Optimal Corporate Governance in the Presence of an Activist Investor*

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Abstract

We provide a model of governance in which a board arbitrates between an activist investor and a manager facing reputational concerns. The optimal level of internal board governance depends on both the severity of the agency conflict and the strength of external governance. Internal governance creates a certification effect, so greater intervention by the board can lead to worse managerial behavior. Internal and external governance are substitutes when external governance is weak (the board commits to an interventionist policy to induce participation from the activist) and complements when external governance is strong (the board relies to a greater extent on the activist's information).

Shareholder activism to force policy changes at publicly-traded firms represents an increasingly important dimension of the market for corporate control. While activist investors represent a source of corporate governance that is external to a firm's power structure, they differ dramatically from the corporate raiders that are the focus of earlier theories of external governance. In most cases, activist investors accumulate relatively small stakes and so cannot exert direct control. Rather, they must rely on persuasion and the firm's internal governance mechanisms to implement changes.[1] As Brav, et al. (2008) show, activist hedge funds are often successful in influencing managers and boards, and their efforts have a substantial impact on firm value.[2]

How does the presence of such an external governance force affect internal governance policy? To address this question, we analyze a model in which a board, recognizing that an activist shareholder may exert discipline on a manager, chooses an appropriate level of internal governance. To our knowledge, this is the first theoretical article to consider the interaction between an activist, the board, and a manager. We argue that the possibility of disputes between an activist and management creates a natural but novel role for the board of directors that has not been considered previously: It functions as an arbitrator between different stakeholders who wish to take the firm in different directions.

Disputes in our model arise because the manager faces reputational concerns that make him reluctant to reverse strategic decisions he has made in the past. As a result, he may ignore an activist's efforts to implement strategic change at the firm, even if he believes such change would increase firm value. The first contribution of our article is to show that, while more stringent internal governance mitigates the effects of this agency conflict ex post, it can exacerbate the manager's reputational concerns ex ante. As a result, it can worsen the very agency conflict that it is intended to solve. Our second contribution is to show that, unlike in standard governance models, internal governance and external governance provided by an activist are natural complements, and only become substitutes when external governance is relatively weak. We develop testable predictions from both theoretical results, and also propose an additional test based on the comparative statics of activist entry.

In our model, a firm chooses between two mutually-exclusive projects with uncertain payoffs. The manager obtains a noisy signal about the relative payoffs of the projects, the precision of which depends on whether the manager has high or low ability. Based on this signal, the manager embarks on one of the projects. Then, an outside investor decides whether to generate costly information about the projects. If acquired, the precision of the outsider's signal lies between that of the high- and low-ability managers. The outsider is an activist in the sense that she only realizes a profit if she can induce the firm to implement value-creating change.

If the information of the outsider conflicts with that of the manager, the manager can choose to concede (switch to the other project) or fight (continue with his original project). The efficient outcome is to fight if his ability is high and concede if his ability is low. However, the manager cares both about firm value and his own short-run reputation, which depends on investors' posterior beliefs over his type before the project pays off. Thus, the low-type manager has an incentive to mimic the high type by fighting.

The board plays two roles in our model. At the outset, it determines a level of ongoing screening over the manager. At a later stage, its screening technology yields information about the type of the manager. This is the only information that the board generates itself. If the activist pushes for change and the manager fights, the board has final authority over the choice of project; in particular, it either upholds or overrules the manager. The board's authority results in a certification effect — a manager who fights and is upheld by the board is more likely to be a high type. The certification effect provides the insight behind our first contribution: Better governance sometimes increases the manager's tendency to fight.

We find that, under some circumstances, more intensive governance by the board can worsen the same agency problem it is intended to correct. This differs from existing articles that identify negative consequences of stronger governance, which conclude that attempting to solve one agency conflict can exacerbate *other* frictions. For example, Burkart, Gromb, and Panunzi (1997) show that intervention by a board to limit a manager's private benefits can cause the manager to under-invest in firm-specific human capital. Adams and Ferreira (2007) show that it can cause the manager to under-supply information to the board. In Almazan and Suarez (2003), underinvestment in human capital is caused by the board's efforts to weed out low quality managers.

Our theory builds on previous work demonstrating that agents facing reputational concerns are reluctant to implement changes. Managers concerned about their reputations may act as if sunk costs matter (Kanodia, Bushman, and Dickhaut 1989) and are reluctant to deviate from their earlier investment levels when additional information becomes available (Prendergast and Stole 1996). Boot (1992) argues that a manager who has purchased assets will not divest often enough because of the reputational cost of reversing prior investment decisions. However, the threat of a hostile takeover can mitigate the agency conflict and induce divestitures.[3]

Since both internal and external governance in our model discipline managers, one may expect them to be natural substitutes (e.g., Fama 1980; Fama and Jensen 1983; and Williamson

1983). However, the two are in fact natural complements — if the activist's information improves, it is more valuable to the board to identify and overrule a low-type manager, so the board invests a greater amount in its screening technology.[4] Indeed, they function as substitutes only when the board departs from the cash-flow maximizing level of governance: If the activist's information is noisy, the board over-invests in internal governance to induce the activist to enter. As the precision of the activist's signal improves, a smaller over-investment is needed, so the level of internal governance falls.

Our model generates several empirical predictions. First, consider an exogenous shock to the net cost of activism, either in absolute terms or relative to other forms of external governance. For example, state business combination laws in the 1980s decreased the cost of activism relative to hostile takeovers, and decimalization reduced the cost to the activist of acquiring an initial stake in a firm. We predict that an exogenous decrease (increase) in the cost of activism leads to increased (decreased) activism, increased (decreased) board vigilance, and more (fewer) disputes between managers and activists when managers have high reputational concerns or when the signals that outsiders can generate about optimal firm strategy are noisy.

Second, various policies on internal governance may be interpreted as requiring a minimal level of board vigilance. For example, the 2002 Sarbanes-Oxley Act increased director accountability, which induces the board to be more active. We predict that when managers have moderate reputational concerns, such an increase will make low-ability managers more intransigent and lead to more disputes between managers and activists. However, managers with high or low reputational concerns will be unaffected.

Third, our results on the relationship between internal and external governance imply that when managers have high reputational concerns, the board's vigilance will decrease with the skill or industry experience of activists to generate information when this skill is low and increase with it when this skill is high. Testing this prediction may help resolve conflicting results in the literature on whether internal and external governance are substitutes or complements.[5]

We depart from prior studies of activists that cast them as insiders who can directly influence cash flows (e.g., Admati, Pfleiderer, and Zechner 1994) or who have direct control over firm decisions (e.g., Noe, Rebello, and Sonti 2008). In practice, activists are typically outsiders, holding relatively small stakes in the firms they target, who must rely on persuasion and the firm's internal governance mechanisms to implement changes. Our article shows that an activist's ability to influence a firm's decisions can both depend on and affect its internal governance policies. Among other things, this suggests that empirical research on how investor activism creates value should take into account its indirect effect on internal governance policy.[6]

Finally, our article contributes to the literature on the allocation of decision-making authority within a firm (e.g., Aghion and Tirole 1997). The board retains formal authority in our model. There are cases in which it retains real authority as well, using its own information to intervene in project choice. However, there are other cases in which it optimally defers to either the manager or the activist, hence vesting real authority in one of these parties. Bebchuk (2005) concludes that a greater concentration of power with shareholders (or their representatives on the board) would improve firm value. Our work is more in the spirit of Harris and Raviv (2008, 2010), who show that neither inside directors (i.e., managers) or activist shareholders should always control corporate decisions. As in their framework, an activist shareholder in our model is only partially informed. Dasgupta and Noe (2010) consider a three-way interaction between shareholders, managers and boards. They find that shareholder democracy leads to additional distortions: Management-oriented boards hide transfers to management, and shareholder-oriented boards are too stringent with compensation.

The rest of the article is organized as follows. The model is presented in Section 1. In Section 2, we analyze the continuation game that results after the outsider has entered and has generated a signal that conflicts with that of the manager. Section 3 analyzes the equilibrium of the entire game. We comment on some features of our model and discuss alternative modeling assumptions in Section 4. In Section 5, we present some of the testable hypotheses of our model. Section 6 concludes. All proofs are relegated to the Appendix.

1. Model

A publicly-traded firm faces a choice between two mutually exclusive projects, A and B. Here, a project is an overall strategic direction for the firm. There are two possible future states. In state x_A, project A yields a cash flow of 1 and project B earns 0. In state x_B, project A earns 0 and project B earns 1. The ex ante probability of state x_A is $\frac{1}{2}$.

There are three agents in the model: the firm's manager, an activist investor (or "outsider"), and the firm's board of directors. The manager has a type θ_H with probability q and θ_L with probability $1-q$. The manager privately knows his own type and observes a noisy signal $s_M \in \{A, B\}$ about the state. The precision of the signal is determined by his type, with $\text{Prob}(s_M = k \mid x_k) = \theta$ for $k = A, B$, where $\theta_H > \theta_L \geq \frac{1}{2}$. That is, the high type has a more precise signal than the low type. After observing his signal, the manager chooses one of the two projects, but has the option to switch projects at a future date. The timing of this decision will be clarified shortly.

The outsider owns a fraction η of the firm's shares at the outset, and seeks to maximize the value of these shares.[7] She can generate a signal about the state, $s_E \in \{A, B\}$, at a cost $\tilde{\kappa}$. The precision of her signal is $\text{Prob}(s_E = k \mid x_k) = \psi$ for $k = A, B$, with $\theta_L < \psi < \theta_H$. If the outsider generates a signal, she shares it with the manager and the board. She is a potential activist in the sense that, if her signal is inconsistent with the firm's current strategy, she pushes for change. We define the net cost of activism as $\kappa = \frac{\tilde{\kappa}}{\eta}$, since the outsider enjoys a fraction η of any increase in firm value due to her activism. As we show in Section 3, the outsider enters only if this net cost of activism is sufficiently low.

The board can take two actions. First, it can invest in learning about the manager's ability. Specifically, it chooses upfront a screening level α at a cost to the firm of $c(\alpha)$. This leads to a signal $s_B \in \{L, H\}$ later in the game about the manager's ability. The informativeness of this signal is determined by α, with $\text{Prob}(s_B = H \mid \theta_H) = 1$ (so the high-ability manager generates signal L with probability 0) and $\text{Prob}(s_B = H \mid \theta_L) = 1 - \alpha$ (so the low-ability manager generates signal L with probability α). Thus, the board's signal is completely uninformative when $\alpha = 0$ and becomes fully informative as α approaches 1. The second action that the board can take is to overrule the manager's choice of strategy and require a particular project to be implemented.

The sequence of events in the model is summarized in Figure 1. At time 0, the manager observes his signal s_M and chooses a project, and the board chooses a screening intensity α. At time 1, the outsider chooses whether or not to generate a signal s_E, and this signal is observed if she generates it. At time 2, having observed the outsider's signal if one was generated, the manager either continues with the project he chose at time 0 or switches to the other project. At time 3, the board observes its signal s_B about the manager's type. After observing this signal, along with the manager's behavior at time 0 and time 2, and the outsider's signal if she generated one, the board decides whether or not to overrule the manager's final (time 2) project choice. At time 4, investors form beliefs about the manager's ability, and at time 5, the project cash flow is realized.

We now describe the payoffs of the agents. Let v denote the cash flow from the project. The board maximizes shareholder value, so its payoff is $v - c(\alpha)$. At time 3, $c(\alpha)$ is sunk, so the board maximizes its expectation of v. The manager cares about both firm value and outside investors' perception of his ability in the shorter run since this affects his outside labor market opportunities and hence his earning potential (e.g., Harris and Holmström 1982). Rather than model this intermediate labor market explicitly, we simply write the manager's payoff as a function of investors' beliefs about his ability at time 4 (i.e., after actions have been taken but before the firm's cash flow has been realized). Specifically, ignoring the sunk cost $c(\alpha)$, the manager's payoff is:

$$U_M = \beta v + (1 - \beta)[\mu\theta_H + (1 - \mu)\theta_L],$$

where $\beta \in (0, 1)$ is a fixed and known parameter and μ represents investors' posterior beliefs at time 4. Investors observe the actions of all parties, but not their signals. That is, they observe the project the manager embarks on, whether the outsider enters, whether the manager concedes or fights, and in the latter case the decision of the board. The assumption of linearity in the two components is for convenience only. We refer to β as a measure of the agency conflict in the firm since the weight that the manager places on his reputation may cause him to deviate from shareholder value maximization. A lower β then implies a more severe agency conflict.[8] Finally, the outsider obtains a payoff $\eta F - \tilde{\kappa}$ if she enters (i.e., generates a signal) and ηF_0 if she stays out, where F and F_0 denote the expected value of the firm if she enters and stays out, respectively.

We consider a perfect Bayesian equilibrium of the game. That is, the board cannot commit to its overturning strategy at time 3. Instead, its action must be a best response given the strategy of the manager. Further, the beliefs of the board at time 3 and investors at time 4 about the type of the manager must be consistent with Bayes' rule whenever possible.

We focus on equilibria in which, at time 0, the manager chooses the project that is favored by his signal. Thus, if $s_M = A$, project A is chosen, and if $s_M = B$, project B is chosen. Then, at time 2, if $s_E = s_M$, the manager has no reason to switch to the other project, and will continue with the project he had chosen earlier. In this case, there is no reason for the board to intervene at time 2.

Thus, the continuation game at time 2 is relevant only if the outsider enters and $s_E \neq s_M$ (that is, the manager and outsider receive conflicting signals). Under this scenario, the manager must decide whether to continue with the current project, or switch to the other project. In keeping with the symmetry of the game, we consider equilibria that are symmetric in the true state and hence invariant to the actual realization of s_M and s_E. Let σ_k, for $k \in \{L, H\}$, denote the probability the manager continues with the current project at time 2, when the manager's type is θ_k and $s_E \neq s_M$. Such a continuation puts the manager in direct conflict with the outsider, and we refer to this choice of strategy as "Fight." If the manager instead adopts the project favored by the outsider's signal, we refer to his action as "Concede." The board must then decide whether to overturn the manager's choice of project.

Suppose the signals of the manager and outsider disagree, and the manager concedes. In keeping with our view of the board as an arbitrator of disputes between the manager and the outsider, we consider equilibria in which the board allows the concession to stand. In Section 2, we exhibit equilibria in the continuation game at time 2. For these equilibria, we show that it is a best response for the board to not intervene when the manager concedes.

Next, suppose the signals of the manager and outsider disagree, and the manager fights. If the board obtains signal L, it knows the manager has the low type, and will overturn the manager's decision. If it obtains signal H, the board has imperfect information about the manager's type. Let γ denote the probability it overturns the manager in this case. If $\gamma = 0$, the board overrules the manager only on obtaining signal L; if $\gamma = 1$, the manager is overruled regardless of the board's signal.

