arguments of this paper apply to ownership structures with more than two controlling shareholders, the analysis is simpler if we restrict attention to two controlling shareholders. Note also that ownership structures with more than two controlling shareholders do not seem to be empirically relevant. Zwiebel (1995), for instance, reports that the Fortune 500 firms of 1981 had an average of 1.4 shareholders with blocks greater than 5 percent of the total capital.

the model monitoring by a large shareholder.

When choosing the ownership structure, the initial shareholder takes into account that no single investor can afford the whole firm. (Otherwise, the first best would be trivially obtained by selling the whole firm to a single investor, who would internalize all the costs and benefits of business decisions.) However, outside investors can afford the maximum between the investment requirement I and the value of the minimum control, $\underline{\alpha}$. With this additional assumption, we allow for ownership structures with multiple controlling shareholders and no minority shareholders.

C Cash flows

Ownership structure is relevant to the firm's value only if shareholders may have different incentives to undertake the project. As in the modern literature on the theory of firm (e.g., Grossman and Hart 1986, and Hart and Moore 1990), we obtain conflicting incentives on the investment decision by introducing nonverifiable cash flows – the private benefits of control – which are fully captured by the shareholders who run the firm, that is, the controlling shareholders.

Accordingly, the project's cash flows consist of two parts: the verifiable cash flow, $I + y$, which is the sum of the investment requirement I and its return y, and the private benefit component, b. In this setting, $b < 0$ if the project reduces the private benefits vis-à-vis the status quo. For instance, down sizing the firm may increase profits and yet reduce the utility of a controlling shareholder who is an empire builder.

Although there are reasons to believe that the number of controlling shareholders may have an impact on the distribution of the project's payoffs, the direction of this effect is uncertain.[5] Hence, we assume that the private benefits do not depend on the number of controlling shareholders. Likewise, the private benefits of the project do not depend on the control stake. Intuitively, the distribution of the project's payoffs, (b, y), reflects the investment opportunities, which do not depend on the ownership structure. Still, the ownership structure affects

[5] For instance, a large number of controlling shareholders may increase the efforts of unlocking private benefits. If so, the private benefits should stochastically increase with the number of controlling shareholders. But, a large number of controlling shareholders may also lead to a destructive fight for private benefits. Hence, private benefits may stochastically decrease with the number of controlling shareholders.

firm value by influencing the control group's incentives to take advantage of the investment opportunities.

In summary, the distributions of b and y depend neither on the number of controlling shareholders nor on the control stake. This assumption implies that $\sum_{i=1}^{2} b_i = b$, where b is the private benefit of the project in an ownership structure with a single controlling shareholder, and b_i is the private benefit of controlling shareholder $i \in \{1, 2\}$ under shared control.

D Information structure

When the initial shareholder chooses the ownership structure (time $t = 0$), information is symmetric: the payoffs of the project, b and y, are random variables with a joint probability that is publicly known. Before making the investment decision, the controlling shareholders learn the verifiable return, y, and their own private benefits from the project, b_i (possibly negative).[6] By their very nature, however, the benefits of control of each controlling shareholder are likely to be privately known. Therefore, we assume that controlling shareholder $i \in \{1, 2\}$ observes only a noisy signal s_j of the private benefit of the controlling shareholder $j \neq i$. This noisy signal satisfies $b_j = s_j + \epsilon_j$ with $\epsilon_j \in [-\frac{\epsilon}{2}, \frac{\epsilon}{2}]$ and $\epsilon > 0$.

Conditioned on s_j, the true private benefit b_j is uniformly distributed in the interval $[s_j - \frac{\epsilon}{2}, s_j + \frac{\epsilon}{2}]$. Hence, the realization of s_j implies that controlling shareholder i's posterior about b_j is independent of b_i. Note also that we do not impose restrictions on the distribution of the signals (s_1, s_2). As such, our results do not rely on how the private benefits of control are shared. In particular, the model is consistent with a sharing rule that gives the smallest fraction of the total private benefits (possibly zero) to the controlling shareholder with the lowest equity stake. Finally, we assume that the signals s_1 and s_2 are observed by both controlling shareholders. (But not by the outside investors.)

III The Efficiency of Sharing Control

This section demonstrates that bargaining problems among multiple controlling shareholders may increase firm value. We characterize the costs and benefits of sharing control, obtaining

[6] If there is only one controlling shareholder, $b_1 = b$, implying that the shareholder in control learns the total private benefits of the project.

a sufficient condition for its efficiency.

A Investment under the initial shareholder's control

To characterize the costs and benefits of sharing control, we first derive the firm's value with a single controlling shareholder. Hence, assume that the initial shareholder raises the investment requirement I by selling a fraction $1-\alpha_1$ of the firm's equity to dispersed shareholders, who have neither the power nor the incentives to interfere in the business decisions. In this case, an inefficient project, $y+b<0$, will be profitable for the initial shareholder if the private benefits are high enough to offset his share of the negative verifiable return, that is, $b > -\alpha_1 y$.[7] Likewise, an efficient project will be foregone, if it implies a reduction in the private benefits of control, $b<0$, that offsets the controlling shareholder's share of the verifiable return y. Both underinvestment and overinvestment may then result, implying the following set of states where a single controlling shareholder distorts the investment decision:

$$\mathcal{D}^1(\alpha_1) = \{(y,b) : y+b<0 \text{ and } \alpha_1 y + b \geq 0, \text{ or } y+b>0 \text{ and } \alpha_1 y + b \leq 0\}, \quad (1)$$

where the superscript in $\mathcal{D}^1$ denotes an ownership structure with a single controlling shareholder, and α_1 is the equity stake of the controlling shareholder.

Note that, conditioned on (y,b) belonging to the set $\mathcal{D}^1$ of inefficient investment decisions, $|y+b|$ is either the absolute value of the negative payoff of an inefficient project, or the positive payoff of an efficient project that is foregone. The expected cost of an ownership structure with a single controlling shareholder is then

$$D^1(\alpha_1) = prob\{(y,b) \in \mathcal{D}^1(\alpha_1)\} E[|y+b| \,|\, (y,b) \in \mathcal{D}^1(\alpha_1)]. \quad (2)$$

It can be easily shown that the incentives to distort the investment decision decrease with the controlling stake α_1 (a larger stake makes the controlling shareholder internalize the firm's value to a greater extent). As a result, it is in the initial shareholder's interest to sell as few minority shares as possible. The optimal ownership structure with a single controlling

[7] Bebchuk and Zingales (1998) use a similar conflict between minority and controlling shareholders to explain why a firm's decision to go public may not be socially optimal.

shareholder is then $(\alpha_1 = \alpha_1^\star, \alpha_2 = 0, \gamma = 1 - \alpha_1^\star)$, where $\gamma = 1 - \alpha_1^\star$ is the minimum minority stake that raises the financing requirement I.

B Investment with shared control

Sharing control opens the door for conflicts of interest within the controlling group. For instance, the Wall Street Journal of May 13, 1998 (page B10) reports that Ted Turner, then Vice Chairman and the largest individual shareholder (11 percent) of Time Warner, had for a second time vetoed the sale of the group's legal channel, Court TV, to Discovery Communications Inc. Allegedly, Ted Turner was concerned with a new owner transforming the legal channel into a competitor to CNN, the flagship of Turner Broadcasting's own cable channel and also a member of the Time-Warner group. According to the Wall Street Journal, Mr. Turner prevailed over Gerald Levin, Time Warner's Chairman, who did not internalize the consequences to CNN of the sale of Court TV to Discovery as much as Mr. Turner.

In our paper, conflicts of interest between the controlling shareholders arise if $b_i + \alpha_i y > 0$ and $b_j + \alpha_j y < 0$ for $i \neq j$, where $b_i + \alpha_i y$ is controlling shareholder i's valuation for the project. In this case, the firm undertakes the project only if controlling shareholder i convinces the opposing shareholder j not to use his veto power. The investment decision amounts to a bargaining game.

In Aghion and Bolton (1992), credit constraints prevent controlling shareholders from finding a solution to their conflicts that maximizes their collective welfare. As a result, Aghion and Bolton argue that shared control is a suboptimal ownership structure, unless the controlling shareholders are confident that their interests will be aligned. In reality, however, a shareholder is not limited to monetary side-payments when trying to convince other shareholders to support a certain investment decision. Transfers of shares, for instance, give some leeway for a credit constrained shareholder to persuade another shareholder to undertake a project.

Yet, frictions in the bargaining process play an important role in shaping firms' ownership structures in our paper. Since, by their very nature, the benefits of control of each controlling shareholder are likely to be privately known, imperfect information is a natural way of introducing frictions in the bargaining process. By focusing on imperfect information as opposed to credit constraints in the bargaining game, we show that, in contrast to Aghion and Bolton

(1992), shared control may be efficient in firms whose controlling shareholders disagree about their corporate agendas.

We thus model the investment decision under shared control as a bargaining game with imperfect information, in which the controlling shareholders may exchange shares for the undertaking of the project. As Myerson and Satterthwaite (1983) demonstrate, imperfect information prevents bargaining mechanisms from achieving ex post efficiency under general conditions, which is all that we need to prove that shared control may protect minority shareholders while increasing firm value. For ease of exposition, we can therefore use a simple and well known mechanism – first analyzed by Chatterjee and Samuelson (1983) – to solve the controlling shareholders' bargaining game.[8]

In the mechanism of Chatterjee and Samuelson, which is a natural generalization of the Nash bargaining solution to a setting with imperfect information, the controlling shareholders simultaneously announce their valuations of the project – call them V_i for $i \in \{1,2\}$. The project is undertaken if and only if $V_1 + V_2 \geq 0$, in which case the two controlling shareholders split their announced benefits. The split of the announced benefits is implemented by a transfer, t, from the first controlling shareholder (the initial one) to the second one. If the project is not undertaken, no side payment is required. The transfer thus solves $V_1 - t = V_2 + t$ or $t = \frac{V_1 - V_2}{2}$. As Lemma 1 shows, transfers of shares can support any incentive-compatible side-payment t if the equity value that arises from the existing assets is sufficiently large.