For convenience, in Table 1 we provide the key notation in the model.

2. Optimal Strategies of Manager and Board at Time 2

In this section, we fix $\alpha \geq 0$, assume the activist has entered, and consider the continuation game starting at time 2. We focus on equilibria that are symmetric in the true state, so without loss of generality assume the manager observes signal A. The board is only relevant if $s_E = B$, so that the outside signal conflicts with the manager's chosen project. For the remainder of the article, we describe equilibria in the continuation game at time 2 only based on the strategies when the signals of the manager and the outsider conflict.

Let $\lambda_i = \theta_i(1-\psi) + \psi(1-\theta_i)$ be the probability that the signals of the manager and the outsider disagree when the manager has type θ_i. Let $\delta_i = \frac{\theta_i(1-\psi)}{\theta_i(1-\psi)+(1-\theta_i)\psi}$ be the probability that the state is x_A, conditional on a type θ_i manager generating signal $s_M = A$ and the outsider generating signal $s_E = B$. As project A generates a cash flow of 1 in state x_A and zero in state x_B, it follows that δ_i is also the expected payoff of project A. Project B generates the converse pattern of cash flows, so its expected payoff is $1 - \delta_i$.

Since $\theta_L < \psi < \theta_H$, it follows that $\delta_L < \frac{1}{2} < \delta_H$. Thus, when $s_M = A$ and $s_E = B$, the first-best outcome is achieved by a high-type manager continuing with project A, and a low-type manager switching to project B. That is, it is costly for the high-type manager to concede and for the low-type manager to fight.

We show in Lemma 1 that equilibria in the continuation game can be characterized as follows. If the board overturns the manager with probability less than 1 when it obtains signal H (i.e., if $\gamma < 1$), then it must be that either the high-type manager fights with probability one, or both types of manager fight with probability zero. If, instead, the board always overturns the manager when it receives the high signal, both types of manager must fight with equal probability. Recall that σ_i is the probability that the type θ_i manager fights.

Lemma 1. *Consider any equilibrium of the continuation game at time 2 in which, if the manager concedes, the board does not intervene.*

(i) If $\gamma < 1$, either $\sigma_H = 1$ or $\sigma_H = \sigma_L = 0$.

(ii) If $\gamma = 1$, then $\sigma_H = \sigma_L$.

Lemma 1 is an important intermediate step to characterizing equilibria in the continuation game that starts at time 2. First, suppose $\gamma < 1$. Then, if the manager fights and the board obtains signal H, with positive probability $(1 - \gamma)$ it allows his choice of project to stand.

Because the high type manager's chosen project has a higher expected payoff than the low-type's, the high-type has a stronger incentive to fight. In equilibrium, either the high type fights with probability one or both types of manager concede. However, the latter equilibrium is only sustained by an off-equilibrium belief that a manager who fights is of low type with sufficiently large probability. Since the high-type manager has a greater incentive to deviate, such an equilibrium does not survive the refinement condition D1 introduced by Cho and Kreps (1987).[9] Therefore, going forward, we focus on the equilibrium in which $\sigma_H = 1$; that is, the high-type manager fights with probability one.

Next, suppose $\gamma = 1$, so that the board always overrules a manager's decision to fight. In this case, the same project is implemented (project B) regardless of whether the manager fights or concedes. Further, outside investors learn nothing about the type of the manager from the board's action. If both types of manager fight with the same probability, investors also learn nothing from the decision to concede. Therefore, in equilibrium $\sigma_H = \sigma_L$. To facilitate comparison with equilibria in which $\gamma < 1$, here too we focus on the equilibrium with $\sigma_H = 1$.

Four different kinds of equilibrium emerge in the continuation game. If β is high, the manager's objective function is weighted toward firm value maximization, so manager and shareholder interests are well-aligned. The manager on his own chooses the value-maximizing project: There is a separating equilibrium in which the high type fights and the low type concedes. The board optimally allows the manager's decision to stand.[10]

Conversely, when β is low and $s_E = B$, the low type has an incentive to mimic the high type by fighting because of his reputational concerns. In this case, a pooling equilibrium obtains in which both types fight with probability one. There are two different types of pooling equilibrium. When the outside signal is imprecise (i.e., ψ is relatively low), the board exhibits what we term "informed" governance: It only overrules the manager if it obtains a low signal on his type (i.e., $s_B = L$). When the outside signal is precise (i.e., ψ is high), the board exhibits "sledgehammer" governance: It always overrules the manager, even when it obtains a high signal. As we show in the proof of Proposition 1, the threshold value of ψ above which the board exhibits sledgehammer governance equals the posterior expectation about the type of the manager given that the board obtains signal H; that is,

$$\psi_f(\alpha) \quad = \quad \frac{q\theta_H + (1-\alpha)(1-q)\theta_L}{q + (1-\alpha)(1-q)}.$$

Observe that $\psi_f(\cdot)$ increases in α. If $\psi \geq \psi_f(\alpha)$, a pooling equilibrium with sledgehammer governance exists for all values of β. The low-type manager anticipates that his decision to fight will always be overruled, so the optimal project is implemented anyway. By fighting, he earns the reputational benefit of pooling with the high type.

Finally, when β is in an intermediate range, there is a hybrid equilibrium in which the low type mixes between fighting and conceding. The board exhibits informed governance, only overruling the manager if it obtains a low signal. If the low type concedes, he is revealed to be the low type since the high type never concedes in equilibrium. Thus the low type's expected payoff from conceding is $\beta(1-\delta_L) + (1-\beta)\theta_L$. If he fights and the board overrules him, he is again revealed to be a low type, so receives the same payoff. If he fights and his decision is allowed to stand, the posterior probability that he is the high type is $\mu_s(\alpha) = \frac{q\lambda_H}{q\lambda_H + (1-\alpha)(1-q)\lambda_L\sigma_L}$, but the expected cash flow is only δ_L instead of $1-\delta_L$. Finally, conditional on fighting, the low type is overruled with probability α. For an appropriate value of σ_L, his payoffs from fighting and conceding are equal, allowing for a mixed strategy.

The threshold values of β that support a separating and hybrid equilibrium are defined as follows:

$$\begin{aligned}
\beta_s(\psi) &= \frac{1}{1+\frac{1-2\delta_L}{\theta_H-\theta_L}}. \\
\beta_\ell(\alpha,\psi) &= \frac{1}{1+\frac{1-2\delta_L}{\theta_H-\theta_L}\left[1+\frac{(1-\alpha)(1-q)\lambda_L}{q\lambda_H}\right]}. \\
\beta_b(\psi) &= \frac{1}{1+\frac{2(\delta_H-\delta_L)}{\theta_H-\theta_L}}.
\end{aligned}$$

Proposition 1 describes the equilibria of the continuation game starting at time 2.

Proposition 1. *The equilibria of the continuation game starting at time 2 are as follows:*

(i) If $\beta \geq \beta_s(\psi)$, there is a separating equilibrium with efficient project selection. In this equilibrium, $\sigma_H = 1$, $\sigma_L = 0$, and $\gamma = 0$.

(ii) If $\beta \in (\max\{\beta_\ell(\alpha,\psi), \beta_b(\psi)\},\ \beta_s(\psi))$, there is a hybrid equilibrium with informed governance. In this equilibrium, the high-type manager fights, the low-type manager mixes between fighting and conceding, and the board overrules the manager only if it obtains the low signal. That is, $\sigma_H = 1, \sigma_L \in (0,1)$, and $\gamma = 0$.

(iii) If $\beta \leq \beta_\ell(\alpha,\psi)$ and $\psi \leq \psi_f(\alpha)$, there is a pooling equilibrium with informed governance. In this equilibrium, both types of manager fight and the board overrules the manager only if it obtains the low signal. That is, $\sigma_H = \sigma_L = 1$ and $\gamma = 0$.

(iv) If $\psi \geq \psi_f(\alpha)$, there is an equilibrium with sledgehammer governance. In this equilibrium, $\sigma_H = \sigma_L = 1$ and $\gamma = 1$.

If $\psi > \psi_f(\alpha)$ and $\beta > \beta_b$, there are multiple equilibria in the continuation game. Suppose $\psi > \psi_f(\alpha)$. If $\beta \geq \beta_s$, both a separating equilibrium and a pooling equilibrium with sledgehammer governance exist, and if $\beta \in (\beta_b, \beta_s)$, both a hybrid equilibrium and a pooling equilibrium with sledgehammer governance exist. In considering the board's choice of α at time 0, it is necessary to choose an equilibrium of the continuation game at time 2. If there are multiple equilibria, we select the equilibrium that maximizes the expected payoff of the board conditional on $s_E \neq s_M$. Lemma 2 shows that the board prefers the separating or hybrid equilibrium to the pooling equilibrium with sledgehammer governance.

Lemma 2. *Suppose $\psi \geq \psi_f(\alpha)$. Then, the board's payoff in a pooling equilibrium with sledgehammer governance is lower than in a separating equilibrium or a hybrid equilibrium, whenever one of the latter two exists.*

Therefore, when $\psi \geq \psi_f(\alpha)$, we fix the equilibrium in the continuation game to be the separating equilibrium if $\beta \geq \beta_s(\psi)$, and the hybrid equilibrium if $\beta \in [\beta_b(\psi), \beta_s(\psi))$. Observe that when $\psi = \psi_f(\alpha)$, the board is indifferent between $\gamma = 0$ and $\gamma = 1$. For this particular value of ψ, there exist equilibria in which the board plays a mixed intervention strategy; i.e., chooses a value of γ strictly between 0 and 1. These equilibria all offer the same payoff to the board, so for convenience we select the equilibrium with $\gamma = 0$.

In Figure 2, we illustrate the equilibria we consider at time 2 for different values of β and ψ. The parameters for this figure are set to $\theta_H = 0.9, \theta_L = 0.55, q = 0.4$, and $\alpha = 0.5$. From the figure, it may be observed that improved external governance (i.e., an increase in ψ) generally improves managerial behavior. As can be seen from the figure, an increase in ψ generally results in a shift toward an equilibrium at time 2 in which the low type fights less often (e.g., from pooling with informed governance to a hybrid equilibrium and from a hybrid to a separating equilibrium). Moreover, as shown in Proposition 2, in a hybrid equilibrium, the low type fights less often as ψ increases.

A higher value of ψ affects the low-type manager's tendency to fight in two ways. First, the probability that the manager has the low type, conditional on the outsider having a conflicting signal, increases with the precision of the outsider's signal. This reduces the reputational benefit of fighting. Second, an increase in the precision of the outsider's signal increases the cash flow gain from choosing the value-maximizing project. Both effects lead to the low type fighting less often.

On the other hand, an increase in internal governance (i.e., in α) generally results in *worse* managerial behavior. In Figure 2, an increase in α shifts β_ℓ up, which can result in a movement from a hybrid to a pooling equilibrium in which the low type always fights. Moreover, as we show in Proposition 2 in a hybrid equilibrium, an increase in α results in the low type fighting more often. In this equilibrium, the low type must obtain the same payoff from fighting and conceding to be indifferent between the two options. As shown in the proof, writing out the payoffs and solving for σ_L yields:

$$\sigma_L = \frac{q\lambda_H}{(1-\alpha)(1-q)\lambda_L}\left[\frac{1-\beta}{\beta}\,\frac{\theta_H-\theta_L}{1-2\delta_L}-1\right]. \tag{1}$$

From this expression, it follows that σ_L increases in α and decreases in ψ, as stated in Proposition 2.

Proposition 2. *In a hybrid equilibrium of the continuation game at time 2, the probability that the low-type manager fights increases with the precision of the board's signal and decreases with the precision of the outsider's signal. That is,* $\frac{\partial \sigma_L}{\partial \alpha} > 0$ *and* $\frac{\partial \sigma_L}{\partial \psi} < 0$.

A higher value of α implies that the low-type manager is more likely to be overturned if he fights. If he fights and is overruled, he obtains the exact same payoff (both in terms of firm value and on the reputational component) as he does on conceding. If he fights and is allowed to proceed with his choice of project, the effects are more complicated. The inefficient project is implemented, which is costly. However, being allowed to proceed by the board provides a noisy certification of his ability, increasing the reputational component of his payoff. The benefit of this certification increases with the quality of board screening, or α. Therefore, holding σ_L fixed, the low type's payoff from fighting *increases* with α. In turn, this results in an increase in σ_L. Therefore, the actions of the board and the low-type manager are strategic complements in this case: Better internal governance leads to the low type becoming more intransigent.

3. Equilibrium of the Overall Game

We now consider the equilibrium of the overall game. First, we consider the decision of the outsider at time 1. Recall that the outsider is endowed with a fraction η of shares in the firm and can generate a signal about the future state with precision ψ at a private fixed cost $\tilde{\kappa}$. If the outsider chooses to enter at time 1, the signal is generated immediately.

If the outsider chooses to stay out, the board does not intervene. Since $\theta_L \geq \frac{1}{2}$, it is optimal to let the manager's decision stand even if the board finds out he has the low type. Let $F_0 = q\theta_H + (1-q)\theta_L$ denote the expected cash flow from the project in this case. Let F denote the expected cash flow from the project after the outsider enters, where the expectation is ex ante with respect to the outsider's signal; that is, the expectation is taken before the outsider knows her signal. If the outsider's signal agrees with that of the manager, the expected value of the firm improves due to the added confirmation the manager has chosen the right project. If the signals disagree, the manager's original project is switched only if the manager or board believe it is value-enhancing to do so. Averaging across these two cases, it follows that $F > F_0$. The outsider will enter if $\kappa \leq F - F_0$, where $\kappa = \frac{\tilde{\kappa}}{\eta}$.

We show that when ψ is low, the outsider stays out, regardless of the value of β. Similarly, for high values of ψ, the outsider always enters. However, there is also an intermediate region of ψ, in which the outsider enters only if β is sufficiently high (i.e., the agency conflict is sufficiently low). Define $\psi_1 = \theta_L + \frac{\kappa}{1-q}$, and $\psi_2(\alpha) = \theta_L + \frac{\kappa}{\alpha(1-q)}$ if $\alpha > 0$. If $\alpha = 0$, let $\psi_2(\alpha)$ be infinite. Since $\alpha < 1$, ψ_1 is strictly less than $\psi_2(\alpha)$. Finally, define a function $\phi(\cdot)$ as follows:

$$\phi(\psi) \quad = \quad \frac{1}{1 + \frac{1-2\delta_L}{\theta_H - \theta_L} + \frac{(1-q)(\psi-\theta_L)-\kappa}{q\lambda_H(\theta_H-\theta_L)}}.$$

These thresholds allow us to identify the circumstances under which the activist will enter. We describe the activist's best response in Lemma 3.