Lemma 1 *Consider any bargaining game in which a controlling shareholder may offer a side payment to the other controlling shareholder in exchange for undertaking the project. If the equity value from the assets in place in place, $V_0 + I$, is sufficiently large, transfers of shares can implement any incentive-compatible payment of the bargaining game. More precisely, $V_0 + I$ must satisfy*

$$V_0 + I \geq -\underline{y} + max_{i\in\{1,2\}} \frac{\bar{b}_i + \alpha_i \bar{y}}{\alpha_i - \underline{\alpha}}, \tag{3}$$

where $\underline{y}$ is the minimum verifiable return, $\bar{y}$ is the maximum verifiable return, $\bar{b}_i$ is the maximum private benefit of controlling shareholder i, and $\alpha_i > \underline{\alpha}$ for $i \in \{1,2\}$.

[8] In an earlier version of our paper – Multiple Large Shareholders in Corporate Governance 1999 (Rodney White Center of Financial Research Working paper #05-99) – we solve the bargaining problem using the direct mechanism approach of Myerson and Satterthwaite (1983).

From now on, we assume that condition (3) is satisfied. Hence, we can proceed as if the controlling shareholders could afford monetary transfer payments.

The transfer payment $t = \frac{V_1 - V_2}{2}$ implies that, conditioned on the investment being made, the two controlling shareholders gain by shading their valuations of the project. Of course, reducing the announced valuation will also increase the chances that the project will not be undertaken (remember that the investment happens if and only if $V_1 + V_2 \geq 0$). When shading their valuations, each controlling shareholder will weigh a higher gain in the event that the project is undertaken against a higher probability that a valuable project is foregone.

To solve this trade-off, we look for a Bayesian equilibrium in which the announcements of the controlling shareholders depend on their own valuations for the project, $b_i + \alpha_i y$, and their guesses of the announcement of the other controlling shareholder. The Bayesian equilibrium is described by a pair of functions, $(V_1(b_1 + \alpha_1 y, s_1, s_2), V_2(b_2 + \alpha_2 y, s_1, s_2))$, such that the announcement of the first controlling shareholder, $V_1(b_1 + \alpha_1 y, s_1, s_2)$, solves

$$\max_{V_1} \int_{V_2^{-1}(-V_1, s_1, s_2) - \alpha_2 y}^{s_2 + \frac{\epsilon}{2}} (b_1 + \alpha_1 y - \frac{V_1 - V_2(b_2 + \alpha_2 y, s_1, s_2)}{2}) f_2(b_2|s_2) db_2. \tag{4}$$

The objective function in program (4) is the expected payoff of the initial shareholder given his announcement of V_1; his true valuation of the project, $b_1 + \alpha_1 y$; and the signals s_1 and s_2. This payoff is uncertain, for two reasons. First, the transfer payment $t = \frac{V_1 - V_2}{2}$ depends on the second controlling shareholder's announcement, V_2, which is a function of his unknown valuation for the project. Second, announcing V_1 will block the project if $V_1 + V_2 < 0$, or equivalently, $V_2 < -V_1$. Hence, the lower the announced V_1, the higher the chances that the project will not be undertaken. In fact, given V_1, the lowest V_2 that leads to the acceptance of the project solves $V_1 + V_2(b_2 + \alpha_2 y, s_1, s_2) = 0$, which implies that $V_1 + V_2(b_2 + \alpha_2 y, s_1, s_2) > 0$ if and only if $b_2 + \alpha_2 y > V_2^{-1}(-V_1, s_1, s_2)$, where $V_2^{-1}(.)$ is the inverse function of $V_2(b_2 + \alpha_2 y, .)$.[9] Therefore, the expectation of the initial shareholder's payoff is taken with respect to b_2 (using the density that the signal s_2 induces, $f_2(b_2|s_2)$) for values higher than the cut-off $V_2^{-1}(-V_1, s_1, s_2) - \alpha_2 y$.

[9] It can be shown that, in any Bayesian Equilibrium, the functions $V_1(.)$ and $V_2(.)$ increase with the valuation of the project. If these functions are not strictly increasing, $V_i^{-1}(x)$ should be understood as the minimum valuation of the project that makes the controlling shareholder i announce x.

Analogous to program 4, the optimal announcement of the second controlling shareholder solves

$$\max_{V_2} \int_{V_1^{-1}(-V_2,s_1,s_2)-\alpha_1 y}^{s_1+\frac{\epsilon}{2}} (b_2 + \alpha_2 y + \frac{V_1(b_1+\alpha_1 y, s_1, s_2) - V_2}{2}) f_1(b_1|s_1) db_1. \quad (5)$$

Proposition 1 characterizes the solution of the bargaining game for best responses $V_1(.)$ and $V_2(.)$ that are linear functions of the controlling shareholders' own valuations.

Proposition 1 *Suppose that the project's verifiable return is* $y \in [\underline{y}, \bar{y}]$*; the private benefit of controlling shareholder* $i \in \{1,2\}$ *is* $b_i \in [\underline{b}_i, \bar{b}_i]$*; the signals of the private benefits are* $s_i = b_i + \epsilon_i$*;* $\epsilon_i \in [-\frac{\epsilon}{2}, \frac{\epsilon}{2}]$*; and the equity value from the existing assets,* $V_0 + I$*, satisfies condition (3). Then, there is a Bayesian Equilibrium in which the investment is undertaken if and only if*

$$b_1 + b_2 + (\alpha_1 + \alpha_2)y \geq \frac{1}{4}\{s_1 + s_2 + (\alpha_1 + \alpha_2)y + \epsilon\}. \quad (6)$$

It is easy to show that the investment policy of the controlling shareholders rejects projects that are in their collective interest. The left-hand side of the investment rule (equation (6)) is the combined valuation of the controlling shareholders. In the absence of bargaining problems, a project will be undertaken if and only if the combined valuation is positive, that is, $b_1 + b_2 + (\alpha_1 + \alpha_2)y \geq 0$. Under imperfect information, however, the project will be accepted only if the combined valuation exceeds $\frac{1}{4}\{s_1 + s_2 + (\alpha_1 + \alpha_2)y + \epsilon\}$. Using $s_i = b_i + \epsilon_i$, this decision rule can be re-written as

$$b_1 + b_2 + (\alpha_1 + \alpha_2)y \geq \frac{1}{3}(\epsilon - \epsilon_1 - \epsilon_2).$$

Since ϵ_i is uniformly distributed in the interval $[-\frac{\epsilon}{2}, \frac{\epsilon}{2}]$, $\epsilon - \epsilon_1 - \epsilon_2$ is strictly positive with probability 1. Hence, the controlling shareholders will pass up projects that are in their collective interest if the payoffs satisfy $0 < b_1 + b_2 + (\alpha_1 + \alpha_2)y < \frac{1}{3}(\epsilon - \epsilon_1 - \epsilon_2)$. We have thus shown that

Proposition 2 *With shared control, the controlling shareholders will not undertake projects that are against their collective interest. They may pass up, though, projects that would have increased the sum of their expected payoffs.*

The intuition for Proposition 2 is straightforward. Both controlling shareholders have incentives to shade their valuations for the project. After all, the transfer paid by the initial shareholder increases with his announcement of the project's value, V_1, and decreases with the other controlling shareholder's announcement, V_2. Shading the valuations increases the chances that the project is not undertaken. Bargaining under imperfect information, therefore, biases the investment decision against the undertaking of the project.

C Shared control as an efficient governance mechanism

Rejecting projects that are in the collective interest of the controlling shareholders is not always inefficient. If the verifiable return y is negative, disagreements among the controlling shareholders may prevent them from undertaking a project that, although in their collective interest, inefficiently harm minority shareholders. In other words, bargaining problems associated with shared control may mitigate overinvestment problems.

Unfortunately, ex-post bargaining problems may also lead to the rejection of efficient projects. For instance, a controlling shareholder who enjoys no private benefits will fiercely resist the undertaking of a project with negative verifiable returns. Shared control, therefore, exacerbates underinvestment problems in firms with projects that are likely to be efficient, despite a negative verifiable return. As such, one would expect that the efficiency of shared control as a governance mechanism depends on the relative costs of overinvestment or underinvestment problems. Indeed, as Proposition 3, below, shows, sharing control unambiguously increases firm value if the probability Π that the project is inefficient is large enough. Accordingly, the model predicts that shared control is more pervasive in firms with large overinvestment problems.[10]

Proposition 3 *Let Π be the probability that the project is inefficient. Moreover, consider the comparative statics problem where Π changes while maintaining everything else fixed, including the optimal stake of a single controlling shareholder. Then, there is a $\hat{\Pi} \in [0, 1)$ such that*

[10] In Proposition 3, the comparative statics assumes that the optimal stake of a single controlling shareholder remains constant when the probability Π that the project is inefficient changes. This assumption can be justified as follows. Although our model rules out any discretion on the scale of the project, controlling shareholders often scale down projects in response to a worst business environment. Our model may capture this optimal response by assuming that the investment requirement I decreases with the probability Π. If, in addition, we assume that I changes so that the equity stake of a single controlling shareholder remains constant, we fix the ownership structure under a single controlling shareholder and focus the sharing control decision on the trade-off between the underinvestment and the overinvestment problems.

sharing control increases firm value via-à-vis unilateral control if $\Pi \geq \hat{\Pi}$*. Sharing control is thus optimal when overinvestment problems are likely to occur.*

Figure 2: Investment decisions with shared control.