Lemma 3. *(i) Suppose* $\kappa \leq \frac{\alpha q(1-q)(\theta_H-\theta_L)}{q+(1-\alpha)(1-q)}$*. Then, the outsider stays out if* $\psi < \psi_1$ *and enters if* $\psi > \psi_2(\alpha)$*. If* $\psi \in [\psi_1, \psi_2(\alpha)]$*, the outsider enters if* $\beta > \phi(\psi)$ *and stays out if* $\beta < \phi(\psi)$*.*

(ii) Suppose the outsider anticipates a pooling equilibrium with informed governance (i.e., $\sigma_L = 1$ *and* $\gamma = 0$*). Then, she enters if and only if* $\alpha \geq \alpha_e \equiv \frac{\kappa}{(1-q)(\psi-\theta_L)}$*.*

For particular values of ψ and β, the outsider is indifferent about entering (e.g., when $\psi = \psi_2$, the outsider is indifferent if $\beta \leq \phi(\psi_2)$). In the spirit of considering equilibria under which firm value is maximized, we assume the activist chooses to enter in this case.

As α increases, ψ_1 and $\phi(\cdot)$ remain unchanged but ψ_2 decreases. In a pooling equilibrium with informed governance, an increase in α implies that the board weeds out the low-type manager more often. This increases the payoff to the outsider from generating her own information. As part (ii) of Lemma 3 shows, if the outsider anticipates a pooling equilibrium with informed governance, she can be induced to enter if α is sufficiently high.

Now, we turn to the board's action at time 0. The board chooses the amount of firm resources $c(\alpha)$ to invest in its signal. The cost function $c(\alpha)$ is strictly increasing and strictly convex in α. In addition, we assume that $c(0) = 0$, $c'(0) = 0$ and $\lim_{\alpha \to 1} c'(\alpha) = \infty$.

The board's decision depends on the entry of the activist and the equilibrium to be played in the continuation game when the signals of the manager and the outsider disagree. In Lemma 4, we first show that if the continuation equilibrium at time 2 is a hybrid equilibrium, a small change in the screening intensity of the board is completely unwound by a corresponding change in the strategy of the low-ability manager. It follows that if the board anticipates a hybrid equilibrium at time 2, it will choose $\alpha = 0$ at time 0.

Now suppose the activist enters and a pooling equilibrium with informed governance obtains at time 2. Anticipating this equilibrium, the board will choose α at time 0 to maximize $(1-q)\lambda_L \alpha[(1-\delta_L) - \delta_L] - c(\alpha)$. The optimal value of α in this case, denoted α_c, must satisfy the first-order condition:

$$c'(\alpha) \quad = \quad (1-q)(\psi - \theta_L). \tag{2}$$

Since $c(\cdot)$ is convex, it is immediate that α_c increases as ψ increases. In choosing the screening level α_c, the board makes optimal use of the outsider's information.

Higher values of ψ imply a greater benefit to overturning the low-type manager. If the outsider's signal is sufficiently strong, the board may choose instead to completely delegate the project decision to the activist by overturning the manager regardless of its signal. If it anticipates an equilibrium with such sledgehammer governance at time 2, the board should optimally choose $\alpha = 0$ at time 0. Define a threshold value ψ_g as the value of ψ that solves the implicit equation:

$$\psi = \frac{q\theta_H + (1-q)(1-\alpha_c)\theta_L - c(\alpha_c)}{q + (1-q)(1-\alpha_c)}, \tag{3}$$

where the equation is implicit because α_c depends on ψ. Then, ψ_g is the maximum value of ψ at which the board invests in learning about the manager's type at time 0 when it anticipates a pooling equilibrium rather than simply opting for sledgehammer governance.

Let $\Pi(\alpha)$ be the board's expectation of firm value (i.e., project cash flow minus the cost of screening) at time 0 if it chooses a screening level α. $\Pi'(\alpha)$ denotes the derivative with respect to α. In Lemma 4, we show how the board's optimal screening intensity at time 0 varies with its expectation about the type of equilibrium that will be played at time 2.

Lemma 4. *Suppose the outsider enters at time 1.*

(i) If a hybrid equilibrium obtains at time 2, then $\Pi'(\alpha) = -c'(\alpha) < 0$.

(ii) Suppose the board anticipates a pooling equilibrium at time 2. If $\psi < \psi_g$*, the board chooses* $\alpha = \alpha_c$ *at time 0 and implements informed governance, with* $\gamma = 0$*. If* $\psi > \psi_g$*, the board chooses* $\alpha = 0$ *at time 0 and implements sledgehammer governance, with* $\gamma = 1$.

To characterize the optimal strategy of the board, we need to define several thresholds in the parameter space. Recall that $\psi_1 = \theta_L + \frac{\kappa}{1-q}$, and let $\psi_3 = \theta_L + \frac{\kappa}{(1-q)c^{-1}(\kappa)}$. Since $c^{-1}(x)$ is less than 1 for any finite x, $\psi_1 < \psi_3$. Define the following threshold value of β at which the board is indifferent between choosing the cash flow maximizing investment α_c and inducing a pooling equilibrium with informed governance, and choosing $\alpha = 0$ and inducing a hybrid equilibrium at time 2:

$$\beta_c(\psi) \quad = \quad \frac{1}{1 + \frac{1-2\delta_L}{\theta_H - \theta_L}\left[1 + \frac{(1-q)\lambda_L}{q\lambda_H}\left\{1 - \alpha_c + \frac{c(\alpha_c)}{c'(\alpha_c)}\right\}\right]}. \tag{4}$$

Define $\beta_m(\psi) = \max\{\phi(\psi), \beta_c(\psi), \beta_b(\psi)\}$. As we show in the proof of Proposition 3, β_m equals $\phi(\psi)$ for low values of ψ and β_b for high values of ψ. If κ is not too high, there also exists an intermediate range of ψ for which β_m equals $\beta_c(\psi)$. Finally, let κ_1 be the strictly positive solution to $\kappa = c\left(\frac{\kappa}{q(1-q)(\theta_H - \theta_L)}\right)$, and let $\kappa_2 = \psi_g - q\theta_H - (1-q)\theta_L$.

The equilibrium of the overall game is characterized as follows.

Proposition 3. *Suppose $\kappa < \min\{\kappa_1, \kappa_2\}$. Then,*

(i) If $\psi < \psi_1$, or $\psi \in [\psi_1, \psi_3)$ with $\beta < \phi(\psi)$, the equilibrium is characterized by no governance. The board chooses $\alpha = 0$, the outsider stays out, and the board allows the manager to proceed at time 2; that is, $\alpha = \gamma = 0$.

(ii) If $\psi \geq \psi_1$ and $\beta \geq \beta_m(\psi)$, the board continues to be completely passive, with $\alpha = \gamma = 0$. However, the outsider enters and either a separating or a hybrid equilibrium is played at time 2.

(iii) There exists a $\psi_c \in (\psi_3, \psi_g)$ such that, if $\psi \geq \psi_3$ and $\beta < \beta_m(\psi)$, then

(a) If $\psi \leq \psi_g$, the board is informed, choosing $\alpha = \alpha_e$ when $\psi \in [\psi_3, \psi_c)$ and $\alpha = \alpha_c$ when $\psi \in (\psi_c, \psi_g]$. In both cases, the outsider enters and a pooling equilibrium with informed governance is played at time 2, with $\gamma = 0$.

(b) If $\psi \in (\psi_g, \theta_H)$, the board chooses $\alpha = 0$. The outsider enters and a pooling equilibrium with sledgehammer governance is played at time 2, with $\gamma = 1$.

Figure 3 illustrates the equilibrium of the overall game for different values of β and ψ. The parameters used are the same as for Figures 2; that is, $\theta_H = 0.9$, $\theta_L = 0.55$, $q = 0.4$, and $\kappa = 0.04$. For each value of β and ψ, we allow α to be chosen optimally by the board. We assume a cost function for the board's signal of $c(\alpha) = 0.1\alpha^5$. While this cost function does not satisfy the condition $\lim_{\alpha \to 1} c'(\alpha) = \infty$, in the example the optimal level of α remains strictly below one.

When ψ is low, the outsider stays out, so the board cannot gain from generating a signal about the manager. Hence, there is no governance in this region. When $\beta \geq \beta_m$ and $\psi \geq \psi_1$, the outsider enters, but the board is optimally passive. It chooses to set $\alpha = 0$, and allows the manager to choose the project. If $\beta \geq \beta_s$, this achieves the first-best outcome, since the manager optimally chooses the value-maximizing project. However, if $\beta \in (\beta_m, \beta_s)$, the low-type manager fights with positive probability, resulting in some inefficiency in project choice. Nevertheless, as we have shown, it is optimal for the board to be passive.

It is optimal for the board to invest in its screening technology if $\beta < \beta_m$ and $\psi \in (\psi_3, \psi_g)$. If $\psi > \psi_c$, it chooses $\alpha = \alpha_c$, which is optimal from a cash flow viewpoint. If $\psi < \psi_c$, the board has to over-invest in screening to induce the outsider to enter, and chooses $\alpha = \alpha_e$.

The board's optimal policy exhibits several discontinuities when ψ is large enough that the outsider enters. First, suppose $\psi \in (\psi_3, \psi_c)$ and $\beta < \beta_m$. Consider an increase in β to β_m. At this point, the board switches from informed governance, with $\alpha \geq \alpha_c$, to being completely passive. Second, suppose $\psi > \psi_g$, and consider a similar increase in β to β_m. The board now switches from extreme activism in the form of sledgehammer governance, in which the manager is always overturned, to complete passivity. Finally, consider the effect of an increase in ψ when $\beta < \beta_m$. When ψ increases to ψ_g, the board's investment in screening drops from α_c to zero. Screening is substituted out in favor of extreme activism.

3.1. Internal and external governance: substitutes or complements?

The relationship between internal governance and external governance is complex in our model. The strength of external governance is represented by the precision of the outsider's signal, ψ. Internal governance is represented by both the screening intensity of the board α and the overturning probability γ.

Consider the case in which the agency conflict is severe; that is, β is low. If the outsider's signal is imprecise, she will stay out, so that the board is passive as well. As the precision of the outsider's signal improves, she switches over to generating a signal, thus providing external governance. At this threshold, the board sets $\alpha = \alpha_e$, which declines in ψ. Near this threshold, $\alpha_e > \alpha_c$, so the board over-invests in screening relative to the level that ensures optimal use of the outsider's information. Further, the board implements informed governance, overturning the manager only when it obtains the low signal. The overall probability that the manager is overturned is monotonic in α, and hence also declining in ψ over this region. Hence, for $\psi \in [\psi_3, \psi_c]$, internal and external governance are substitutes.

However, if ψ lies between ψ_c and ψ_g, $\alpha_e < \alpha_c$. Now, the activist will enter even if the board chooses the level of α that is optimal in terms of cash flow. Therefore, the board sets $\alpha = \alpha_c$, which is *increasing* in ψ. The intuition here is that the value to the board of overturning the low type increases as the precision of the outsider's signal increases. Thus, it invests a greater amount in the screening technology. The board continues to implement informed governance, so the overturning probability is also increasing in ψ. Thus, internal and external governance are complements in this region.

Finally, if $\psi > \psi_g$ and β is low, the board does not screen the manager, and simply acts on the outsider's signal in deciding whether or not to overrule managerial decisions. In this sense, external governance completely substitutes for internal governance over this region of the parameter space. Proposition 4 summarizes these results.

Proposition 4. *Suppose $\psi \in [\psi_3, \psi_g]$ and $\beta < \beta_m(\psi)$. Then, the screening intensity of the board (α) decreases in the strength of external governance (ψ) when $\psi < \psi_c$ and increases in ψ when $\psi > \psi_c$.*

Thus, while large changes in the strength of external governance result in external governance substituting for internal governance, small changes in the strength of external governance can have complementary effects on internal governance. Overall, therefore, we find a non-monotone relationship between external and internal governance.

Our results therefore imply that corporate governance indices, such as those of Gompers, Ishii, and Metrick (2003) and Bebchuk, Cohen, and Ferrell (2009) must be interpreted with caution. If all firms have chosen an optimal level of governance, a higher index value may simply reflect the severity of the agency problem at one firm. If a firm has been sub-optimal, on the other hand, our results show that its value might be improved by less rather than more intense governance.

4. Comments on Model Features

In this section, we comment on some of the features of our model, as well as the implications of relaxing some of the assumptions.

First, the roles of the activist and board are distinct in our model. The board's expertise lies in evaluating the manager and the activist's in evaluating firm strategies. In practice, we expect the board to have an advantage in evaluating the quality of the manager, given its repeated interactions with the manager. Activist investors, on the other hand, specialize in evaluating strategies across different firms, in part through ongoing investments from which they can learn about the state of the world.

Suppose that, in contrast to our model, an activist investor also generates some information about the manager. Suppose further that the activist obtains such information at time 1, before deciding whether to enter (i.e., generate a signal). The activist will enter only if she believes the manager is likely to have a low type. This refines the board's and investors' beliefs about the type of the manager if the activist enters, but does not qualitatively change the results. Alternatively, suppose the activist investor can invest in learning about the manager, but, like the board in our model, receives her information about manager type only at time 3. The activist will then withdraw from a fight if her signal suggests that the manager's ability is high. A decision to withdraw in turn sends a noisy certification about the manager's ability. This increases the incentives of the low type manager to fight. Thus, such information generated by the activist has broadly the same effect as the information generated by the board in our model.

Suppose now the board were also to obtain information about project payoffs. If the board obtains such information at time 0, we can simply think of the prior probabilities θ_H and θ_L as combining the information of manager and board, with the rest of the model going through. Conversely, suppose the board receives information about payoffs only at time 2, after the manager has chosen whether to fight or concede. The additional signal will simply be used to refine the posterior belief that the firm is in the right project. The presence of such information strengthens the certification effect of upholding a manager's decision to fight. The overall effect is therefore similar to the effect of the signal about manager type.

Second, in our model the board invests in screening at time 0, with the information from the screening process only available at time 3. In many contexts, learning about the type of an agent is a process that takes place over time. Nevertheless, there may be scenarios, say with long drawn-out activism contests, in which the board can invest in learning after the contest begins. Suppose the board can choose α and γ both at time 3. The board can no longer commit to being passive when it expects a hybrid equilibrium to be played in the continuation game. The certification effect of being upheld by the board remains important. The manager will have a stronger incentive to fight when he anticipates a higher α because of this certification benefit. However, now the cost of screening is no longer sunk when the manager decides whether to fight or concede. Since the cost of the board's signal reduces firm value, the higher cost associated with a higher anticipated α reduces the low-type manager's incentives to fight. Thus, the overall effect of a higher anticipated α on σ_L is ambiguous.