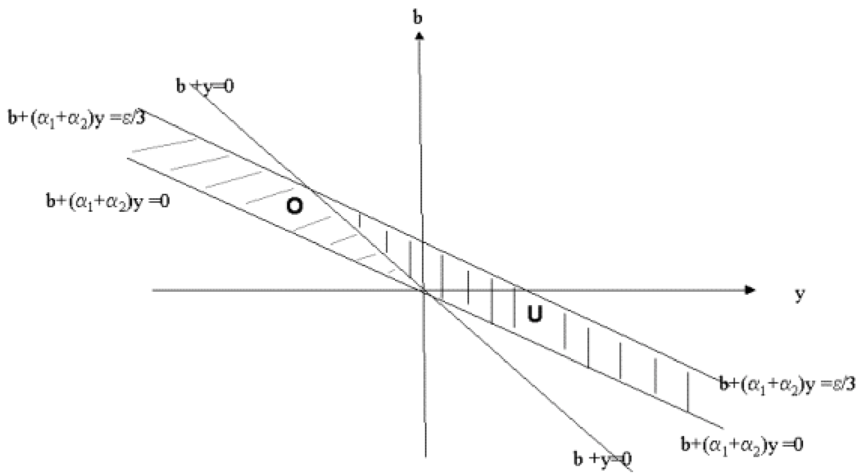

Figure 2 illustrates Proposition 3 in the worst case scenario (for shared control) that the equity stake of the controlling shareholders is equal to the optimal equity stake of a single controlling shareholder. In the figure, the space above the 45 degree line ($b + y = 0$) describes the payoffs of the efficient projects. In turn, the space above the line $b + (\alpha_1 + \alpha_2)y = 0$ describes the projects (payoffs) that would be undertaken had a single controlling shareholder with an equity stake $\alpha_1 + \alpha_2$ had full control over the investment decision. Hence, the area under $b+y = 0$ and above $b+(\alpha_1+\alpha_2)y = 0$ characterizes the single shareholder's incentives to overinvest. In this area, the project may be inefficient, $b+y < 0$, and yet the single controlling shareholder undertakes it to enjoy the positive private benefits if $b+(\alpha_1+\alpha_2)y > 0$. In contrast, the area under $b + (\alpha_1 + \alpha_2)y = 0$ and above $b + y = 0$ represents the single shareholder's incentives to underinvest. In this area, the single controlling shareholder foregoes efficient projects to avoid the loss of private benefits.

Once control is shared, the condition for accepting a project changes from $b+(\alpha_1+\alpha_2)y \geq 0$

to $b+(\alpha_1+\alpha_2)y \geq \frac{1}{3}(\epsilon-\epsilon_1-\epsilon_2)$. (Assuming that the control stake remains the same.) The higher hurdle blocks some efficient projects that a single controlling shareholder would have undertaken, reducing firm value accordingly. If the realizations of the signals equal the true private benefits (i.e., $\epsilon_i = 0$ for $i \in \{1,2\}$), these projects are characterized by the region U (for underinvestment) in figure 2.

Yet, the higher hurdle may also prevent inefficient projects that a single controlling shareholder would have undertaken. These projects are described by the area below $b+y=0$ and $b+(\alpha_1+\alpha_2)y = \frac{1}{3}\epsilon$, and above $b+(\alpha_1+\alpha_2)y = 0$ (marked O in figure 2). The net benefits of sharing control thus depend on whether the payoffs of the project are more likely to lie on regions U or O. As the probability Π that the project is inefficient increases, so do the chances that the realized payoffs lie on the region O. In fact, in the polar case that Π converges to 1, the region U becomes irrelevant and the net benefits of sharing control collapse to the gains of curbing overinvestment problems (region O). Sharing control is then certain to be efficient, as stated in Proposition 3.

While Proposition 3 gives us a sufficient condition for the efficiency of shared control – significant overinvestment problems – it does not imply that shared control is always efficient. In our framework, it is certainly possible that an ownership structure with a single controlling shareholder strictly dominates shared control. For example, suppose that $y = 0$ and $b > 0$ (i.e., all projects in the opportunity set increase private benefits while keeping the verifiable cash flows unchanged). In this case, a single controlling shareholder implements the first best, which calls for investment in all states of the world. Nonetheless, multiple controlling shareholders may disagree about how to split the private benefits of control, allowing for instances in which the project will not be undertaken, which is an inefficient outcome. Unilateral control may thus dominate shared control.

In general, therefore, firm characteristics determine the weakest overinvestment problem that induces an initial shareholder to share control. As Proposition 4 shows, the level of financing requirement is one example of a firm characteristic that plays an important role in the efficiency of shared control as a governance mechanism.

Proposition 4 *The efficiency of the shared control mechanism does not depend on the level of financing requirement (I) while the value of firms with a single controlling shareholder* *decreases with the level of financing requirement. The benefits of sharing control thus increase with the level of financing requirement.*

The intuition for Proposition 4 is quite simple. When the investment requirement increases, a single controlling shareholder must sell a larger amount of minority shares to finance the project. The lower control stake makes the initial shareholder internalize a smaller fraction of the firm's value, increasing his incentives to distort the investment policy. Firm value thus decreases with the investment requirement.

In contrast, a larger financing requirement does not imply a reduction of the control stake under shared control. The initial shareholder can raise extra funds by selling more of his control shares to the other controlling shareholder, while keeping the control stake constant. By so doing, the initial shareholder can finance a larger investment requirement.

In summary, while firms under a single controlling shareholder experience a decrease in value when the financing requirement increases, sharing control insulates the firm's value from the investment requirement. The net benefits of sharing control increase with the financing requirement for any probability Π that the project is inefficient.

IV The Role of Large Shareholders in Corporate Governance

Sharing control is not the only mechanism available to prevent inefficient investment decisions that harm minority shareholders. Since Grossman and Hart (1980) and Shleifer and Vishny (1986), a large literature on corporate control has described the efficiency gains of letting outside investors monitor the control group. In this section, we introduce monitoring in the model, contrasting it with shared control. We shall show that these two control mechanisms imply different investment policies, obtaining a sufficient condition for sharing control to dominate monitoring as a governance mechanism.

A Introducing monitoring

In our model, a controlling group may act against the interests of the minority shareholders in two ways. First, the controlling group may invest in a project with negative verifiable returns (e.g., a value-decreasing acquisition driven by empire building concerns), imposing on the minority shareholders a loss of $-\gamma y$, where γ is the minority stake. Second, the controlling group may pass up a project with a positive verifiable return, at a cost of γy to the minority shareholders. We can thus write the minority shareholders' cost of an investment decision that is against their interests as $\gamma|y|$, where $|y|$ is the absolute value of the verifiable return.

Assume now that an outside investor can assure a probability $m \in [0,1]$ that the court will overturn an investment decision that is against the interest of the minority shareholders. Call this probability m the outcome of the outside investor's monitoring efforts. Then, conditioned on an investment decision that is against the interests of the minority shareholders, their expected benefit of monitoring is $m\gamma|y|$.

Yet, monitoring is not costless. Although verifying y can be costless after the cash flows realize, convincing the court to overturn an investment decision requires information on the project's returns before they realize. Gathering this information is costly. Moreover, all else equal, increasing the probability m of overturning the investment decision requires a larger investment in information. Hence, we assume that the cost of monitoring increases with m.

The cost of monitoring also depends on the nature of the investment. For instance, evaluating a project with a high volatility of verifiable returns (e.g., an R&D project) is likely to be more difficult than a typical project. Courts should then be more reluctant to overturn a management's decision related to an R&D project. Finally, we assume that the cost of monitoring entails a fixed component f, which rules out monitoring by dispersed shareholders. Accordingly, we parameterize the monitor's cost by the function $c(m) = \frac{\rho m^2}{2} + f$, which increases with the fixed cost component f, the level of monitoring m, and the parameter $\rho > 0$, which captures the relation between the volatility of the returns and the cost of monitoring; the larger the volatility is, the larger the value of ρ.

The cost of monitoring induces a free-rider problem. As Grossman and Hart (1980) point out, while the monitor bears the cost $c(m)$, the gains of overturning an investment decision is spread over all the minority shareholders. Assuming that observing y is costless for the monitor but verifying it to a court costs $c(m)$, the monitor's optimal level of monitoring solves

$$\max_{\{m \in [0,1]\}} \beta m|y| - \frac{\rho m^2}{2} - f, \tag{7}$$

where $\beta \in (0,1)$ is the equity stake of the monitor.

Solving the maximization problem (7) yields $m^\star = min\{\frac{\beta}{\rho}|y|, 1\}$ if $f \leq \beta m^\star |y| - \frac{\rho(m^\star)^2}{2}$ and zero otherwise. As expected, the incentives to monitor increase with the equity stake, β, and decrease with the parameter ρ that captures the cost of verifying y and the fixed cost component f.

Having an effective monitor is not necessarily efficient, nonetheless. As Burkart, Gromb, and Panunzi (1997) point out, an outside monitor may overturn investment decisions that increase the firm's value but harm the minority shareholders. For instance, monitoring will be inefficient if the control group decides to undertake a value enhancing project that harms the minority shareholders, i.e., $b + y > 0$ but $y < 0$. Or if a monitor tries to force the control group to undertake a project whose positive verifiable return implies a large loss of private benefits. An initial shareholder may thus choose to pulverize the minority shares among dispersed shareholders, making it more difficult for an outside investor to amass a block β that elicits incentives for monitoring.

Of course, there exist parameter values that elicit incentives for the initial shareholder to facilitate monitoring. This raises the following question: Is monitoring a redundant governance mechanism when shared control protects minority shareholders? The next subsection answers this question.

B Sharing control versus monitoring

Monitoring and shared control are not redundant mechanisms to protect minority shareholders. As we argue below, these two control mechanisms have actually opposite biases with respect to investment decisions. While shared control leans toward preserving valuable private benefits of control, monitoring emphasizes verifiable cash flows. As a result, the two mechanisms will be, at times, complementary.

To see that shared control and monitoring may play complementary roles, consider first that shared control leads to an overinvestment problem: $b + y < 0$ but $b + (\alpha_1 + \alpha_2)y > \frac{1}{3}\{\epsilon - \epsilon_1 - \epsilon_2\}$. With multiple controlling shareholders, bargaining problems create a bias toward underinvestment. Thus, overinvestment may only occur if, thanks to the presence of minority shareholders, controlling shareholders do not fully internalize a negative verifiable return. A negative verifiable return will trigger a monitor's effort to block the investment decision, though. Monitoring, therefore, mitigates overinvestment problems that shared control does not curb.

Monitoring may also play a complementary and value-enhancing role when shared control implies underinvestment: $b+y>0$ but $b+(\alpha_1+\alpha_2)y<\frac{1}{3}\{\epsilon-\epsilon_1-\epsilon_2\}$. In this case, monitoring increases value if the interests of the minority shareholders are aligned with firm value ($b+y>0$ and $y>0$), because a monitor will try to force the controlling group to undertake the efficient project. Note, however, that monitoring will not curb the distorted incentives of the controlling group if the verifiable return is negative ($y<0$), for outside shareholders will actually benefit from the inefficient investment decision.

Unfortunately, monitoring may also increase inefficiency under shared control. For instance, the controlling group may decide to undertake an efficient project, $b+(\alpha_1+\alpha_2)y>\frac{1}{3}(\epsilon-\epsilon_1-\epsilon_2)$, whose verifiable return y is negative. A monitor with equity stake β would then spend $c(m^\star)$ to stop the project. Likewise, a monitor may try to force the control group to undertake an inefficient project if $y>0$. An ownership structure with an outside monitor, therefore, is not necessarily optimal.

Proposition 5 provides a sufficient condition for monitoring to be sub-optimal. The optimal ownership structure of firms with poor investment opportunities (large probability Π that the project is inefficient) does not include an outside monitor if there is a positive probability that the interests of the minority shareholders are not aligned with the firm's value (i.e., $Prob(b+y<0,y>0)>0$) and unilateral control cannot achieve the first best (i.e., $Prob(b+y<0,\alpha y+b>0)>0$ for any equity stake $\alpha>0$ of the single controlling shareholder). In this case, sharing control approaches the first best, while monitoring is always inefficient.

Proposition 5 *Assume that $Prob(b+y<0,y>0)>0$ and $Prob(b+y<0,\alpha y+b>0)>0$ for any equity stake $\alpha\in[0,1)$ of a single controlling shareholder. Then an optimal ownership structure includes multiple controlling shareholders and no outside monitor if the probability Π that the project is inefficient is greater than or equal to some $\hat{\Pi}\in[0,1)$.*

The intuition of Proposition 5 is as follows. If the probability Π that the project is inefficient is large enough, ex-post bargaining problems curb overinvestment without a significant increase of the underinvestment problem. Indeed, for $\Pi=1$, Proposition 2 implies that ex-post bargaining problems will, at most, induce the controlling shareholders to pass up an inefficient project. Hence, the first best is achieved by making the controlling shareholders full residual claimants on the firm's value. In contrast, monitoring (with or without multiple controlling shareholders) introduces the possibility that the outside monitor convinces the court to force the controlling group to undertake an inefficient project with a positive verifiable return.

As it turns out, firms with a large probability of overinvestment are not the only ones that should avoid outside monitors. The net gains of monitoring decrease with the cost ρ of verifying the return y. The larger ρ is, the higher the cost of convincing the court to overturn a business decision. Monitoring is thus unlikely to be an efficient corporate control mechanism in firms whose cash flows are hard to verify (high values of ρ).

By contrast, the court's ability to verify cash flows does not affect the effectiveness of sharing control as a corporate control mechanism. In fact, our model assumes that, at the moment that the investment decision is made, the controlling shareholders know the verifiable return y. In other words, sharing control keeps the investment decision in the hands of insiders, who have an informational advantage over the court (or any other outsider) in evaluating the project. Accordingly, sharing control should prevail in firms whose cash flows are hard to verify even if overinvestment problems are not too severe. In these firms, large shareholders should have a direct participation in the management.

V The Stability and Robustness of Sharing Control

There are at least four reasons for one to be concerned about the stability and robustness of an ownership structure with multiple controlling shareholders. First, a controlling group may have ex-post incentives to change an ex-ante optimal controlling stake. Second, some of the controlling shareholders may try to form a coalition to exclude the controlling shareholders who oppose their favorable policies. Third, the same bargaining problems that discipline the controlling group create incentives for one of the controlling shareholders to buyout the whole control stake. Fourth, incentive contracts may imply that shared control is a dominated mechanism to protect minority shareholders. This section addresses these four concerns.

A Ex post changes in the control stake

Since a lower equity stake makes the controlling group internalize more of the private benefits of control and less of the firm's verifiable cash flows, a reduction in the control stake should be followed by a drop in stock prices. This stock price reaction curbs some of the controlling shareholders' desire to reduce their equity stake. Yet, while a drop in the equity value will be shared with the minority shareholders, the controlling shareholders will capture all of the increase in private benefits that ultimately explains the lower equity value. Depending on the joint distribution of the private benefits and the verifiable cash flows, the stock price reaction may not fully curb ex post incentives for lowering the control stake. We argue below, however, that supermajority rules can prevent ex post incentives to reduce the control stake from breaking down an ex-ante optimal ownership structure.

Suppose that the optimal ownership structure requires that a fraction $\alpha^{\star}$ of the firm's shares is held by the controlling group. For a given voting structure, the stake $\alpha^{\star}$ is associated with a number of votes, say v. The initial shareholder can avoid ex-post incentives to reduce the controlling stake below $\alpha^{\star}$ by giving control to a group of investors who holds a fraction v of the votes. With this mechanism, which can be interpreted as a supermajority rule, the controlling shareholders cannot divest below v without bearing the risk of losing control.

Now, reducing the control stake is not the only threat to the stability of an ex ante optimal ownership structure. It is possible that the controlling group receives information that motivates them to increase the control stake. For instance, suppose that the controlling shareholders' signals of the private benefits become precise enough to virtually eliminate any disagreement within the controlling group. In this case, the equity effect is the only reason for shared control to increase value. An ex post optimal control stake would then use the controlling group's debt capacity to repurchase as many minority shares as possible. Does the resetting of the ownership structure unravel the results of sections III and IV?

Since a larger control stake makes the control group internalize a larger fraction of the verifiable cash flows, it increases the value of the minority shares. But then the repurchase of minority shareholders will reduce firm value only if it leads to an even larger loss of private benefits, which, of course, is against the interests of the controlling shareholders. Thus, a controlling group's decision to repurchase minority shares can only enhance efficiency.

It then follows that firm value under shared control goes up if we allow for future increases in the control stake. In contrast, a single controlling shareholder cannot afford future repurchases of minority shares, because, from the beginning, his optimal control stake is as large as possible. Hence, allowing for future repurchases of minority shares unambiguously increases the gains of sharing control. The main results of the paper are thus reinforced, that is, weaker overinvestment problems, lower costs of verifying cash flows, and smaller financing requirements will imply that shared control dominates monitoring as a governance mechanism.

B Coalition games and shareholders' agreements

In principle, a member of a controlling group may be co-opted to participate in a new coalition that aims to defeat the incumbent controlling group. Bennedsen and Wolfenzon (2000) argue that the size of the controlling stake is determined by these coalition games. Can this additional restriction break down equilibria with multiple controlling shareholders?

Shareholders' agreements may prevent exclusions and defections that could unravel the controlling group. For instance, pooling agreements (also called voting agreements) assure that each member of the agreement will nominate a certain number of candidates for the board of directors. (In most cases, the participants of the agreement must cast their votes in the group's nominees.) Based on the number of votes of each controlling shareholder, a supermajority provision can be chosen to give veto power to each member of the group, avoiding their exclusion and blocking the formation of new coalitions. Finally, buyout agreements give group members the right to veto the sale of controlling shares to undesirable investors.

Unfortunately, we do not have data on the use of shareholders' agreements in the U.S.[11] As of December 1996, however, the CONSOB (the Italian equivalent of the Securities and Exchange Commission) reported that 58 of the 303 Italian firms with listed shares (i.e., 19.1 percent) had some type of shareholder agreement (see table 1). Restrictions on the sale of shares (buyout agreements) are the most common ones (17.2 percent), followed by voting agreements (12.8 percent), and control agreements that establish policies for the firm (6.6 percent). In interpreting the data, one should take into account that most Italian public

[11] Nonetheless, corporate law books (e.g., O'Neal and Thompson 1992) and Black and Gilson (1997) report that shareholders' agreements are often present in close corporations and in the venture capital industry, respectively.

companies have a majority shareholder. Fulghieri and Zingales (1995) report that, in 1990, 53 percent of the firms listed in the Milan Stock Exchange (by far Italy's largest) had a majority shareholder. Assuming that 53 percent of the firms in the CONSOB database do not have shareholders' agreements because they have a majority shareholder, then the fraction of firms with no majority shareholder that have a shareholders' agreement would go up to 40.7 percent.

C Dissolving the controlling group

In the absence of credit constraints, a buyout is a natural mechanism to eliminate bargaining problems that, although ex-ante optimal, are ex-post inefficient from the perspective of the controlling shareholders. In our model, the second controlling shareholder may have some debt capacity left after his purchasing of the control stake. If so, he may try to acquire full control by making an offer for the remaining control shares.

Consider then that a controlling shareholder can make a buyout offer between the time that he learns his valuation of the project and the time that the investment decision has to be made. We ask whether there is an incentive compatible direct mechanism that lets the controlling shareholders dissolve their partnership with probability 1. If so, ex-post bargaining problems can be solved by a buyout, and the temporary presence of multiple controlling shareholders would not increase value.

Proposition 6 shows that the same asymmetry of information that prevents the controlling shareholders from agreeing with the investment decision will prevent them from dissolving the control group.

Proposition 6 *(Dissolving the controlling group) Assume that controlling shareholder j receives a signal s_i of the private benefits of controlling shareholder $i \neq j$, with $\underline{b}_i = s_i - \frac{\epsilon}{2}$, $\bar{b}_i = s_i + \frac{\epsilon}{2}$, and $\sum_{i=1}^{2}(\underline{b}_i + \alpha_i y) < 0 < \sum_{i=1}^{2}(\bar{b}_i + \alpha_i y)$. Then there is no ex-post efficient mechanism that dissolves the controlling group after the controlling shareholders have privately learned their valuations.*

Proposition 6 departs from Cramtom, Gibbons, and Klemperer (1987), who argue that a partnership can always be efficiently dissolved if the equity holdings are evenly spread across several partners. (Proposition 6 can be generalized to more than two controlling shareholders.) The way we model the private benefits of control is the key to explaining the difference in the results. In Cramtom, Gibbons, and Klemperer, the value of the firm to each controlling shareholder is proportional to the fraction of shares that they own. As a result, in an evenly distributed ownership structure, the cost of extracting a truthful announcement of the firm's value decreases with the number of controlling shareholders. In our model, a controlling shareholder may have large private benefits of control in spite of an evenly distributed ownership structure.

D Incentive contracts

So far, we have ignored incentive schemes that align the interests of minority and controlling shareholders. One could argue, however, that incentive contracts are a cheaper and more efficient mechanism to protect minority shareholders than shared control. Incentive contracts – the arguments goes – prevent an inefficient dilution of the rights of minority shareholders, without imposing the bargaining costs associated with shared control.