A related notion is that a board typically screens a manager before he is hired. In our model, that would correspond to the board increasing q, the probability the manager has the high-type. As long as pre-screening is not perfect, there will remain some uncertainty over manager type. Interestingly, from equation (1), it may be observed that in the hybrid equilibrium $\frac{\partial \sigma_L}{\partial q} = \frac{\lambda_H}{(1-\alpha)\lambda_L} \left[\frac{1-\beta}{\beta} \frac{\theta_H - \theta_L}{1-2\delta_L} - 1 \right] \frac{1}{(1-q)^2}$, which is strictly positive whenever $\beta < \beta_s(\psi)$ (i.e., the minimal value of β that supports a separating equilibrium). Therefore, pre-screening has a similar effect as an increase in α in our model. It increases the certification benefit of fighting and winning, which leads to the low-type manager fighting more often. This effect somewhat undermines the benefit of pre-screening.

Third, we assume that the cost of screening the manager is borne by the firm. If instead the cost were thought of as a personal cost to the board rather than coming out of the firm's resources, the manager would again ignore $c(\alpha)$ in choosing whether to fight. The results would then be similar to those in our current model.

Fourth, we assume that fighting and losing has no direct cost for the manager. An alternative assumption is that the board could discipline the manager by, for example, firing him if he fights and is overruled. This would make fighting and being overruled more costly to the manager than conceding. Since the skill of the manager lies in selecting rather than implementing a project in our model, such a policy is costly to shareholders as well, if the new manager faces a learning curve. Nevertheless, our results are robust to the introduction of such a punishment, provided it is not too large.

Fifth, since a project here refers to the long-term strategy of a firm, it is rare to see the same manager involved in repeated disputes or subsequent projects. Nevertheless, after one such interaction in our model, the board has better information about the quality of the manager. If it knows the manager has the low type, it can directly side with a future activist or fire the manager. If it obtains signal H instead, its new prior for a subsequent dispute is given by its posterior at the end of the first dispute.

Sixth, we treat β, the extent to which the manager cares about firm value, as exogenous. In practice, β is likely to be chosen by the board to try and align the manager's interests with those of shareholders. To the extent that contracting is costly, agency problems may remain. Our game may be thought of as taking place after β has been set.

Seventh, we treat the quality of the outsider's information, ψ, as exogenously given. Since the outsider generates information about the state of the world, we can think of ψ as being determined by her accumulated experience through her investments in other firms. An alternative would be to have the activist choose the precision of her signal. Suppose that choosing a precision ψ had a cost $C(\psi) = A\psi^2$, where A is some parameter. The optimal value of ψ decreases in A. Thus, we can equivalently think of a high ψ as corresponding to a low A and vice versa.

Finally, the board's signal in our model has an asymmetric structure. The high-type manager always generates signal H, whereas the low-type manager generates signal H with probability $1 - \alpha$ and L with probability α. The assumption is made largely for analytic tractability. An alternative assumption would be that the high type can also generate either signal H or signal L. As long as the board's signal about the low type is at least as noisy as its signal about the high type, the intuition behind our results goes through. Compared to the case we analyze, the certification benefit obtained by the low-type manager in the hybrid equilibrium improves even more with α, as the higher likelihood that the high-type survives the screening procedure improves posterior beliefs about a manager who fights and is upheld.

5. Empirical Implications

Recall that the unique aspect of our model is that we consider the responses of a manager and a board to the presence of an activist investor. In this section, we develop three novel empirical predictions based on this behavior. The first two predictions relate to the comparative statics of the model. We consider the effects of exogenous changes in κ, the cost of entry for the activist, and the minimum level of α, the screening intensity of the board. The final prediction relates to the correlation between the strength of internal and external governance. We first present our predictions and then discuss possible empirical proxies for the key parameters of the model.

Our first prediction is based on the equilibrium of the whole game, as exhibited in Proposition 3. Consider the response of the board and manager to exogenous changes in factors that may affect the entry of an activist. These factors relate to the model parameter κ, which represents the net cost to the activist of entering. Since the mid-1980s, there have been a number of exogenous shocks to this relative cost of activism, either in absolute terms or compared to other forms of external governance. For example, the business combination laws passed in many states in the late 1980s made hostile takeovers difficult, and therefore made activism less costly in comparison. Similarly, decimalization on the U.S. stock exchanges in 2001 increased liquidity and reduced the cost of acquiring a stake in the firm (e.g., Bessembinder 2003).

We take as given in our model that the information of the activist is important in determining the optimal action for shareholders. In general, we expect firms to be heterogeneous on this dimension. The information of the activist is more likely to be important when other sources generate less information about how much value a firm's current strategy will create. In such a situation, the activist needs a smaller stake to earn a profit, so again the relative cost of entry κ falls. Hong and Kacperczyk (2010) show that, following mergers of some brokerage houses over the period 1984–2005, there was a reduction in the number of analysts covering some stocks. This is an example of a plausibly exogenous shock to the amount of alternative information available about the value of a firm's strategy.

In our model, a reduction in κ has two effects: (i) both ψ_1 and ψ_3 fall, as does the threshold $\phi(\psi)$. That is, the no-governance region shrinks, leading to a discrete increase in the level of internal governance (α) for low values of ψ; and (ii) the minimal level of internal governance that induces the activist to enter, α_e, falls. This results in a lower α in the region in which the board chooses α just high enough to induce the activist to enter. Since the first effect leads to a discrete jump in α while the second results in only small changes in α, the first effect should dominate. Putting these together, Table 2 provides a summary of the reactions to a reduction in κ in our model.

As seen from Table 2, the testable predictions of our model have the most bite in the low β, low ψ region. Here, given the sequence of events in our model, we expect the board will become more vigilant *before* the activist enters, activists will enter more often, and the incidence of fights will be high (recall that the high-type manager always fights).

Hypothesis 1. *Consider an exogenous fall in the relative cost of entry to an activist. Then:*

(i) compared to firms whose managers have low reputational concerns, firms whose managers have high reputational concerns will see boards become more vigilant, followed by increased activism by outsiders and more disputes between managers and outsiders;

(ii) compared to firms for which outsiders can generate precise information about optimal

firm strategy, firms for which outsiders can generate only noisy information will see boards become more vigilant, followed by increased activism by outsiders and more disputes between managers and outsiders; and

(iii) the differential effects in (i) and (ii) are strongest in the set of firms for which both factors are present; i.e., managers have high reputational concerns and activists can generate only noisy information.

Hypothesis 1 sets up the potential for the following series of difference-in-difference tests. Consider the period before and after a change in the cost of activist entry or the importance of activist information. First, sort firms into two groups based on whether their managers have high or low reputational concerns. The change in board vigilance, activism by outsiders, and disputes between managers and outsiders should be greater for managers with high reputational concerns. Second, sort firms into two groups based on the strength of signals that outsiders can generate about optimal firm strategies. The change in board vigilance, activism by outsiders, and disputes between managers and outsiders should be greater in the firms for which outsider signals are imprecise. Third, all changes should be most pronounced when managers are concerned about their reputation *and* activists have noisy information.

Hypothesis 2 relates to an out-of-equilibrium prediction exhibited in Proposition 2: An increase in board vigilance (α in our model) leads to the low-type CEO fighting more often in a hybrid equilibrium. Of course, in our model, α is endogenous so we cannot test this prediction by simply looking for changes in α. In the model, we normalize the minimal level of α to be zero. However, in practice, the minimum level of such board vigilance is established by the regulatory environment. We note that there have been a number of regulatory changes over time that can be interpreted as affecting the minimal level of α a board can choose. For example, the Sarbanes-Oxley Act of 2002 increased the accountability of directors, making it more difficult for boards to adopt a completely passive stance. Along similar lines, in 2002 the NYSE and NASDAQ filed proposed rule changes with the SEC (SR-NYSE-2002-33 and SR-NASD-2002-80 respectively) to establish a minimum number of independent directors both on the board and on key committees. To the extent that independent directors are likely to monitor management more strictly, rules of this type may be interpreted as an increase in the minimal level of α. Since these regulations are imposed by a third party on firms, they are exogenous to the choices made by the board, and can form the basis of a test.

An increase in the minimal level of α is only likely to have bite when a hybrid equilibrium is played in our model; i.e., the manager has moderate reputational concerns. With mild career concerns, the low type concedes; with severe concerns, he continues to fight with probability one. However, from Proposition 2, when the manager's career concerns are moderate, an increase in α leads to the low-type manager fighting more often. This leads to Hypothesis 2.

Hypothesis 2. *Consider an exogenous increase in the minimum level of board vigilance. Then,*

(i) firms whose managers have moderate reputational concerns will see more disputes between managers and outsiders; and

(ii) firms whose managers have mild or severe reputational concerns will see no change.

Observe that this hypothesis is also testable using a difference-in-difference method similar to that described above. We note in passing that one novel aspect of both Hypotheses 1 and 2 is that the number or frequency of disputes between managers and outsiders is an outcome variable.

Finally, our model has the potential to resolve the mixed results in the literature on whether internal and external governance are substitutes or complements. We find a relationship between the two only for managers with high reputational concerns. Further, as shown in Proposition 4, in our model the two are substitutes when the outsider's information is noisy and complements when it is more precise. This leads to Hypothesis 3.

Hypothesis 3. *(i) For managers with high reputational concerns, the strength of internal governance is negatively correlated with the strength of external governance when the latter is weak, and positively correlated when the latter is strong.*
(ii) For managers with low reputational concerns, there is no relationship between internal and external governance.

Testing these hypotheses would require data on investor activism and disputes between managers and activists. The former can be collected from 13-D filings with the SEC, which investors are required to file when they obtain 5% or more of a firm's shares. As Brav, et al. (2008) mention, in this filing investors are also required to disclose their intent to be involved in firm decisions. Data on disputes can be collected from readily available news sources, as conflicts between managers and activists often play out publicly.

Carrying out these tests would also require reasonable proxies for the severity of reputational concerns, the ability of outsiders to generate information about optimal firm strategies, and board vigilance. Reputational concerns should be more severe when beliefs about the manager's skill level are more diffuse. Based on these arguments, the literature has considered a CEO's tenure and proximity to retirement (Gibbons and Murphy 1992) as being inversely related to career concerns. The age of an agent has also been used as an inverse proxy for noise in the market's beliefs about mutual fund managers (Chevalier and Ellison 1999) and macro-economic forecasters (Lamont 2002). In addition, the results of Hong, Kubik, and Solomon (2000) suggest that inexperienced stock analysts have the greatest incentive to build a reputation.

Wagner and Wenk (2012) consider the impact of a binding say-on-pay rule in Switzerland, and show that stock prices are negatively affected. The rule may be interpreted as corresponding to a decrease in board governance. Consistent with our prediction, they find the impact to be more negative for firms with young CEOs (who face the greatest reputational concerns) than those with old CEOs.

There is less guidance in the literature on reasonable proxies for the level of board vigilance and the ability of outsiders to generate useful information about the optimal firm strategy. Proxies for the level of board vigilance could include the number of independent directors, the industry experience of newly-appointed directors, and the number of board meetings per year. On the ability of outsiders to generate information, one may consider using the presence of activist institutional investors or investors on lists such as sharkrepellent.net's "SharkWatch 50 investors" [see Cohn, Gillan, and Hartzell (2011) for details]. An alternative proxy could be the previous experience of such investors with activist campaigns in a given industry.

6. Conclusion

Investor activism has become an increasingly important component of the market for corporate control. The potential presence of an external disciplining device affects both the role of the board in governance and its optimal policy. We view the board as the logical arbiter of disputes among warring factions seeking to take the firm in different directions. The optimal policy of the board depends both on the potential for agency conflict and the strength of external governance.

We show that under some conditions more active intervention by a board induces greater misbehavior by the manager, thereby exacerbating the agency conflict. As a result, the board is ex ante passive even though ex post intervention would improve shareholder value. The relationship between internal and external governance is non-monotone when the agency conflict with the manager is severe. Overall, our model produces the rich set of interactions that we observe among activist investors, managers, and boards.

A. Appendix: Proofs

Proof of Lemma 1

Consider the beliefs held by investors. Let $\mu_c = \text{Prob}(\theta = \theta_H \mid s_M \neq s_E,$ manager concedes$)$, $\mu_o = \text{Prob}(\theta = \theta_H \mid s_M \neq s_E,$ manager fights and board overrules$)$, and $\mu_s = \text{Prob}(\theta = \theta_H \mid s_M \neq s_E,$ manager fights and board allows manager's project to stand$)$.

The payoff to a type θ_i manager if he concedes is $\beta(1-\delta_i) + (1-\beta)[\theta_L + \mu_c(\theta_H - \theta_L)]$. Let p_i be the probability that a manager of type θ_i is overruled when he fights, so that $p_H = \gamma$ and $p_L = \gamma + \alpha(1-\gamma)$. Then, the payoff to a type θ_i manager who fights is $\beta[p_i(1-\delta_i) + (1-p_i)\delta_i] + (1-\beta)[\theta_L + \{p_i\mu_o + (1-p_i)\mu_s\}(\theta_H - \theta_L)]$. A type θ_i manager fights only if the payoff from fighting weakly exceeds the payoff from conceding; i.e., if

$$\beta(1-p_i)(2\delta_i - 1) + (1-\beta)[p_i\mu_o + (1-p_i)\mu_s - \mu_c](\theta_H - \theta_L) \quad \geq \quad 0.$$

The left-hand side of the last inequality represents the net gain from fighting rather than conceding, with the first term being the cash flow component of the gain and the second term the reputation component.

(i) Suppose $\gamma < 1$. Further, suppose that $\sigma_L > 0$. Then, it follows that

$$\beta(1-p_L)(2\delta_L - 1) + (1-\beta)[p_L\mu_o + (1-p_L)\mu_s - \mu_c](\theta_H - \theta_L) \quad \geq \quad 0. \tag{A.1}$$

Observe that $\delta_L < \frac{1}{2}$, so it must be that $p_L\mu_o + (1-p_L)\mu_s > \mu_c$. Consider the corresponding net gain to a high-type manager from fighting rather than conceding,

$$\beta(1-p_H)(2\delta_H - 1) + (1-\beta)[p_H\mu_o + (1-p_H)\mu_s - \mu_c](\theta_H - \theta_L).$$

Since $\delta_H > \frac{1}{2} > \delta_L$, the cash flow component is strictly higher for the θ_H type. Also, $p_L = \gamma + \alpha(1-\gamma) \geq p_H = \gamma$, with strict inequality if $\alpha > 0$. It therefore follows that $\mu_s \geq \mu_o$, with strict inequality if $\alpha > 0$. Therefore the reputational component of the net gain from fighting is at least as large for the high-type manager as for the low-type manager. Therefore,

$$\beta(1 - p_H)(2\delta_H - 1) + (1 - \beta)[p_H\mu_o + (1 - p_H)\mu_s - \mu_c](\theta_H - \theta_L) \quad > \quad 0,$$

and it is a strict best response for the θ_H type manager to fight. That is, if $\sigma_L > 0$, then $\sigma_H = 1$. Hence, it must be that either $\sigma_H = 1$, or $\sigma_L = 0$ and $\sigma_H = 0$.

Now, suppose $\sigma_L = 0$ and $\sigma_H > 0$. Then, Bayes' rule implies that $\mu_s = \mu_o = 1$; that is, if the manager fights, investors believe he has type θ_H. It follows that both the cash flow and reputational components of the net gain from fighting strictly exceed zero for the high-type manager, so it must be that $\sigma_H = 1$.

Therefore, in equilibrium, either $\sigma_H = 1$ or $\sigma_L = \sigma_H = 0$.

(ii) Suppose $\gamma = 1$. Then, $p_L = p_H = 1$. For both types of manager, the net gain from fighting rather than conceding is $(1 - \beta)(\mu_o - \mu_c)(\theta_H - \theta_L)$. If $\mu_o > \mu_c$, then it must be that $\sigma_H = \sigma_L = 1$, whereas if $\mu_o < \mu_c$, then $\sigma_H = \sigma_L = 0$. Consider the case $\mu_o = \mu_c$. Suppose $\sigma_H \neq \sigma_L$. Then, both the "fight" and "concede" information sets are reached in equilibrium. Applying Bayes' rule, $\mu_o = \frac{q\lambda_H\sigma_H}{q\lambda_H\sigma_H + (1-q)\lambda_L\sigma_L}$ and $\mu_c = \frac{q\lambda_H(1-\sigma_H)}{q\lambda_H(1-\sigma_H)+(1-q)\lambda_L(1-\sigma_L)}$. Therefore, $\mu_o = \mu_c$ if and only if $\sigma_H = \sigma_L$, contradicting the conjecture that $\sigma_H \neq \sigma_L$. ■

Proof of Proposition 1

(i) Suppose $\beta \geq \beta_s(\psi)$. In a separating equilibrium, Bayes' rule implies that $\mu_s = 1$ and $\mu_c = 0$. For the manager of type θ_i, the net gain from fighting rather than conceding is thus

$$\beta(2\delta_i - 1) + (1 - \beta)(\theta_H - \theta_L).$$

As $\delta_H > 1$, the above expression is strictly positive for the high-type manager, so $\sigma_H = 1$. It is a best response for low-type manager to concede if the expression is weakly negative, or

$$\beta(1-2\delta_L) \quad \geq \quad (1-\beta)(\theta_H-\theta_L), \tag{A.2}$$

which holds when $\beta \geq \beta_s(\psi)$. Finally, since only the high-type manager fights, it is a best response for the board to not overturn the manager regardless of whether he fights or concedes.

(ii) In the conjectured equilibrium, since $\sigma_H = 1$ and $\sigma_L \in (0,1)$, Bayes' rule implies that $\mu_c = 0$. That is, if the manager concedes, investors and the board both recognize him to have the low type. As $\gamma = 0$, if he fights and is overruled, $\mu_0 = 0$ and if he fights and is allowed to proceed, $\mu_s = \frac{q\lambda_H}{q\lambda_H+(1-\alpha)(1-q)\lambda_L\sigma_L} > 0$.

Now, consider the high-type manager. In his payoff, the cash flow component of the net gain from fighting is $\beta(2\delta_H - 1) > 0$, and the reputational component is $(1-\beta)(\mu_s-\mu_c)(\theta_H - \theta_L) > 0$. Therefore, his best response is $\sigma_H = 1$.

Next, consider the low-type manager. Since $\gamma = 0$, $p_L = \alpha$. Substituting p_L, μ_c, μ_o and μ_s into the left-hand side of equation (A.1), it is a best response for him to mix between fighting and conceding if and only if:

$$\beta(1-\alpha)(2\delta_L-1)+(1-\beta)\left[\frac{(1-\alpha)q\lambda_H}{q\lambda_H+(1-\alpha)(1-q)\lambda_L\sigma_L}\right](\theta_H-\theta_L) \quad = \quad 0. \tag{A.3}$$

Simplifying and solving for σ_L, we obtain:

$$\sigma_L \quad = \quad \frac{q\lambda_H}{(1-\alpha)(1-q)\lambda_L}\left[\frac{1-\beta}{\beta}\,\frac{\theta_H-\theta_L}{1-2\delta_L}-1\right]. \tag{A.4}$$

Therefore, $\sigma_L > 0$ requires $\beta < \beta_s(\psi)$, and $\sigma_L < 1$ requires $\beta > \frac{1}{1+\frac{1-2\delta_L}{\theta_H-\theta_L}\left[1+\frac{(1-\alpha)(1-q)\lambda_L}{q\lambda_H}\right]} = \beta_\ell(\alpha,\psi)$. That is, if $\beta \in (\beta_\ell(\alpha,\psi), \beta_s(\psi))$, σ_L as defined is strictly between 0 and 1 and constitutes a best response for type θ_L.

Finally, consider the optimal strategy of the board. If the manager concedes, the board knows he has type θ_L, and must allow the concession to stand. Suppose the manager fights and the board obtains signal H. The board's beliefs are also represented by $\mu_s = \frac{q\lambda_H}{q\lambda_H+(1-\alpha)(1-q)\lambda_L\sigma_L}$. The cost of screening, $c(\alpha)$ is sunk at time 2 and can be ignored. If the board overturns the manager, it obtains a payoff $(1-\mu_s)(1-\delta_L)+\mu_s(1-\delta_H)$. If it does not overturn, it obtains a payoff $(1-\mu_s)\delta_L+\mu_s\delta_H$. It is then a best response for the board to set $\gamma = 0$ if and only if $(1-\mu_s)(2\delta_L-1)+\mu_s(2\delta_H-1) \geq 0$, or $\mu_s \geq \frac{1-2\delta_L}{2(\delta_H-\delta_L)}$. Substituting in for μ_s the above inequality holds if and only if $\beta \geq \frac{1}{1+2\frac{\delta_H-\delta_L}{\theta_H-\theta_L}} = \beta_b$. Hence, if $\beta > \beta_b(\psi)$, the board maximizes its payoff by setting $\gamma = 0$.

Therefore, if $\beta > \max\{\beta_\ell(\alpha,\psi), \beta_b(\psi)\}$ and $\beta < \beta_s(\psi)$, a hybrid equilibrium exists in the continuation game, with $\sigma_H = 1$, $\sigma_L \in (0,1)$, and $\gamma = 0$.

(iii) In the conjectured equilibrium, the "concede" information set is reached with probability zero. Assign the belief $\mu_c = 0$ at this information set to both investors and the board. Note that the board observes its signal (which investors do not) and this belief is consistent with both signal outcomes. Observe that $\gamma = 0$, so that $p_H = 0$ and $p_L = \alpha$. Further, $\mu_o = 0$ (investors know the manager has the low type whenever he is overruled) and $\mu_s = \frac{q\lambda_H}{q\lambda_H+(1-\alpha)(1-q)\lambda_L} > \mu_c$.

Building on part (ii), for the high-type manager, both the cash flow and reputational components of payoff are strictly greater when he fights rather than concedes. Therefore, his best response is $\sigma_H = 1$. For the low-type manager, it is a best response to set $\sigma_L = 1$ if and only if $\beta \leq \beta_\ell(\alpha,\psi)$.

Next, consider the best response of the board. As in part (ii), if the manager fights it should set $\gamma = 0$ if and only if $\mu_s \geq \frac{1-2\delta_L}{2(\delta_H-\delta_L)}$; that is, if $\frac{q\lambda_H}{q\lambda_H+(1-\alpha)(1-q)\lambda_L} \geq \frac{1-2\delta_L}{2(\delta_H-\delta_L)}$, or

$$q\lambda_H(2\delta_H - 1) \geq (1-q)(1-\alpha)\lambda_L(1-2\delta_L). \tag{A.5}$$

Now, note that for each $i = H, L$, $\lambda_i = \theta_i(1-\psi) + \psi(1-\theta_i)$ and $\delta_i = \frac{\theta_i(1-\psi)}{\lambda_i}$. Hence, it follows that $\lambda_H(2\delta_H - 1) = \theta_H - \psi$, and $\lambda_L(1-2\delta_L) = \psi - \theta_L$. Making these substitutions, the inequality (A.5) may be re-written as $q(\theta_H - \psi) \geq (1-q)(1-\alpha)(\psi - \theta_L)$, or

$$\psi \quad \leq \quad \frac{q\theta_H + (1-q)(1-\alpha)\theta_L}{q + (1-q)(1-\alpha)} \quad \equiv \quad \psi_f(\alpha). \tag{A.6}$$

Hence, it is optimal for the board to set $\gamma = 0$ if and only if $\psi \leq \psi_f(\alpha)$.

Finally, if the manager concedes, given the board's belief that he has the low type, it is optimal for the board to allow the concession to stand.

(iv) Suppose there is an equilibrium in which $\gamma = 1$. From Lemma 1, it must be that $\sigma_H = \sigma_L$. Further, as in the proof of Lemma 1 part (ii), the net gain to each type of manager from fighting is $(1-\beta)(\mu_o - \mu_c)(\theta_H - \theta_L)$. If $\sigma_H = \sigma_L \in (0,1)$, both information sets "concede" and "fight" are reached. It follows that $\mu_c = \mu_o$; that is, the investors have the same beliefs over type when the manager concedes and when he fights and is overruled. Therefore, each type of manager is indifferent between fighting and conceding, so any $\sigma_H = \sigma_L$ strictly between 0 and 1 is a best response. If $\sigma_H = \sigma_L = 1$, assign $\mu_c = \mu_o = q$. It follows again that it is a best response for each type of manager to fight with probability one.

Now, when the manager fights and the board receives signal H, the probability it ascribes to the manager having the high type is $\mu_f(\alpha) = \frac{q\lambda_H}{q\lambda_H+(1-\alpha)(1-q)\lambda_L}$. Modifying the proof of part (iii), it should set $\gamma = 1$ if and only if $\mu_f(\alpha) \leq \frac{1-2\delta_L}{2(\delta_H-\delta_L)}$; that is, if and only if $\psi \geq \psi_f(\alpha)$. Observe that under exactly the same condition, the board should not overturn when the manager concedes and it obtains signal H. Of course, it remains a best response for the board to overturn the manager if he fights and it obtains signal L, and to not overturn if he concedes and it obtains signal L. ■

Proof of Proposition 2

Consider the expression for σ_L in equation (1). It is immediate that as α increases, σ_L increases as well. Also, note that $\frac{\partial}{\partial\psi}\frac{\lambda_H}{\lambda_L} = -\frac{2\psi(1-\theta_L)(\theta_H-\theta_L)}{[\theta_L(1-\psi)+\psi(1-\theta_L)]^2}$, which is negative, and that $1-2\delta_L$ increases with ψ. It follows that, as ψ increases, σ_L also increases. ■

Proof of Lemma 2

Let z denote the posterior probability the manager has type θ_H, conditional on $s_M \neq s_E$. Then, $z = \frac{q\lambda_H}{q\lambda_H+(1-q)\lambda_L}$. Suppose the continuation equilibrium at time 2 is (σ, γ). Then, the expected payoff of the board is the expected cash flow from the project less the cost of the screening procedure, $c(\alpha)$. That is,

$$P = z[\gamma(1-\delta_H)+(1-\gamma)\delta_H]+(1-z)[(1-\delta_L)-\sigma_L(1-\alpha)(1-\gamma)(1-2\delta_L)]-c(\alpha).$$

Suppose $\psi \leq \psi_f(\alpha)$ and $\beta > \beta_s$. Then, from Proposition 1, both a separating equilibrium and a pooling equilibrium with sledgehammer governance exist. In the separating equilibrium, $\sigma_L = 0$ and $\gamma = 0$. Thus, the board's payoff is $P_{\text{sep}} = z\delta_H + (1-z)(1-\delta_L) - c(\alpha)$. In the sledgehammer equilibrium, $\sigma_L = 1$ and $\gamma = 1$. Thus, the board's payoff is $P_{\text{slg}} = z(1-\delta_H) + (1-z)(1-\delta_L) - c(\alpha)$. Now, $P_{\text{sep}} - P_{\text{slg}} = z(2\delta_H - 1) > 0$, since $\delta_H > 1/2$.

Now suppose that $\psi > \psi_f(\alpha)$ and $\beta > \beta_b$. Then, from Proposition 1, both the hybrid and sledgehammer equilibria exist. In the hybrid equilibrium, $\gamma = 1$, and the exact expression for σ_L is shown in equation (1). From equation (1), $\sigma_L(1-\alpha) = \frac{q\lambda_H}{(-q)\lambda_L}\left[\frac{1-\beta}{\beta}\frac{\theta_H-\theta_L}{1-2\delta_L} - 1\right]$.

Therefore, the board's payoff from the hybrid equilibrium is $P_{\text{hyb}} = z\delta_H + (1-z)(1-\delta_L) + z[\frac{1-\beta}{\beta}\ \theta_H - \theta_L - (1-2\delta_L)] - c(\alpha)$. Now, $P_{\text{hyb}} - P_{\text{slg}} = z[2(\delta_H - \delta_L) - \frac{1-\beta}{\beta}(\theta_H - \theta_L)]$. It follows that the condition $P_{\text{hyb}} \geq P_{\text{slg}}$ is equivalent to the condition $\beta \geq \beta_b(\psi)$. ■

Proof of Lemma 3

(i) First, we determine the outsider's expectation of improvement in firm value if she enters. Suppose the outsider enters, and in the continuation equilibrium at time 2, the project favored by the manager's signal is undertaken with probability p_i whenever $s_E \neq s_M$ and the manager has type θ_i.