Suppose then that before selling minority shares to finance the project, the entrepreneur commits to a compensation scheme that pays him an amount $F(y)$, which is a function of the verifiable cash flows. (Because private benefits are not verifiable by a court, the compensation scheme cannot be contingent on b.) In this setting, the single controlling shareholder will invest if and only if his total payoff from the project, which now includes the compensation $F(y)$, is bigger than or equal to zero, i.e., $\alpha_1 y + b + F(y) \geq 0$. Of course, the first best investment rule is still $y + b \geq 0$ (invest if and only if the project increases firm value). Thus, the incentive contract implements the first best if and only if $\alpha_1 y + F(y) + b = y + b$ which implies that $F(y) = (1 - \alpha_1)y$. But then, the controlling shareholder's payoff from undertaking the project is $b + \alpha_1 y + (1 - \alpha_1)y = b + y$. In other words, the controlling shareholder captures all of the project's cash flows, leaving no incentives for outside investors to pay I for minority shares.[12] With unilateral control, therefore, incentive contracts cannot obtain the first best while leaving scope for the entrepreneur to finance the project by issuing minority shares.

In fact, it is easy to show that, in our framework, linear incentive schemes cannot enhance value. To see this, consider a contract that pays the entrepreneur a fraction $\delta \in (0, 1)$ of the

[12] If the equity value from the assets in place is larger than the investment requirement (i.e., $V_0 > I$), investors would be willing to finance the project despite the controlling shareholder's capturing all the project's verifiable return. Nonetheless, $V_0 > I$ contradicts the assumption that the firm is credit constrained.

verifiable cash flows. Without loss of generality, we can add this fraction δ to the entrepreneur's equity share in the analysis of the investment decision. By so doing, whether the entrepreneur's sensitivity to the verifiable cash flow comes from his equity holdings or the linear contract is irrelevant. In the optimum, this sensitivity will amount to the maximum $\alpha_1^\star$ that lets the initial shareholder raise the financing requirement I. But this fraction $\alpha_1^\star$ is exactly the optimal equity stake of a single controlling shareholder with no compensation contract.

It is certainly possible that some nonlinear contract increases efficiency under a single controlling shareholder. As we have already shown, nonetheless, no contract can achieve the first best while raising the financing requirement. In contrast, the proof of Proposition 5 shows that firm value under shared control converges to the first best when the probability that the project is inefficient gets closer to 1 and the fraction of minority shares gets closer to zero. Allowing for incentive contracts, therefore, does not change the main result of this paper, namely, sharing control may protect minority shareholders while preserving valuable private benefits of control.

VI Evidence and Discussion

A Ownership structure of close corporations in the U.S.

A main insight of this paper is that, regardless of their roles, the presence of multiple large shareholders protects the minority ones. If all the large shareholders directly participate in the firm's management, bargaining problems may prevent business decisions that would be costly for the minority shareholders. If one or more large shareholders are out of the controlling group, their equity stakes elicit incentives for them to monitor the business decisions, constraining the controlling group's ability to dilute minority shareholders. Hence, our model predicts that multiple large shareholders should be pervasive in firms with significant conflicts of interests among the shareholders.

A vast literature on corporate law describes bargaining problems involving shareholders in close corporations.[13] Accordingly, we believe that close corporations constitute a good sample to examine for the ownership incentives that this paper emphasizes. Our starting

[13] See, for instance, O'Neal and Thompson (1992).

point is thus a sample of 4,637 firms in the database of the National Survey of Small Business Finances (NSSBF) of 1992. The NSSBF provides ownership and financial data on 4,637 for-profit, non-financial businesses with less than 500 employees (the database includes neither subsidiaries nor farm businesses). From this initial sample, we restrict attention to the 310 close corporations with annual sales above $10 million that had more than one shareholder.

Table 2 presents summary statistics of the sample. From the 310 firms, it is inferred that, as of 1992, there were 64,708 close corporations in the U.S. with more than one shareholder and annual sales above $10 million. The estimate of the average sales of these 64,708 close corporations is $23.3 million, while the average asset value and the average number of employees are estimated at $7.5 million and 98.0, respectively. The distribution of shareholders in the close corporations is highly skewed. Although the average number of shareholders is 74.4, the median is only 3.0 (31.2 percent of the firms have 2.0 shareholders and 18.8 percent have 3.0 shareholders).

Firms participating in the survey report, among other things, the ownership stake of the principal shareholder, who is not necessarily the largest one, and the total number of shareholders.[14] Unfortunately, the database does not provide information on the number of shares held by shareholders other than the principal one. Nonetheless, we can obtain a lower and an upper bound on the equity holdings of, respectively, the second largest and the smallest shareholder by computing the average equity stake of the shareholders other than the principal one. We use these bounds to infer the ownership structure of the close corporations in the sample.

Following La Porta, Lopez-de-Silanes, and Shleifer (1999), we say that a firm has a large shareholder if there is a shareholder with more than 20 percent of the shares. A firm has multiple large shareholders if the largest shareholder has more than 20 percent of the shares while a second one has at least 10 percent. In implementing these criteria, we classify a firm as having multiple large shareholders if the equity stake of the principal shareholder and the average equity stake of the remaining ones are both larger than 10 percent, with at least one of them above 20 percent.[15] A firm has only one large shareholder if the maximum between

[14] According to the NSSBF questionnaire, the principal shareholder is "typically the owner who has the largest ownership share and has the primary authority to make financial decisions."

[15] This criterion biases the results against finding multiple large shareholders because the average equity stake

the equity holdings of the principal one and the average of the other equity stakes is above 20 percent while the minimum is below 10 percent. Finally, we say that a firm has minority shareholders if there is no large shareholder or if there is a shareholder whose equity holdings are half of the equity holdings of the largest shareholder. We implement this latter condition by requiring that either the equity holdings of the principal shareholder are twice the average equity holdings, or vice versa.[16]

The last six rows of table 2 provide describe the ownership structure of the close corporations. Not surprisingly, 86.9 percent of the firms have at least one large shareholder. Also, 67.7 percent of the close corporations have minority shareholders, while 54.7 percent of the firms with at least one large shareholder have minority shareholders as well (not reported in the table). Contrary to the sample of La Porta, Lopez-de-Silanes, and Shleifer (1999), the majority of firms with at least one large shareholder has other large shareholders (65.8 percent).[17]

In an attempt to tie the presence of multiple large shareholders to the protection of the minority ones, we also compute the probability of finding multiple large shareholders conditioned on the joint presence of a large shareholder and minority ones. The last row in table 2 shows that this probability is 45.6 percent. This very coarse look at the ownership structure of close corporations in the U.S., therefore, suggests that the presence of multiple large shareholders is far from being a rare event. Yet, the data cannot tell us whether the presence of multiple large shareholders reflects monitoring or sharing control. The next subsection shows how to empirically distinguish these two cases.

B Testing the determinants of shared control

Whether large shareholders participate in the management or limit themselves to monitor the controlling group has important implications for corporate governance. For instance, to reduce rent-seeking behavior, corporate law in the U.S. constrains a shareholder's ability to influence the management. Several changes have been proposed in the last 10 years to relax these

may be below 10 percent even if there exists a shareholder other than the principal one with more than 10 percent of the shares.

[16]The idea here is that having at least twice the equity stake of another shareholder gives a strong bargaining power to the largest shareholder. The requirement goes both ways because the principal shareholder is not necessarily the largest one.

[17]In a sample of public firms in 27 countries, La Porta, Lopez-de-Silanes, and Shleifer (1999) find that only 25 percent of the firms that are controlled by a large shareholder have other large shareholders.

limitations. Roughly, the intent of these changes is to increase shareholders' ability to monitor the management. As several authors have argued, however, enhancing the effectiveness of monitoring may be inefficient. In particular, this paper shows that making it more difficult for a controlling group to limit the monitoring of their activities may be value decreasing if mechanisms like shared control can protect the minority shareholders more efficiently.

Our model predicts that multiple controlling shareholders should be more often present in firms with overinvestment problems, high costs of verifying cash flows, and large financing requirements. One way to test this prediction is to pre-select a sample of firms with these characteristics and to test whether they are more likely to have multiple controlling shareholders than a control sample.

Since the innovative nature of an R&D project makes it harder for an outsider to assess its profitability, firms with large investments in R&D probably constitute a good sample to look for shared control. As we have argued in the introduction, the SEC requires that firms with publicly traded securities disclose the existence of shareholders' agreements, making them available in their EDGAR database. The existence of shareholders' agreements in a firm can thus be used as a proxy for shared control. Hence, a testable implication of the model is that shareholders' agreements are more often found in firms with large R&D investments.

C Ownership structure and law

In countries that offer weak legal protection to minority shareholders, private benefits may be financed by the firm's cash-flow. If so, the private benefits are pecuniary and they should be negatively correlated to the firm's "public" cash-flow. We can easily incorporate this negative correlation into our model.

Still assuming that b is the total private benefits of control, let $y - kb$ be the project's return from the perspective of the minority shareholders, where $k \in [0, 1]$. In countries that offer weak protection to minority shareholders, k is strictly positive, reflecting the possibility that private benefits are financed by public cash-flows. If so, \$1 of private benefits imposes a direct loss of \$k to minority shareholders. In countries with strong legal protection to the minority shareholders, $k = 0$ and the private benefits of control are probably better interpreted as being nonpecuniary.

The major results of our paper can be extended to the case where $k > 0$. Sharing control still implies a trade-off between underinvestment and overinvestment costs. The effects of a weaker protection to minority shareholders on the optimal ownership structure are ambiguous, though. On the one hand, $k > 0$ makes private benefits more costly to minority shareholders, increasing the costs of distorting the investment policy. Accordingly, the incentives for controlling groups to share control and introduce outside monitoring increase. On the other hand, a controlling shareholder's ability to capture public cash-flows increases the side payment that another controlling shareholder may request in exchange for not blocking the project. As a result, the probability of disagreement increases when $k > 0$. The larger underinvestment costs reduce the incentives for multiple controlling shareholders. The existence of two opposing effects, thus, prevents an unambiguous theoretical relation between a country's legal protection of minority shareholders (parameterized by k) and the optimal number of controlling shareholders.

An empirical study by La Porta, Lopez-de-Silanes, and Shleifer (1999) suggests that these two opposing effects cancel each other. Using a sample of firms in 27 countries, La Porta, Lopez-de-Silanes and Shleifer find that the probability that a controlling shareholder is alone in family-controlled public firms is 65 percent for the countries offering weak protection to minority shareholders, while the probability increases to 79 percent in the countries with stronger protection to minority shareholders. Nonetheless, the difference of means is not statistically significant (t-statistics equal to -1.31).