There are two cases to consider. First, the signal of the activist investor agrees with the manager's signal with probability $1-\lambda_i = \theta_i\psi+(1-\theta_i)(1-\psi)$. If $s_M = s_E = Y \in \{A, B\}$, the true state is x_Y with conditional probability $\frac{\theta_i\psi}{1-\lambda_i}$. Hence, the expected cash flow in this case is $\frac{\theta_i\psi}{1-\lambda_i}$. Next, suppose $s_E \neq s_M$. This event occurs with probability $\lambda_i = \theta_i(1-\psi)+\psi_p(1-\theta_i)$. If the project favored by the manager's signal is undertaken, the expected cash flow is $\delta_i = \frac{\theta_i(1-\psi)}{\lambda_i}$. If the project favored by the outsider's signal is undertaken, the expected cash flow is $1-\delta_i = \frac{\psi(1-\theta_i)}{\lambda_i}$. Now, when $s_E \neq s_M$, the project favored by the manager's signal is undertaken with probability p_i. Thus, before the activist observes her signal, the expected cash flow from the project when the manager has type θ_i is:

$$(1-\lambda_i)\frac{\theta_i\psi}{1-\lambda_i} + \lambda_i\frac{p_i\theta_i(1-\psi)+(1-p_i)\psi(1-\theta_i)}{\lambda_i} \quad = \quad p_i\theta_i + (1-p_i)\psi.$$

Taking an expectation over manager types, the expected cash flow from the project when the outsider enters is:

$$F \quad = \quad q[\theta_H - (1-p_H)(\theta_H - \psi)] + (1-q)[\theta_L + p_L(\psi - \theta_L)]. \tag{A.7}$$

Now, the improvement in expected cash flow following the outsider's intervention is $F - F_0$, where $F_0 = q\theta_H + (1-q)\theta_L$. Consider each kind of equilibrium that can occur at time 2. Use the values of α and γ to determine the appropriate values of p_H and p_L in equation (A.7) in each case. Then, the cash flow improvement if the outsider intervenes is $\Delta_S(\psi) = (1-q)(\psi - \theta_L)$ if the continuation equilibrium is separating, $\Delta_Y(\psi, \alpha, \sigma_L) = (1-q)[1-\sigma_L(1-\alpha)](\psi - \theta_L)$ if it is hybrid, $\Delta_I(\psi, \alpha) = \alpha(1-q)(\psi - \theta_L)$ if it is pooling with informed governance, and $\Delta_G(\psi) = -q(\theta_H - \psi) + (1-q)(\psi - \theta_L)$ if it is pooling with sledgehammer governance. It is immediate that the maximal cash flow improvement occurs when a separating equilibrium is played in the continuation game at time 2.

Now, $\Delta_S(\psi) = \kappa$ when $\psi = \psi_1$, and $\Delta_S(\psi) < \kappa$ for $\psi < \psi_1$. Hence, even if a separating equilibrium is played in the continuation game, the outsider is better off staying out than intervening when $\psi < \psi_1$. Since the payoff in any other equilibrium is lower, the outsider stays out for all values of β when $\psi < \psi_1$.

Next, suppose $\psi \in [\psi_1, \psi_2]$. We first show that $\phi(\psi) = \frac{1}{1+\frac{1-2\delta_L}{\theta_H-\theta_L}+\frac{(1-q)(\psi-\theta_L)-\kappa}{q\lambda_H(\theta_H-\theta_L)}}$ is strictly decreasing in ψ when $\psi \geq \psi_1$. Consider the denominator of $\phi(\psi)$. Since δ_L is decreasing in ψ, it follows that $\frac{1-2\delta_L}{\theta_H-\theta_L}$ is increasing in ψ. Denote the third term in the denominator as $Z = \frac{(1-q)(\psi-\theta_L)-\kappa}{q(\theta_H-\theta_L)\lambda_H}$. Then, $\frac{\partial Z}{\partial \psi} = \frac{(1-q)(\psi-\theta_L)-\kappa}{q\lambda_H(\theta_H-\theta_L)} = \frac{\lambda_H(1-q)-[(1-q)(\psi-\theta_L)-\kappa](1-2\theta_H)}{q(\theta_H-\theta_L)\lambda_H^2}$. The denominator is clearly positive. Consider the numerator: $\lambda_H(1-q) > 0$, and $1-2\theta_H < 0$. Further, recall that $\psi_1 = \theta_L + \frac{\kappa}{1-q}$. Hence, if $\psi \geq \psi_1$, it follows that $(1-q)(\psi-\theta_L)-\kappa \geq 0$. Therefore, the numerator of $\frac{\partial Z}{\partial \psi}$ is strictly positive, and hence Z is strictly increasing in ψ. Hence, the denominator of $\phi(\psi)$ is strictly increasing in ψ whenever $\psi \geq \psi_1$. It follows that $\phi(\psi)$ is strictly decreasing in ψ over the same range.

Now, observe that $\phi(\psi_1) = \frac{1}{1-\frac{1-2\delta_L}{\theta_H-\theta_L}} = \beta_s(\psi_1)$. By inspection, $\phi(\psi) < \beta_s(\psi)$ when $\psi > \psi_1$. Recall that $\beta_\ell(\alpha,\psi) = \frac{1}{1+\frac{1-2\delta_L}{\theta_H-\theta_L}+\frac{(1-\alpha)(1-q)\lambda_L(1-2\delta_L)}{q\lambda_H(\theta_H-\theta_L)}}$. Now, $\lambda_L(1-2\delta_L) = \psi - \theta_L$, so that we can write $\beta_\ell(\alpha,\psi) = \frac{1}{1+\frac{1-2\delta_L}{\theta_H-\theta_L}+\frac{(1-\alpha)(1-q)(\psi-\theta_L)}{q\lambda_H(\theta_H-\theta_L)}}$. Therefore, the condition $\phi(\psi) > \beta_\ell(\alpha,\psi)$ is equivalent to $(1-q)(\psi-\theta_L) - \kappa > (1-\alpha)(1-q)(\psi-\theta_L)$, or $\psi < \theta_L + \frac{\kappa}{\alpha(1-q)} = \psi_2$. Also, it follows that $\phi(\psi_2) = \beta_\ell(\alpha,\psi_2)$.

Finally, the condition $\kappa < \frac{\alpha q(1-q)(\theta_H-\theta_L)}{q+(1-q)(1-\alpha)}$ is equivalent to $\psi_2 < \psi_f(\alpha)$. Further, it is straightforward to show that $\psi < \psi_f(\alpha)$ in turn implies that $\beta_\ell(\alpha,\psi) > \beta_b(\psi)$.

Therefore, for $\psi \in (\psi_1,\psi_2)$, $\phi(\psi)$ lies between $\beta_S(\psi)$ and $\max\{\beta_\ell(\alpha,\psi),\beta_b(\psi)\}$. It follows from Proposition 1 part (ii) that for any ψ in this range, if $\beta = \phi(\psi)$, a hybrid equilibrium is played in the continuation game.

Consider the payoff improvement the outsider can expect from this hybrid equilibrium. We have $\Delta_Y(\psi,\alpha,\sigma_L) = (1-q)[1-\sigma_L(1-\alpha)](\psi-\theta_L)$, where σ_L is as defined in equation (1). When $\beta = \phi(\psi)$, $\frac{1-\beta}{\beta} = \frac{1-2\delta_L}{\theta_H-\theta_L} + \frac{(1-q)(\psi-\theta_L)-\kappa}{q\lambda_H(\theta_H-\theta_L)}$. Hence,

$$\frac{1-\beta}{\beta}\,\frac{\theta_H-\theta_L}{1-2\delta_L} - 1 \quad = \quad \frac{(1-q)(\psi-\theta_L)-\kappa}{q\lambda_H(1-2\delta_L)}.$$

Further, note that $\lambda_L(1-2\delta_L) = \psi - \theta_L$. Therefore, $\sigma_L = \frac{(1-q)(\psi-\theta_L)-\kappa}{(1-\alpha)(1-q)(\psi-\theta_L)}$, so that $\Delta_Y(\psi,\alpha,\sigma_L) = (1-q)(\psi-\theta_L)[1-(1-\alpha)\sigma_L] = \kappa$. That is, if $\psi \in (\psi_1,\psi_2)$ and $\beta = \phi(\psi)$, the payoff improvement resulting from the outsider's intervention is exactly κ. Hence, the outsider is indifferent between intervening and not.

Now, keeping ψ fixed, consider an increase in β. From equation (1), σ_L declines in β. Hence, $\Delta_Y(\psi,\alpha,\sigma_L)$ increases as β increases. Therefore, for any $\beta > \phi(\psi)$, if a hybrid equilibrium is played in the continuation game at time 2, the outsider strictly prefers to enter. If σ_L declines to zero, a separating equilibrium is played in the continuation game.

Since $\Delta_S(\psi) > \Delta_Y(\psi, \alpha, \sigma_L)$ for all $\sigma_L > 0$, the outsider again strictly prefers to enter.

Finally, consider $\psi > \psi_2(\alpha)$. The condition $\kappa < \frac{\alpha q(1-q)(\theta_H - \theta_L)}{q+(1-q)(1-\alpha)}$ is equivalent to $\psi_2 < \psi_f(\alpha)$. Suppose first that $\psi \in (\psi_2, \psi_f]$. Then, it is possible that, if β is sufficiently low, a pooling equilibrium with informed governance is played in the continuation game at time 2. The payoff improvement if the outsider intervenes is then $\Delta_I(\psi, \alpha) = \alpha(1-q)(\psi - \theta_L)$. If $\psi > \psi_2 = \theta_L + \frac{\kappa}{\alpha(1-q)}$, it follows that $\Delta_I(\psi, \alpha) > \kappa$, and the outsider strictly prefers to enter. Suppose, instead, that a hybrid equilibrium is played in the continuation game. Recall that $\beta_L(\alpha, \psi) > \phi(\psi)$ for $\psi > \psi_2$. As shown above, for any fixed ψ, if $\beta > \phi$ and a hybrid equilibrium is played, the outsider strictly prefers to enter. Finally, it follows that if a separating equilibrium is played, since $\psi > \psi_1$, the outsider strictly prefers to enter.

Next, suppose that $\psi > \psi_f$. If β is sufficiently low, a pooling equilibrium with sledgehammer governance is played in the continuation game at time 2. The payoff improvement if the outsider intervenes is then $\Delta_G(\psi) = -q(\theta_H - \psi) + (1-q)(\psi - \theta_L)$. Evaluating this expression at $\psi = \psi_f$, we have $\Delta_G(\psi_f) = \frac{\alpha q(1-q)(\theta_H - \theta_L)}{q+(1-\alpha)(1-q)} > \kappa$. Since $\Delta_G(\psi)$ is strictly increasing in ψ, the outsider strictly prefers to enter at all $\psi > \psi_f$.

On the other hand, if β is high enough that a hybrid equilibrium results, since $\beta_b(\psi) > \beta_L(\alpha, \psi) > \phi(\psi)$, the outsider again strictly prefers to enter. Finally, it follows that if a separating equilibrium is played, since $\psi > \psi_1$, the outsider strictly prefers to enter.

(ii) In a pooling equilibrium with informed governance, $\sigma_L = 1$ and $\gamma = 0$. Thus, the cash flow improvement following the outsider's intervention is $(1-q)\alpha(\psi - \theta_L)$. For the outsider to intervene, this expression must be weakly greater than κ; i.e., $\alpha \geq \frac{\kappa}{(1-q)(\psi - \theta_L)} = \alpha_e$. ■

Proof of Lemma 4

(i) In a hybrid equilibrium $\gamma = 0$, so the board's payoff may be written as:

$$\Pi(\alpha) \quad = \quad F - c(\alpha) \quad = \quad q\theta_H + (1-q)\psi - (1-q)(1-\alpha)\sigma_L(\psi - \theta_L) - c(\alpha). \quad \text{(A.8)}$$

From the expression for σ_L in equation (1), it follows that the term $(1-\alpha)\sigma_L$ is a constant that does not depend on α. It is immediate that the derivative with respect to α is $\Pi'(\alpha) = -c'(\alpha) < 0$.

(ii) In a pooling equilibrium with informed governance, $\sigma_H = \sigma_L = 1$ and $\gamma = 0$. Hence, in equation (A.7), $p_H = 1$ and $p_L = \alpha$. Substituting in these values, the payoff of the board in this equilibrium may be written as:

$$\Pi(\alpha) \quad = \quad q\theta_H + (1-q)\psi - (1-q)(1-\alpha)(\psi - \theta_L) - c(\alpha). \quad \text{(A.9)}$$

The first-order condition with respect to α is:

$$c'(\alpha) \quad = \quad (1-q)(\psi - \theta_L), \quad \text{(A.10)}$$

and since $c(\cdot)$ is convex, the second-order condition is satisfied. Hence, if the board anticipates a pooling equilibrium with informed governance at time 2, it should set $\alpha = \alpha_c$. Its expected payoff is then:

$$\Pi(\alpha_c) \quad = \quad q\theta_H + (1-q)\psi - (1-q)(1-\alpha_c)(\psi - \theta_L) - c(\alpha_c). \quad \text{(A.11)}$$

Now, suppose the board anticipates sledgehammer governance at time 2. It should optimally set $\alpha = 0$. Its expected payoff is then:

$$\tilde{\Pi}(0) \quad = \quad q\psi + (1-q)\psi \quad = \quad \psi. \quad \text{(A.12)}$$

Comparing the two payoffs, the board strictly prefers to set $\alpha = \alpha_c$ and conduct informed governance when $\theta < \psi_f(\alpha)$. ■

Proof of Proposition 3

We begin the proof with three preliminary steps.

Preliminary step 1: Board payoffs

The board's payoff is the expected cash flow from the project minus $c(\alpha)$. In each equilibrium, using equation (A.7) from the proof of Lemma 3 where necessary, the payoff to the board can be determined as follows: In a no-governance equilibrium, it earns a payoff $F_N(\alpha) = q\theta_H + (1-q)\theta_L - c(\alpha)$, in a separating equilibrium it earns $F_S(\alpha, \psi) = q\theta_H + (1-q)\psi - c(\alpha)$, in a pooling equilibrium with informed governance it earns $F_I(\alpha, \psi) = q\theta_H + (1-q)\theta_L + (1-q)\alpha(\psi - \theta_L) - c(\alpha)$, in a pooling equilibrium with sledgehammer governance it earns $F_G(\alpha, \psi) = \psi - c(\alpha)$, and in a hybrid equilibrium it earns $F_Y(\alpha, \psi) = q\theta_H + (1-q)\left[\psi - \frac{q\lambda_H}{(1-q)\lambda_L}\left\{\frac{1-\beta}{\beta}\,\frac{\theta_H - \theta_L}{1-2\delta_L} - 1\right\}(\psi - \theta_L)\right] - c(\alpha)$.

Preliminary step 2: Threshold ψ values

Define ψ_c as the value of ψ at which $\alpha_e(\psi) = \alpha_c(\psi)$; i.e., as the solution to $\psi = \theta_L + \frac{\kappa}{(1-q)\alpha_c(\psi)}$. Further, define ψ_d as the value of ψ at which $\phi(\psi) = \beta_c(\psi)$; i.e., as the solution to $\psi = \theta_L + \frac{\kappa + c(\alpha_c(\psi))}{(1-q)\alpha_c(\psi)}$. We show that the following ordering holds: $\psi_1 < \psi_3 < \psi_c < \psi_d < \psi_g$.

$\psi_1 < \psi_3$: Recall that $\psi_1 = \theta_L + \frac{\kappa}{1-q}$ and $\psi_3 = \theta_L + \frac{\kappa}{(1-q)c^{-1}(\kappa)}$. We have $c^{-1}(\kappa) < 1$ since $\kappa < \infty$, so $\psi_1 < \psi_3$.

$\psi_3 < \psi_c$: We first show that $\alpha_e(\psi_3) > \alpha_c(\psi_3)$. Recall that $\psi_3 = \theta_L + \frac{\kappa}{(1-q)c^{-1}(\kappa)}$. Denote $c^{-1}(\kappa) = x$; then $\kappa = c(x)$. The condition $\alpha_e(\psi_3) > \alpha_c(\psi_3)$ is then equivalent to $x > c'^{-1}\left(\frac{c(x)}{x}\right)$, or $c'(x) > \frac{c(x)}{x}$, which holds by convexity of $c(\cdot)$. Hence, $\alpha_e(\psi_3) > \alpha_c(\psi_3)$. Further, α_e is strictly decreasing in ψ and α_c is strictly increasing in ψ. Since $\alpha_e(\psi_c) = \alpha_c(\psi_c)$ by definition, it follows that $\psi_3 < \psi_c$.

$\psi_c < \psi_d$: This follows directly from the fact that $c(\alpha_c(\psi)) > 0$.

$\psi_d < \psi_g$: From the definition of ψ_d, it follows that $(1-q)(\psi_d - \theta_L)\alpha_c(\psi_d) - c(\alpha_c(\psi_d)) = \kappa$. Similarly, from the definition of ψ_g, we have $(1-q)(\psi_g - \theta_L)\alpha_c(\psi_g) - c(\alpha_c(\psi_g)) = \psi_g - q\theta_H - (1-q)\theta_L = \kappa_2$. Since $\kappa < \kappa_2$, it is immediate that $(1-q)(\psi_d - \theta_L)\alpha_c(\psi_d) - c(\alpha_c(\psi_d)) < (1-q)(\psi_g - \theta_L)\alpha_c(\psi_g) - c(\alpha_c(\psi_g))$. Now, recall that $c'(\alpha_c(\psi)) = (1-q)(\psi - \theta_L)$ for each ψ. Hence, the function $(1-q)(\psi - \theta_L)\alpha_c(\psi) - c(\alpha_c(\psi))$ is strictly increasing in ψ and $\psi_d < \psi_g$.

Preliminary step 3: Relationship between β_m and ψ

Recall that $\phi(\psi_d) = \beta_c(\psi_d)$. It is straightforward to show that $\phi(\psi) < \beta_c(\psi)$ if and only if $\psi < \psi_d$. Similarly, we can show that $\beta_c(\psi) < \beta_b(\psi)$ if and only if $\psi < \psi_g$, with equality when $\psi = \psi_g$. Therefore,

$$\beta_m = \begin{cases} \phi(\psi) & \text{if} \quad \psi \leq \psi_d \\ \beta_c(\psi) & \text{if} \quad \psi \in (\psi_d, \psi_g) \\ \beta_b(\psi) & \text{if} \quad \psi \geq \psi_g, \end{cases} \tag{A.13}$$

Having established these preliminary results, we now prove each part of the proposition.

Proof of part (i)

Suppose first that $\psi < \psi_1$. Then, as shown in the proof of Lemma 3 part (i), the outsider stays out, regardless of the value of α chosen by the board. It is then optimal for the board to allow the project of even the low-ability manager to stand, so it chooses $\alpha = 0$. Hence, there is no governance in this region.

Next, suppose $\psi \in (\psi_1, \psi_3)$ and $\beta < \phi(\psi)$. In this region, the board can induce the outsider to enter by choosing $\alpha = \alpha_e$. We show that the board instead prefers the no-governance outcome.

Suppose the board chooses an α such that the outsider enters. Since $\phi(\psi) < \beta_s(\psi)$ for each value of ψ, the equilibrium in the continuation game cannot exhibit separation; instead, either a hybrid or pooling equilibrium must obtain. As shown in the proof of Proposition 5, if a hybrid equilibrium results in the continuation game and $\beta < \phi(\psi)$, the outsider will not enter regardless of the value of α.

The only other possibility in which the outsider may enter is that there is a pooling equilibrium in the continuation game. We first show that the pooling equilibrium must exhibit informed governance, and then argue that the board is better off with no governance.

Step 1. In this parameter region, a pooling equilibrium must exhibit informed governance.

Consider the equation that defines κ_1, $\kappa = c\left(\frac{\kappa}{q(1-q)(\theta_H-\theta_L)}\right)$. The left-hand side is linear in κ, and the right-hand side is strictly convex. Hence, if $\kappa < \kappa_1$, it follows that $\kappa > c\left(\frac{\kappa}{q(1-q)(\theta_H-\theta_L)}\right)$, or $q(\theta_H - \theta_L) > \frac{\kappa}{(1-q)c^{-1}(\kappa)}$. Adding θ_L to both sides, we have $\psi_f(0) > \psi_3$. From Proposition 1 part (iv), we know that a pooling equilibrium with sledgehammer governance exists only if $\psi \geq \psi_f(\alpha)$. However, $\psi_f(\alpha)$ is strictly increasing in α. Hence, $\psi_3 < \psi_f(\alpha)$ for any $\alpha \geq 0$, and for $\psi < \psi_3$, any pooling equilibrium must exhibit informed governance.

Step 2. The board prefers no governance.

The board must choose $\alpha \geq \alpha_e = \frac{\kappa}{(1-q)(\psi-\theta_L)}$ to induce the outsider to enter in this parameter region. Hence, the difference in payoffs between a pooling equilibrium with informed governance and the no-governance outcome is $F_I(\alpha_e, \psi) - F_N(0) = \kappa - c\left(\frac{\kappa}{(1-q)(\psi-\theta_L)}\right)$. Evaluating this last expression at $\psi = \psi_3 = \frac{\kappa}{(1-q)c^{-1}(\kappa)}$, we have $F_I(\alpha_e, \psi_3) - F_N(0) = 0$. That is, at $\psi = \psi_3$, the board is indifferent between a pooling equilibrium with $\alpha = \alpha_e(\psi)$ and a no-governance outcome with $\alpha = 0$.

By inspection, $F_I(\alpha_e(\psi), \psi) - F_N(0)$ is strictly increasing in ψ, so for any $\psi < \psi_3$, it follows that $F_I(\alpha_e(\psi), \psi) < F_N(0)$. That is, the board strictly prefers no governance to a pooling equilibrium with $\alpha = \alpha_e$. Since $\alpha_e > \alpha_c$, which is the optimal value of α conditional on the outsider entering, it follows that the board earns a higher profit in the pooling equilibrium with informed governance when it chooses $\alpha = \alpha_e$ rather than any value strictly greater than α_e. Therefore, $F_I(\alpha, \psi_3) - F_N(0) < 0$ for any $\alpha > \alpha_e(\psi)$. Hence, the board prefers the no-governance outcome to any pooling equilibrium with informed governance in which $\alpha \geq \alpha_e(\psi)$. The board then optimally chooses $\alpha = 0$, and the outsider stays out.

Proof of part (ii)

Next, we consider part (ii) of the proposition. Suppose that $\psi > \psi_1$ and $\beta > \phi(\psi)$. Then, from Lemma 3 part(i), the outsider enters.

First, suppose $\beta \geq \beta_s(\psi)$. Then, if the outsider enters, a separating equilibrium is played in the continuation game at $t = 2$. Hence, the efficient outcome is obtained without board intervention and it is optimal for the board to set $\alpha = 0$.

Next, suppose that $\beta \in [\beta_m(\psi), \beta_s(\psi))$. We proceed in three steps.

Step 1. If the board chooses $\alpha = 0$ and the outsider enters, a hybrid equilibrium obtains in the continuation game.

Suppose the board chooses $\alpha = 0$. Consider $\beta_c(\psi)$ in equation (4) and $\beta_\ell(\alpha, \psi)$ as defined before Proposition 1, substituting $\alpha = 0$ into the latter equation. Then, it follows that $\beta_c(\psi) \geq \beta_\ell(0,\psi)$ if and only if $\alpha_c \geq \frac{c(\alpha_c)}{c'(\alpha_c)}$. But the last inequality follows from the convexity of $c(\cdot)$. Hence, $\beta_c(\psi) \geq \beta_\ell(0,\psi)$.

Now, from the definition of β_m, it follows that $\beta_m(\psi) \geq \max\{\beta_\ell(0,\psi), \beta_b(\psi)\}$. Hence, if $\beta \in [\beta_m(\psi), \beta_s(\psi))$, the board chooses $\alpha = 0$ and the outsider enters, from Proposition 1 part (ii), a hybrid equilibrium obtains in the continuation game. Since $\psi \geq \psi_1$, it follows from the proof of Lemma 3 part (i) that the outsider enters.

Step 2. If it anticipates a hybrid equilibrium, the board optimally chooses $\alpha = 0$.

From Lemma 4 part (i), it follows that $F_Y(\alpha,\psi) = -c'(\alpha) < 0$. Therefore, if the board anticipates that a hybrid equilibrium it chooses $\alpha = 0$.

Step 3. For any fixed value of α, the board prefers a hybrid to a pooling equilibrium.

The overall payoff to the board in a hybrid equilibrium may be written as $F_Y(\alpha) = q\theta_H + (1-q)[1-\sigma(1-\alpha)](\psi - \theta_L) - c(\alpha)$. Hence, the difference in payoffs between a hybrid equilibrium and a pooling equilibrium with informed governance is $F_Y(\alpha) - F_I(\alpha) = (1-q)(1-\sigma)(1-\alpha)(\psi - \theta_L) > 0$. Further, from Lemma 2 part (ii), since $\beta \in [\beta_b(\psi), \beta_s(\psi))$, the board's expected payoff is higher in a hybrid equilibrium than in a pooling equilibrium with sledgehammer governance.

Hence, when $\beta \in [\beta_m(\psi), \beta_s(\psi))$, the board chooses $\alpha = 0$, the outsider enters, and a hybrid equilibrium obtains at $t = 2$.

Proof of part (iii) (a)

We separately consider the cases $\psi \in (\psi_3, \psi_c]$ and $\psi \in [\psi_c, \psi_g)$, maintaining $\beta < \beta_m(\psi)$ in each case.

First, suppose $\psi \in (\psi_3, \psi_c)$. Suppose the board chooses some $\alpha \geq \alpha_e(\psi)$. It is immediate that $\psi \geq \psi_2(\alpha)$. Further, $\alpha \geq \alpha_e(\psi)$ implies that $(1-\alpha)(1-q)(\psi-\theta_L) \leq (1-q)(\psi-\theta_L)-\kappa$, which further implies that $\phi(\psi) \leq \beta_\ell(\alpha_e(\psi), \psi)$. Next, note that $\psi_g < \psi_f(\alpha_c(\psi_g))$ since $c(\alpha_c(\psi_g)) > 0$. Hence, for any $\psi < \psi_g$, we have $\psi < \psi_f(\alpha_c(\psi)$. Also, $\alpha_e > \alpha_c$ for $\psi < \psi_c$ and $\psi_f'(\alpha) > 0$. Therefore, if $\psi < \psi_c$ and $\alpha \geq \alpha_e(\psi)$, it follows that $\psi < \psi_f(\alpha)$. Therefore, by Proposition 1 part (iii), a pooling equilibrium with informed governance obtains. Across these equilibria, the board's payoff is clearly maximized by choosing $\alpha = \alpha_e$. The payoff to the board in this equilibrium is then $F_I(\alpha_e(\psi), \psi)$.

Now, suppose the board chooses $\alpha < \alpha_e$. Then, one can show that $\psi < \psi_2(\alpha)$. Further, $\beta_m(\psi) = \phi(\psi)$ when $\psi \in (\psi_3, \psi_c)$, so $\beta < \beta_m(\psi)$ implies that $\beta < \phi(\psi)$. Therefore, by Lemma 3 part (i), the activist stays out and no governance results. Across these equilibria, the board's payoff is clearly maximized by choosing $\alpha = 0$, which leads to a payoff $F_N(0)$.

Now, a few steps of algebra show that $F_I(\alpha_e(\psi_3), \psi_3) = F_N(0)$. Further, $F_I(\alpha_e(\psi), \psi)$ is strictly increasing in ψ, since $\alpha_e(\psi)$ is decreasing in ψ. Therefore, whenever $\psi > \psi_3$, $F_I(\alpha_e(\psi), \psi) > F_N(0)$. Hence, the board chooses $\alpha = \alpha_e$, and the activist enters.

However, $\psi > \psi_3$ can be rewritten as $F_I(\alpha_e(\psi_3), \psi_3) > F_N(0)$. So the board does not choose $\alpha < \alpha_e(\psi)$. Therefore, the board optimally chooses $\alpha = \alpha_e(\psi)$, which results in a pooling equilibrium with informed governance in the continuation game.

Next, suppose $\psi \in (\psi_c, \psi_g)$. We proceed in three steps.

Step 1. If the board chooses $\alpha \geq \alpha_c(\psi)$, the equilibrium of the continuation game is a pooling equilibrium with informed governance.

Observe that $\psi > \psi_c$ implies that $\psi > \theta_L + \frac{\kappa}{(1-q)\alpha_c(\psi)} = \psi_2(\alpha_c(\psi))$. Since

$\psi_2'(\alpha) < 0$, we also have $\psi > \psi_2(\alpha_c(\psi))$ for any $\alpha > \alpha_c(\psi)$. Further, as observed earlier in considering the region $\psi \in (\psi_3, \psi_c)$, $\psi < \psi_g$ implies $\psi < \psi_f(\alpha_c(\psi))$. Since $\psi_f'(\alpha) > 0$, we also have $\psi < \psi_f(\alpha)$ for $\alpha > \alpha_c(\psi)$. Now, $\psi > \psi_c$ can be rewritten as $\alpha_c(\psi)(1-q)(\psi - \theta_L) \geq \kappa$, which is equivalent to $\beta_\ell(\alpha_c(\psi), \psi) > \phi(\psi)$. Hence, $\beta < \beta_m(\psi)$ implies that $\beta < \beta_\ell(\alpha_c(\psi), \psi)$ in this range, with $\frac{\partial \beta_\ell}{\partial \alpha} > 0$. In sum, $\alpha \geq \alpha_c(\psi)$ results in $\psi \in (\psi_2(\alpha(\psi)), \psi_f(\alpha(\psi))$ and $\beta < \beta_\ell(\alpha, \psi)$. Hence, by Proposition 1 part (iii), $\alpha \geq \alpha_c(\psi)$ results in a pooling equilibrium with informed governance.

Across these equilibria, the board's payoff is maximal at $\alpha = \alpha_c(\psi)$.