VII Conclusion

In the corporate control literature, large shareholders are usually assumed to monitor managers on behalf of all shareholders. As La Porta, Lopez-de-Silanes, and Shleifer (1999) document, however, large shareholders often participate in the management. Accordingly, Pagano and Roell (1998) suggest that an optimal ownership structure may require multiple large shareholders: It takes a large shareholder to monitor a large shareholder in control. Yet, a vast literature on corporate law does not view large shareholders as monitoring each other on behalf of minority shareholders. Instead, large shareholders are perceived as decision makers who seek to influence corporate decisions in a way that favors their personal agendas.

This paper argues that firm characteristics determine the role that large shareholders play in corporate governance. In firms with severe underinvestment problems, sharing control creates bargaining problems that exacerbate the risk of corporate paralysis. Control should not be divided, and, as in the corporate control literature, monitoring by a large outside investor arises as the most efficient way to protect minority shareholders. In contrast, sharing control increases efficiency in firms with severe overinvestment problems. In these cases, multiple large shareholders should participate in the firm's management. Since bargaining problems within the controlling group protect the minority shareholders, the incentives for monitoring are reduced. Large shareholders, therefore, will more likely act as key decision-makers, as in the corporate law literature.

References

Aghion, P. and P. Bolton, 1992. An Incomplete Contracts Approach to Financial Contracting. *Review of Economic Studies* 59, 473-494.

Bebchuk, L. and L. Zingales, 1998. Ownership Structures and the Decision to Go Public: Private vs. Social Optimality. Unpublished working paper. Harvard University.

Black, B. and R. Gilson, 1997. Venture Capital and the Structure of Capital Markets: Banks versus Stock Markets. Unpublished working paper. Columbia University School of Law.

Bennedsen, M. and D. Wolfenzon, 2000. The Balance of Power in Close Corporations. *Journal of Financial Economics* 58, 113-139.

Berle, A. and G. Means, 1932. *The Modern Corporation and Private Property.* New York: Macmillan.

Bolton, P. and E. Von Thadden, 1998. Blocks, Liquidity, and Corporate Control. *Journal of Finance* 53, 1-25.

Burkart, M., D. Gromb, and F. Panunzi, 1997. Large Shareholders, Monitoring, and the Value of the Firm. *Quarterly Journal of Economics* 112, 693-728.

Chatterjee, K. and W. Samuelson, 1983. Bargaining under Incomplete Information. *Operations Research*

Cramton, P., R. Gibbons, and P. Klemperer, 1987. Dissolving a Partnership Efficiently, *Econometrica* 55, 615-632.

Fulghieri, P. and L. Zingales, 1995. Privatizzazioni e struttura del controllo societario: il ruolo della public company, in *La Nuove Frontiere della Politica Economica*: F. Galimberti, F. Giavazzi, A. Penati e G. Tabellini eds. Milano: II Sole 24 Ore.

Grossman, S. and O. Hart, 1980. Takeovers Bids, the Free Rider Problem and the Theory of the Corporation. *Bell Journal of Economics* 11: 42-69.

Grossman, S. and O. Hart, 1986. The Costs and Benefits of Ownership: A Theory of Lateral and Vertical Integration. *Journal of Political Economy* 94, 691-719.

Harris, M. and A. Raviv, 1988. Corporate Control Contests and Capital Structure. *Journal of Financial Economics* 20, 55-86.

Hart, O. and J. Moore, 1990. Property Rights and the Theory of the Firm. *Journal of Political Economy* 98, 1119-1158.

La Porta, R., F. Lopez-de-Silanes, and A. Shleifer, 1999. Corporate Ownership Around the World. *Journal of Finance* 54, 471-517.

Myerson, R. and M. Satterthwaite, 1983. Efficient Mechanisms for Bilateral Trading. *Journal of Economic Theory* 28, 265-281.

O'Neal, F. and R. Thompson, 1992. Close Corporations: Law and Practice. *Callaghan, Third Edition.*

Pagano, M. and A. Roell, 1998. The Choice of Stock Ownership Structure: Agency Costs, Monitoring, and the Decision to Go Public. *Quarterly Journal of Economics* 113, 187-225.

Shleifer, A. and R. Vishny, 1986. Large Shareholder and Corporate Control. *Journal of Political Economy* 94, 461-488.

Stulz, R., 1988. Managerial Control of Voting Rights. *Journal of Financial Economics* 20, 25-54.

Zwiebel, J., 1995. Block Investment and Partial Benefits of Corporate Control. *Review of Economic Studies* 62, 161-185.

Appendix

Proof of Lemma 1

Let $V_0 + I$ be the value of equity that arises from the assets in place (i.e., excluding the project). In case the project is undertaken, the verifiable cash flow increases by y. Since the verifiable cash flow y is known by both controlling shareholders, they agree that controlling shareholder j's wealth increases by $\alpha(y + V_0 + I) \geq 0$ if he receives a fraction α of the equity stake of controlling shareholder i. Given that $\underline{\alpha}$ suffices for any controlling shareholder to retain control, controlling shareholder i can offer up to $(\alpha_i - \underline{\alpha})(y + V_0 + I)$ as a side payment in any bargaining game. If $\underline{y}$ is the minimum verifiable cash flow, then $(\alpha_i - \underline{\alpha})(\underline{y} + V_0 + I)$ is a transfer that controlling shareholder i can afford with probability 1.

Now, let $\bar{V}_i \equiv \bar{b}_i + \alpha_i \bar{y}$ be the controlling shareholder i' maximum valuation for the project, with $\bar{b}_i$ an upper bound on the private benefits of controlling shareholder i and $\bar{y}$ an upper bound on the project's verifiable cash flow. Clearly, controlling shareholder i will not announce a valuation that implies a transfer larger than $\bar{V}_i$. In equilibrium, therefore, the transfer payment is bounded by $\bar{b}_i + \alpha_i \bar{y}$. Hence, a sufficient condition for transfers of shares to implement any incentive-compatible bargaining mechanism is that, with probability 1, any controlling shareholder $i \in \{1, 2\}$ can afford the upper bound on the transfer payment by transferring an amount of shares that does not lead to a loss of control. Formally,

$$(\alpha_i - \underline{\alpha})(\underline{y} + V_0 + I) \geq \bar{b}_i + \alpha_i \bar{y}, \text{ for } i \in \{1, 2\},$$

which implies condition (3) when $\alpha_i > \underline{\alpha}$ for $i \in \{1, 2\}$.

$\square$

Proof of Proposition 1

From Lemma 1, condition 3 implies that the controlling shareholders can honor any incentive compatible payment that may arise from the Chatterjee-Samuelson mechanism by transferring their shares. Thus, let $V_i(x_i, s_1, s_2)$ be the best announcement of controlling shareholder $i \in \{1, 2\}$, where $x_i = b_i + \alpha_i y$ is controlling shareholder i's valuation of the project. To simplify the notation, we will henceforth omit the arguments s_1 and s_2 in $V_i(x_i, s_1, s_2)$. In addition, let $u_i \equiv s_i + \frac{\epsilon}{2} + \alpha_i y$ and $l_i \equiv s_i - \frac{\epsilon}{2} + \alpha_i y$ be, respectively, the upper and lower bounds of controlling shareholder i's valuation of the project given the signal s_i and the verifiable return y.

Standard arguments in the mechanism design literature show that, in any Bayesian equilibrium, $V_i(x_i)$ increases with the valuation of the project x_i. Moreover, Lemma 2, below, shows that the equilibrium announcements must satisfy a system of differential equations.

Lemma 2 *In any Bayesian equilibrium in which the best policies $V_1(x_1)$ and $V_2(x_2)$ are differentiable, the following linked differential equations hold:*

$$V_1^{-1}\left(-V_2\left(x_2\right)\right)+V_2\left(x_2\right)=\frac{1}{2}\frac{\left(1-F_2(x_2)\right)}{f_2(x_2)}V_2'\left(x_2\right) \tag{8}$$

$$V_2^{-1}\left(-V_1\left(x_1\right)\right)+V_1\left(x_1\right)=\frac{1}{2}\frac{\left(1-F_1(x_1)\right)}{f_1(x_1)}V_1'\left(x_1\right), \tag{9}$$

where $F_i(x_i)$ and $f_i(x_i)$ are, respectively, the distribution and the density of $x_i \equiv b_i + \alpha_i y$ conditioned on the signals s_1 and s_2.

Proof. Given V_1, the minimal announcement $V_2^\star$ that implies the undertaking of the project must satisfy $V_1 + V_2^\star = 0$. Since $V_2(x_2)$ increases with x_2, $V_2^\star$ induces a cutoff for the valuation x_2 of the second controlling shareholder: $V_1 + V_2(x_2^\star) = 0 \Rightarrow x_2^\star = V_2^{-1}(-V_1)$. The expected payoff of the initial shareholder given an announcement V_1 and a valuation x_1 is then equal to

$$\Pi_1(V_1,x_1)=\int_{V_2^{-1}(-V_1)}^{u_2}[x_1-\frac{1}{2}(V_1-V_2(x_2))]f_2(x_2)dx_2.$$

Assume first that any small perturbation from $V_1(x_1)$ affects the probability that the project will be undertaken. Then V_1 maximizes the expected payoff off the initial shareholder if and only if

$$\begin{aligned}\frac{\partial \Pi_1(V_1,x_1)}{\partial V_1} &= -\left(x_1-V_1\right)f_2(V_2^{-1}\left(-V_1\right))\frac{dV_2^{-1}\left(-V_1\right)}{dV_1}-\frac{1}{2}\int_{V_2^{-1}(-V_1)}^{u_2}f_2(x_2)dx_2 = \\ &= \frac{\left(x_1-V_1\right)f_2(V_2^{-1}\left(-V_1\right))}{V_2'\left(V_2^{-1}\left(-V_1\right)\right)}-\frac{1}{2}\left(1-F_2(V_2^{-1}\left(-V_1\right))\right)=0\end{aligned}$$

Since $x_2^\star = V_2^{-1}(-V_1)$, the above equation can be rewritten as

$$(x_1 + V_2\left(x_2^\star\right)) - \frac{1}{2}\frac{(1 - F_2(x_2^\star))}{f_2(x_2^\star)} V_2'\left(x_2^\star\right) = 0 \tag{10}$$

If V_1 is an optimal response, $V_1 + V_2(x_2^\star) = 0$ implies that the initial shareholder's valuation, $x_1^\star$, that led to V_1 solves $V_1(x_1^\star) + V_2(x_2^\star) \Rightarrow x_1^\star = V_1^{-1}(-V_2(x_2^\star))$. Plugging $x_1^\star$ into equation (10) yields equation (8):

$$V_1^{-1}\left(-V_2\left(x_2^\star\right)\right) + V_2\left(x_2^\star\right) - \frac{1}{2}\frac{(1 - F_2(x_2^\star))}{f_2(x_2)} V_2'\left(x_2^\star\right) = 0.$$

The proof that equation (9) holds when any small perturbation of V_2 affects the chances that the project will be undertaken is analogous. Hence, suppose now that a perturbation of $V_1(x_1)$ does not change the probability that the project will be undertaken. This can happen in two cases. First, x_1 may be so large that, given $V_1(.)$ and $V_2(.)$, the project will be undertaken regardless of the announcement of the second controlling shareholder. In this case, there exists $x_2^\star \in [l_2, u_2)$ such that $V_1(l_1) + V_2(x_2^\star) = 0$. Still, the differential equation governing the optimal announcement of the initial shareholder remains unchanged, as we show below.

$$\Pi_1^\star(V_1, x_1) = \int_{V_2^{-1}(-V_1)}^{x_2^\star} [x_1 - \frac{1}{2}(V_1 - V_2(x_2))] f_2(x_2) dx_2 + \int_{x_2^\star}^{u_2} [x_1 - \frac{1}{2}(V_1 - V_2(x_2^\star))] f_2(x_2) dx_2.$$

$$\begin{aligned}
\frac{\partial \Pi_1^\star(V_1, x_1)}{\partial V_1} &= -\left(x_1 - V_1\right) f_2(V_2^{-1}\left(-V_1\right)) \frac{dV_2^{-1}\left(-V_1\right)}{dV_1} - \frac{1}{2}\int_{V_2^{-1}(-V_1)}^{x_2^\star} f_2(x_2) dx_2 - \frac{1}{2}\int_{x_2^\star}^{u_2} f_2(x_2) dx_2 \\
&= \frac{\left(x_1 - V_1\right) f_2(V_2^{-1}\left(-V_1\right))}{V_2'\left(V_2^{-1}\left(-V_1\right)\right)} - \frac{1}{2}\left(1 - F_2(V_2^{-1}\left(-V_1\right))\right) = 0,
\end{aligned}$$

which is exactly the same first order condition that we obtained before.

The second boundary case happens when the valuation of a controlling shareholder is so low that it blocks the project regardless of the announcement of the other controlling shareholder. To characterize this situation, let $x_1^{\star\star}$ be the minimum valuation of the initial shareholder when the second controlling shareholder's announcement is as large as possible, that is, $V_2(u_2)$. Then, $V_1(x_1^{\star\star}) + V_2(u_2) = 0$, and the project will not be undertaken for any $x_1 < x_1^{\star\star}$. Since the project will not be undertaken, the announcement of the initial shareholder is irrelevant. It is then optimal to set $V_1(x_1)$ satisfying equation (8) for $x_1 < x_1^{\star\star}$ with the understanding that the project will not be undertaken. Similarly, $V_1(u_1) + V_2(x_2^{\star\star}) = 0$ implies that the project will not be undertaken for $x_2 < x_2^{\star\star}$, and we can assign $V_2(x_2)$ satisfying equation (9).

□

The proof of the Proposition follows from equations (8) and (9). Conditioned on s_i, b_i is uniformly distributed in the interval $[l_i - \alpha_i y, u_i - \alpha_i y]$. Standard computations then show that, conditioned on s_i, the hazard rate of the random variable $x_i \equiv b_i + \alpha_i y$ is $\frac{(1-F_i(x_i))}{f_i(x_i)} = u_i - x_i$. Plugging this hazard ratio into equations (8) and (9) yields

$$\begin{aligned} V_1^{-1}(-V_2(x_2)) &= \frac{1}{2}(u_2 - x_2) V_2'(x_2) - V_2(x_2) \\ V_2^{-1}(-V_1(x_1)) &= \frac{1}{2}(u_1 - x_1) V_1'(x_1) - V_1(x_1). \end{aligned}$$

Assume now that there is a solution for the above system of differential equations that is linear in the valuation x_i, that is, $V_1(x_1) = Ax_1 + B$ and $V_2(x_2) = Cx_2 + D$. Thus

$$\begin{aligned} V_1^{-1}(-(Cx_2 + D)) &= \frac{1}{2}(u_2 - x_2) C - (Cx_2 + D) \\ V_2^{-1}(-(Ax_1 + B)) &= \frac{1}{2}(u_1 - x_1) A - (Ax_1 + B). \end{aligned}$$

Plugging $V_1^{-1}(-(Cx_2 + D)) = \frac{-(Cx_2+D)-B}{A}$, $V_2^{-1}(-(Ax_1 + B)) = \frac{-(Ax_1+B)-D}{C}$, and collecting terms gives us

$$\begin{aligned} (\frac{-C}{A} + \frac{3}{2}C)x_2 - \frac{B+D}{A} &= \frac{1}{2}Cu_2 - D \\ (\frac{-A}{C} + \frac{3}{2}A)x_1 - \frac{B+D}{C} &= \frac{1}{2}Au_1 - B. \end{aligned} \tag{11}$$

This system of equations must hold for all values of x_1 and x_2, which requires that $-\frac{C}{A} + \frac{3}{2}C = 0 \Rightarrow A = \frac{2}{3}$ and $-\frac{A}{C} + \frac{3}{2}A = 0 \Rightarrow C = \frac{2}{3}$. Plugging $A = \frac{2}{3}$ and $C = \frac{2}{3}$ into the system of equations (11) obtains

$$\begin{aligned} -(B + D) &= \frac{2}{9}u_2 - \frac{2}{3}D \\ -(B + D) &= \frac{2}{9}u_1 - \frac{2}{3}B \end{aligned}$$

Solving this system of equation gives us $D = -\frac{1}{4}u_1 + \frac{1}{12}u_2$, $B = \frac{1}{12}u_1 - \frac{1}{4}u_2$. The optimal announcements of the controlling shareholders as a function of their valuations are then

$$\begin{aligned} V_1(x_1) &= \frac{2}{3}x_1 + \frac{1}{12}u_1 - \frac{1}{4}u_2, \\ V_2(x_2) &= \frac{2}{3}x_2 + \frac{1}{12}u_2 - \frac{1}{4}u_1. \end{aligned}$$

From above, $V_1(x_1)+V_2(x_2) \geq 0$ is equivalent to $\frac{2}{3}x_1 + \frac{1}{12}u_1 - \frac{1}{4}u_2 + \frac{2}{3}x_2 + \frac{1}{12}u_2 - \frac{1}{4}u_1 \geq 0$, which implies $x_1 + x_2 \geq \frac{1}{4}(u_1 + u_2)$. Plugging $x_i = b_i + \alpha_i y$ and $u_i = s_i + \frac{\epsilon}{2} + \alpha_i y$ into this last inequality yields $b_1 + b_2 + (\alpha_1 + \alpha_2)y \geq \frac{1}{4}\{s_1 + s_2 + (\alpha_1 + \alpha_2)y + \epsilon\}$.

We now show that the investment rule holds in the boundaries as well. If, for instance, x_2 is large enough to imply the investment regardless of the announcement of the initial shareholder, Lemma 2 shows that $V_2 = V_2(x_2^\star)$ for $x_2 \geq x_2^\star$, where $x_2^\star$ solves $V_1(l_1) + V_2(x_2^\star) = 0$. Thus, $V_1(x_1) + V_2(x_2) \geq V_1(x_1) + V(x_2^\star) \geq 0 \Rightarrow V_1(x_1) + V_2(x_2) \geq 0 \Rightarrow b_1 + b_2 + (\alpha_1 + \alpha_2)y \geq \frac{1}{4}\{s_1 + s_2 + (\alpha_1 + \alpha_2)y + \epsilon\}$. Conversely, $V_1(x_1) + V_2(x_2) < 0 \Rightarrow V_1(x_1) + V(x_2^\star) < 0$, which is not consistent with the assumption that the investment will happen for $x_2 \geq x_2^\star$ with probability 1. Therefore, investing if and only if $b_1 + b_2 + (\alpha_1 + \alpha_2)y \geq \frac{1}{4}\{s_1 + s_2 + (\alpha_1 + \alpha_2)y + \epsilon\}$ is optimal when some realization of x_2 implies the undertaking of the project regardless of the realization of x_1. The same argument can be used to show that $b_1 + b_2 + (\alpha_1 + \alpha_2)y \geq \frac{1}{4}\{s_1 + s_2 + (\alpha_1 + \alpha_2)y + \epsilon\}$ characterizes the optimal investment rule when a large x_1 implies the undertaking of the project regardless of x_2. Finally, Lemma 2 shows that $V_1(x_1)$ and $V_2(x_2)$ are optimal announcements when x_1 and x_2 are such that the probability that the project will be undertaken is zero. Moreover, $V_1(x_1) + V_2(x_2) < 0$ in these cases. Hence, the investment rule $b_1 + b_2 + (\alpha_1 + \alpha_2)y \geq \frac{1}{4}\{s_1 + s_2 + \alpha y + \epsilon\}$ still applies.

□

Proof of Proposition 3

We show that sharing control increases value for $\Pi \to 1$ when the control stake under shared control is equal to the optimal equity stake of a single controlling shareholder, i.e., $\alpha_1 + \alpha_2 = \alpha_1^\star = \alpha^\star$, where α_i is the equity stake of controlling shareholder i under shared control, and $\alpha_1^\star$ is the optimal equity stake of a single controlling shareholder. This suffices to prove the proposition because letting controlling shareholders choose a different control stake can only increase the gains of sharing control.