Step 2. A sufficiently low α may result in the outsider staying out, but the board prefers $\alpha = \alpha_c(\psi)$ and a pooling equilibrium with informed governance.

Across all continuation equilibria in which the outsider stays out, the board's payoff is maximized by choosing $\alpha = 0$, with a payoff $F_N(0)$. Substituting in $\psi = \psi_3$, we can show that $F_I(\alpha_e(\psi_3), \psi_3) = F_N(0)$. But for $\psi > \psi_3$, $F_I(\alpha_e(\psi_3), \psi) > F_I(\alpha_e(\psi_3), \psi_3)$. Further, since α_e is decreasing in ψ, we have $F_I(\alpha_e(\psi), \psi) > F_I(\alpha_e(\psi_3), \psi)$. Finally, $F_I(\alpha_c(\psi), \psi) > F_I(\alpha_e(\psi), \psi)$, since $\alpha_c(\psi)$ maximizes $F_I(\alpha, \psi)$ over α. Hence, $F_I(\alpha_c(\psi), \psi) > F_N(0)$, so the board prefers to set $\alpha = \alpha_c$ to the no-governance outcome.

Step 3. A low α may result in a pooling equilibrium with sledgehammer governance or a hybrid equilibrium, but the board prefers $\alpha = \alpha_c(\psi)$ with informed governance.

Since $\psi_f'(\alpha) > 0$, a sufficiently low α may result in $\psi > \psi_f(\alpha)$ and a pooling equilibrium with sledgehammer governance. However, observe that $\psi < \psi_g$ implies that $F_G(0, \psi) < F_I(\alpha_c(\psi), \psi)$, so the board prefers to set $\alpha = \alpha_c$ and follow up with informed governance.

Similarly, since $\frac{\partial \beta_\ell}{\partial \alpha} > 0$, it may be that for a sufficiently low α, $\beta > \beta_\ell(\alpha, \psi)$, resulting in a hybrid equilibrium. To induce a hybrid equilibrium (if possible), the board would optimally choose $\alpha = 0$. For $\psi < \psi_g$, we have $\beta_m(\psi) = \max\{\phi(\psi), \beta_c(\psi)\}$. Suppose that $\beta_m(\psi) = \beta_c(\psi)$. It can be shown that $\beta < \beta_c(\psi)$ is equivalent to $F_Y(0, \psi) < F_I(\alpha_c(\psi), \psi)$. Therefore, the board would choose $\alpha = \alpha_c(\psi)$ and a pooling equilibrium over $\alpha = 0$ and a hybrid equilibrium.

Finally, suppose $\beta_m(\psi) = \phi(\psi)$. For there to be a hybrid equilibrium, it must be that $\beta > \beta_\ell(\alpha, \psi)$, so $\beta_\ell(\alpha, \psi) < \phi(\psi)$. The latter inequality implies that $(1-q)(\psi - \theta_L) - \kappa < (1-\alpha)(1-q)(\psi - \theta_L)$, or $\psi < \psi_2(\alpha)$. Hence, by Lemma 3 part (i), the outsider stays out, and the outcome is no governance.

In summary, when $\psi \in (\psi_c, \psi_g)$ and $\beta < \beta_m(\psi)$, the board chooses $\alpha = \alpha_c(\psi)$ and implements a pooling equilibrium with informed governance.

Proof of part (iii) (b)

Suppose that $\psi > \psi_g$ and $\beta < \beta_m(\psi)$. It can be shown that $\psi_g > \psi_f(0)$. Further, $\beta_m(\psi) = \beta_b(\psi)$ for $\psi > \psi_g$. Hence, by Proposition 1 part (iv), if the board chooses $\alpha = 0$, a pooling equilibrium with sledgehammer governance results. Further, $\alpha = 0$ is optimal over all values of α that also yield a pooling equilibrium with sledgehammer governance.

Now, $F_G(0, \psi) = \psi$, and $F_N(0) = q\theta_H + (1-q)\theta_L = \psi_f(0)$. Since $\psi > \psi_g > \psi_f(0)$, it follows that $F_G(0, \psi) > F_N(0)$, so the board prefers the pooling equilibrium with sledgehammer governance to any continuation equilibrium with no governance. Further, $\psi > \psi_g$ is equivalent to $F_I(\alpha_c(\psi), \psi) < F_G(0, \psi)$, so the board prefers the pooling equilibrium with sledgehammer governance to any continuation equilibrium that features pooling with informed governance. Finally, note that since $\beta < \beta_b(\psi)$, Proposition 2 part (i) implies immediately that a hybrid equilibrium cannot obtain. ∎

Proof of Proposition 4

Recall that $\alpha_e = \frac{\kappa}{(1-q)(\psi-\theta_L)}$. By inspection, α_e decreases as ψ increases.

The value α_c is defined as the value of α that solves the equation $c'(\alpha) = (1-q)(\psi - \theta_L)$. Since $c(\cdot)$ is convex, as ψ increases, $c'(\alpha_c)$ must increase as well. That is, α_c increases. ∎

Notes

[1]For example, in 2005 MLF Investments (which owned approximately 10% of the shares) persuaded Alloy, Inc. to spin off its merchandise business. Similarly, in 2007 Nelson Peltz induced Heinz to divest brands acquired earlier in the tenure of the CEO despite owning only 5.4% of the firm's equity.

[2]Successful activism is often accompanied by winning seats on the board (Klein and Zur 2009). Gillan and Starks (2007) document several additional sources of shareholder activism, as well as its increased incidence over the years.

[3] Consistent with managers being reluctant to reverse their own prior decisions, divestitures increase after a hostile takeover (Shleifer and Vishny 1986) and after a change in management (Weisbach 1995).

[4]In related work, complementarity has been shown between governance by the board and governance from subordinates (Acharya, Myers, and Rajan 2011) and between the actions of a board and an outside auditor (Immordino and Pagano 2012).

[5]For example, Mayers, Shivdasani, and Smith (1997) show that mutual insurance companies (which are hard to take over) have more outside directors than stock insurance companies, suggesting substitutability. Ferreira, Ferreira, and Raposo (2011) find that board independence is negatively related to (and hence a substitute for) the informativeness of a firm's stock price. John, Litov, and Yeung (2008) show that in countries with poor investor protection, managers invest sub-optimally. Potentially this creates a role for internal governance. On the

other hand, Brickley and James (1987) find that banks in states that prohibit takeovers have fewer outside directors, suggesting internal governance complements external governance.

[6]Admati and Pfleiderer (2009), Edmans (2009), and Edmans and Manso (2011) also treat large shareholders as informed outsiders. The threat of a fall in stock price if these shareholders sell their shares provides discipline to management.

[7]An equivalent assumption is that the outsider can purchase a fraction η of the firm's shares in the market at a price that does not anticipate her entry.

[8]While the manager in our model is concerned about a reputation for being skilled, Boot, Greenbaum, and Thakor (1993) and Fisher and Heinkel (2008) analyze models in which an agent attempts to acquire a reputation for honesty, which he then sometimes exploits.

[9]We note that the equilibrium survives the Intuitive Criterion, as both types of managers can gain from deviating if, following "Fight," investors believe the manager has the high type.

[10]The same outcome can also be achieved by a separating equilibrium in which the high-type manager concedes and the low-type manager fights, with the board always overruling the manager. Similarly, there are outcome-equivalent equilibria in which the high type concedes and the board overrules him that correspond to the equilibria with informed governance. A strategy in which only the high type concedes and is always overruled by the board is unrealistic. Moreover, with even a small cost to switching projects, the resulting equilibria are inefficient compared to the equilibria we consider. We focus therefore on the case in which the high type fights and any concession comes from the low type.

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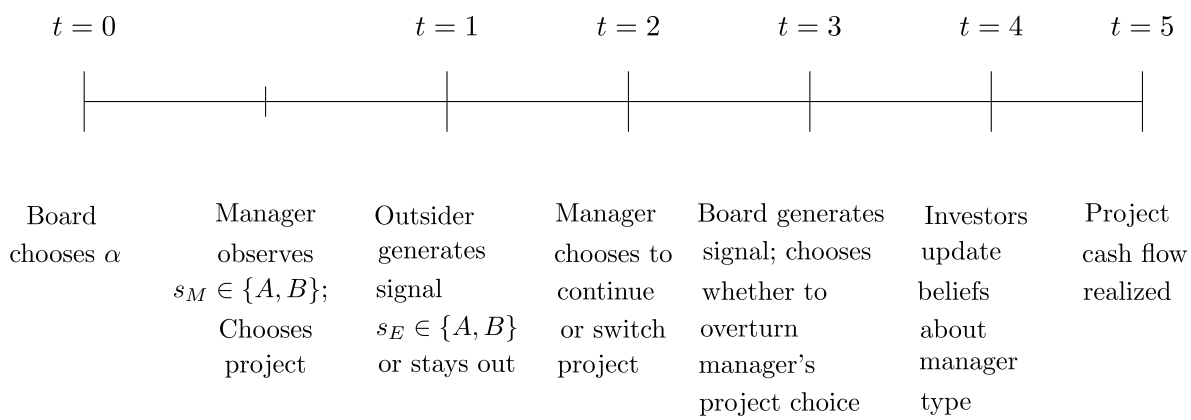
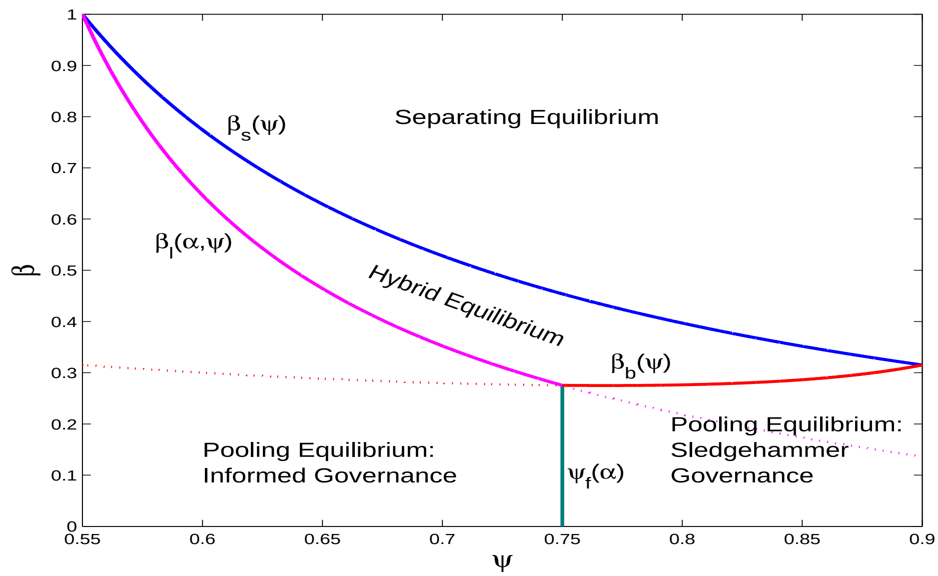


Figure 1 :

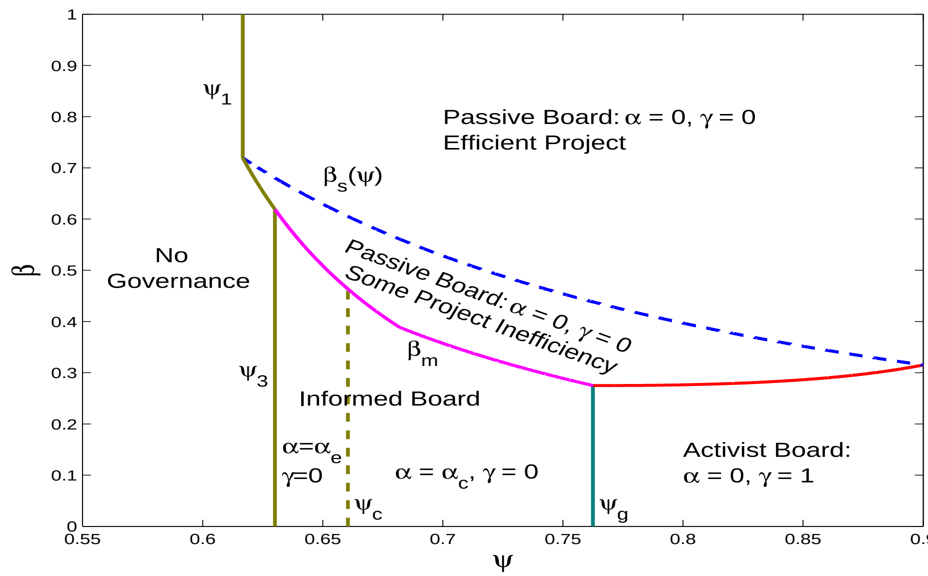
Sequence of events



This figure represents the equilibria we consider at time 2, for different values of ψ and β. The other parameters used to generate the figure are $\theta_H = 0.9, \theta_L = 0.55, q = 0.4$, and $\alpha = 0.5$.

Figure 2 :

Equilibria in the continuation game at time 2



This figure represents the equilibria that occur in the overall game for different values of the parameters ψ and β. The other parameters are $\theta_H = 0.9, \theta_L = 0.55, q = 0.4$, $c(\alpha) = 0.1\alpha^5$, and $\kappa = 0.04$.

Figure 3 :

Equilibria in the overall game for different values of β and ψ

Table 1 :

Model variables

θ_i	Accuracy of manager signal; $\theta_H > \theta_L \geq \frac{1}{2}$.
ψ	Accuracy of outsider's signal; $\theta_L < \psi < \theta_H$.
α	Informativeness of board's signal about manager.
$c(\alpha)$	Board's investment in screening at time 0.
η	Fraction of firm owned by outsider.
$\tilde{\kappa}$	Cost to outsider of generating a signal.
κ	Net cost to outsider of generating a signal ($\tilde{\kappa}/\eta$).
s_M	Manager's signal about state at time 0.
s_E	Outsider's signal about state at time 1.
s_B	Board's signal about the manager's type at time 2.
σ_H	Probability high-type manager fights.
σ_L	Probability low-type manager fights.
γ	Probability that board overturns on obtaining signal H.
v	Cash flow from project.
β	Weight on firm value in manager's preferences.
μ	Investors' posterior probability (at time 4) that manager has high type.

Table 2 :

Effect of a reduction in κ, the net cost to the activist of generating a signal

	Reputational Concerns	
	Severe (β low)	Mild (β high)
Activist has noisy information (low ψ):		
Activist	Enters more often	Continues to enter
Board	Increases intervention	Remains passive
Low-type Manager	Fights more often	Continues to concede
Activist has precise information (high ψ):		
Activist	Continues to enter	Continues to enter
Board	Remains passive	Remains passive
Low-type Manager	Continues to fight	Continues to concede