Let $\mathcal{I}_1 = \{(y,b) : b_1 + b_2 + \alpha^\star y \geq 0\}$ be the set of projects (payoffs) that a single controlling shareholder will undertake and $\mathcal{I}_2 = \{(y,b) : b_1 + b_2 + \alpha^\star y \geq \frac{1}{3}(\epsilon - \sum \epsilon_i)\}$ be the set of projects that will be undertaken under shared control. Given the probability Π that the project is inefficient, define $G(\Pi) = E_\Pi[(y+b)(\mathcal{X}_{\mathcal{I}_2} - \mathcal{X}_{\mathcal{I}_1})]$, where, for $i \in \{1,2\}$, $\mathcal{X}_{\mathcal{I}_i}$ is an indicator function that takes value 1 if and only if $(y,b) \in \mathcal{I}_i$, and $E_\Pi[.]$ is the expectation under the probability Π. Thus, $G(\Pi)$ is the gain (or loss) of sharing control. Note also that since $\frac{1}{3}(\epsilon - \sum \epsilon_i)$ is always non-negative, $\mathcal{X}_{\mathcal{I}_2} - \mathcal{X}_{\mathcal{I}_1} = -1$ if $0 \leq b + \alpha^\star y < \frac{1}{3}(\epsilon - \epsilon_1 - \epsilon_2)$, and $\mathcal{X}_{\mathcal{I}_2} - \mathcal{X}_{\mathcal{I}_1} = 0$ otherwise.

Defining $\mathcal{U} = \{(y,b) : y + b > 0 \text{ and } 0 \leq b + \alpha^* y < \frac{1}{3}(\epsilon - \sum \epsilon_i)\}$ as the set of payoffs such that shared control leads to underinvestment, and $\mathcal{O} = \{(y,b) : y + b \leq 0 \text{ and } 0 \leq b + \alpha^* y < \frac{1}{3}(\epsilon - \sum \epsilon_i)\}$ as the set where shared control prevents overinvestment, we can write the gain of sharing control as

$$G(\Pi) = -E_\Pi[y + b|\mathcal{O}]P_\Pi[\mathcal{O}] - E_\Pi[y + b|\mathcal{U}]P_\Pi[\mathcal{U}],$$

where $E_\Pi[\cdot|\mathcal{A}]$ is the expectation conditional on being in the set $\mathcal{A}$ using the conditional distribution of (b,y) that yields the probability Π that the project is inefficient, and $P_\Pi(\mathcal{A})$ denotes the probability that the payoffs belong to $\mathcal{A}$. Note that, by construction of the sets $\mathcal{O}$ and $\mathcal{U}$, both $EO = -E_\Pi[y + b|\mathcal{O}] > 0$ and $EU = -E_\Pi[y + b|\mathcal{U}] < 0$ do not depend on Π because changes in Π affect only the probability that $b+y > 0$ or $b+y \leq 0$. Hence, conditioned on $\mathcal{O}$ or $\mathcal{U}$, changes in Π are irrelevant. We can thus write

$$G(\Pi) = EO \cdot P_\Pi[\mathcal{O}] + EU \cdot P_\Pi[\mathcal{U}].$$

But since $P_\Pi[\mathcal{O}]$ is increasing in Π (overinvestment becomes a more likely problem) and $P_\Pi[\mathcal{U}]$ is decreasing in Π, we conclude that $G(\Pi)$ is monotonically increasing in Π. Since $P_\Pi[\mathcal{U}] \to 0$ when Π is close to 1, monotonicity then implies that $G(\Pi) \geq 0$ for $\Pi \geq \hat{\Pi}$ and $\hat{\Pi}$ sufficiently close to 1. Thus, shared control dominates a structure with single-controlling shareholder for all $\Pi \geq \hat{\Pi}$.

□

Proof of Proposition 4

With a single controlling shareholder, a larger investment requirement implies a larger equity sale to minority shareholders. The larger minority stake increases the incentives to distort the investment policy, leading to larger efficiency costs and a lower firm value. Therefore, a large financing requirement reduces firm value if control is not shared.

In contrast, firm value does not depend on the investment requirement I under shared control. To see this, let $\alpha_1 + \alpha_2$ be an optimal controlling stake given I and consider an increase of the investment requirement to $I' > I$. The initial shareholder can finance I' without changing the controlling stake: simply sell more of his own shares to the second controlling shareholder. Inspection of the investment rule under shared control (equation (6)), reveals that the decision of undertaking the project depends only on the aggregate control stake, $\alpha_1 + \alpha_2$. Hence, if a controlling stake $\alpha_1 + \alpha_2$ is optimal for investment requirement I, then it must remain optimal for an investment requirement $I' > I$.

It then follows that, contrary to firms with a single controlling shareholder, the financing requirement does not affect the value of firms with shared control. As such, the relative efficiency of shared control increases with the financing requirement, making it easier for sharing control to dominate unilateral control for any probability Π that the project is inefficient.

□

Proof of Proposition 5

Let the control stake under shared control be $\alpha_1 + \alpha_2 = 1$, which implies that the initial entrepreneur finances all the investment needs by selling shares to another controlling shareholder. Given this control stake, we show that the firm's value under shared control converges to the first best if Π is close to 1, while the firm's value cannot reach the first best with a single controlling shareholder.

From Proposition 1, controlling shareholders will invest only if $b+(\alpha_1+\alpha_2)y \geq \frac{1}{3}(\epsilon - \sum \epsilon_i) > 0$. For $\alpha_1 + \alpha_2 = 1$, the investment rule collapses to $b + y \geq \frac{1}{3}(\epsilon - \sum \epsilon_i) > 0$. It then follows that the only type of inefficiency that shared control may imply is underinvestment, which happens if $0 < b + y < \frac{1}{3}(\epsilon - \sum \epsilon_i)$. But if Π is close to 1, the probability that $y + b > 0$ goes to zero, and thus the ownership structure with shared control converges to the first best.

In contrast, ownership structures with unilateral control (with or without a monitor) do not approach the first best, as Π approaches 1. To see this, suppose that the optimal equity stake of a single controlling shareholder is $\alpha_1^\star < 1$ and that there is no monitor. The single controlling shareholder will invest if and only if $\alpha_1^\star y + b > 0$. The condition $Prob[y + b < 0, \alpha y + b > 0] > 0$ for any $\alpha \in [0, 1)$ then assures that there will be overinvestment with positive probability even if $\Pi = Prob[y + b < 0] \to 1$. Allow now for monitoring. Then the monitor may avoid overinvestment when $y + b < 0$ and $\alpha_1^\star y + b > 0$. However, excessive monitoring will result if $y + b < 0$ and $y > 0$, which, by assumption of the Proposition, is an event with positive probability for any Π. Therefore, we conclude that any ownership structure with a single controlling shareholder cannot reach the first best when Π is close to 1.

□

Proof of Proposition 6

Assume by absurd that, for any (b, y), there is a controlling shareholder $i(b, y)$ who can successfully acquire full control. From the Revelation Principle, we can ignore the signals of the private benefits, restricting attention to direct mechanisms, in which the controlling shareholder $i(b, y)$ pays $t_j(b, y)$ to the controlling shareholder $j \neq i(b, y)$.

The new single controlling shareholder internalizes all of the private benefits, investing if and only if $b + \alpha y > 0$, where $\alpha \equiv \sum_{i=1}^{2} \alpha_i$. Conditioned on the existence of the buy out mechanism, this investment rule can be replicated in the ownership structure with multiple controlling shareholders. If x is the probability that the controlling group undertakes the project, set $x(b, y) = 1$ if and only if $b + \alpha y > 0$, with transfers $t_j(b, y)$ for $j \neq i(b, y)$, and $t_i(b, y) = -t_j(b, y)$. Thus, we have obtained a direct mechanism for the investment decision that, under shared control, is ex-post efficient.

As it turns out, the existence of an ex-post efficient bargaining mechanism contradicts Myerson and Satterthwaite (1983), who show that, under imperfect information, an ex-post efficient mechanism is not implementable if, as assumed in the proposition, the gains of trade change signs with positive probability.[18]

□

[18] An earlier version of our paper, Multiple Large Shareholders in Corporate Governance 1999 (Rodney White Center of Financial Research Working paper #05-99), provides a more detailed proof of Proposition 6.

Table 1
Public Companies with Shareholders' Agreements in Italy

	Number of companies	Median number of shareholders in the agreement	Median percentage of shares in the agreement
Buy-out Agreements	52 (17.16%)	4.5	50.6%
Voting Agreements	39 (12.87%)	4.0	51.0%
Control Agreements	20 (6.6%)	6.0	50.4%
Any Agreement	58 (19.14%)	4.0	50.8%

This table shows the fraction of the 303 Italian public firms with shareholders' agreements, as reported by the "Ownership Structure of Companies Listed on Stock Exchanges in Italy," CONSOB, December 1996. *Buy-out agreements* impose restrictions on the transferability of shares. *Voting (or pooling) agreements* force the participants of the agreement to vote with the group. *Control agreements* set corporate policies that otherwise would be decided by the board of directors. *Any agreement* refers to firms that have any of the previously mentioned shareholders' agreements. Numbers in parenthesis show the percentage of the 303 public firms that have the agreements.

Table 2
Close Corporations in the U.S.

	Full Sample
Observations	310
Estimated number of firms	64,708
Average number of employees	98.0
Average asset value (US$ million)	7.5
Average annual sales (US$ million)	23.3
Median (Average) number of shareholders	3.0 (74.4)
Probability of having multiple large shareholders conditioned on having at least one large shareholder -- %	65.8
Number of firms with at least one large shareholder -- %	86.9
Number of firms with multiple large shareholders -- %	57.2
Number of firms with minority shareholders -- %	67.7
Probability of having multiple large shareholders conditioned on having minority shareholders and at least one large shareholder -- %	45.6

The NSSBF database includes 4,637 firms with less than 500 employees that answered the 1992 National Survey of Small Business Finances. Out of these 4,637 firms, we selected the close corporations with more than one shareholder and annual sales above $10 million, ending up with our full sample of 310 firms. From these 310 firms, the NSSBF estimates a population of 64,708 firms. The remaining rows in the table report summary statistics for these 64,708 firms. To compute these summary statistics, we assume that: I) A firm has multiple large shareholders if two shareholders have at least 10% of the shares and one of them has more than 20%; II) A firm has one large shareholder if at least one shareholder has more than 20% of the shares while the other shareholders have less than 10% of the shares; and III) A firm has minority shareholders if there are no large shareholders or if there is a shareholder with less than half of the shares of a large shareholder.