Optimal Corporate Governance in the Presence of an Activist Investor*

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June, 2011

*We thank Anat Admati, Sugato Bhattacharyya, Philip Bond, (especially) Alex Edmans, Giovanni Immordino, Paolo Fulghieri, Milt Harris, TJ Liu, Abhiroop Mukherjee, Amit Seru and participants at seminars at Carnegie Mellon, Chicago Booth, CSSSC Kolkata, Michigan, Stockholm School of Economics, Texas, Toronto, UBC and Wharton and the Caesarea Center, China International, FEA, FIRS, and Paris Spring Corporate Finance conferences for helpful comments.

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Abstract

We provide a model of governance in which a board arbitrates between an activist investor and a manager. Reputational concerns make the manager reluctant to implement a change in firm strategy, creating an agency conflict. Board arbitration creates a certification effect; if the agency conflict is moderate, greater intervention by the board leads to worse manager behavior. The optimal level of internal governance as supplied by the board depends on both the severity of the agency conflict and the strength of external governance. With weak external governance, the board commits to an interventionist policy to induce participation from the activist, and internal and external governance are substitutes. With strong external governance, the board relies to a greater extent on the activist's information, so internal and external governance are complements.

1 Introduction

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.[1] Rather, they must rely on persuasion and the firm's internal governance mechanisms to implement changes. 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? We argue that the possibility of disputes between an activist shareholder and management creates a natural but novel role for the board of directors: It functions as an arbitrator between different stakeholders who wish to take the firm in different directions. We analyze a model in which a board recognizes that an activist shareholder may exert discipline on a manager and chooses an appropriate level of internal governance.

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 paper 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.

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 and embarks on a project. The precision of the signal depends on the manager's ability, which can be high or low. Then, an outside investor decides whether to generate information about

[1]In typical examples, in 2005 MLF Investments (which owned approximately 10% of the shares) persuaded Alloy, Inc. to spin off its merchandise business, and 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. Gillan and Starks (2007) document several additional sources of shareholder activism, as well as its increased incidence over the years.

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 of the game, it determines a level of ongoing screening over the manager. At a later stage, its screening technology yields information directly about the type of the manager. 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.

Ours is not the first paper to argue that more active board governance can worsen agency conflicts. Burkart, Gromb and Panunzi (1997) show that intervention by a board to limit a manager's private benefits consumption 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. In all of these models, the board faces a tradeoff: solving one problem makes another problem worse. Our model is unique in that there is no tradeoff: more intensive governance to prevent distortions created by the manager's reputational concerns worsens the very agency conflict it is intended to solve. This suggests that, in contrast to other agency problems, intensive governance by the board may be counter-productive when it comes to solving agency problems driven by reputational concerns.

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). Further, Boot (1992) demonstrates that a manager who has purchased assets will not divest often enough. In contrast to our results on the effects of intensive internal governance, he shows that the threat of a corporate raider taking over the firm can mitigate the agency conflict and induce divestitures.[3]

The second contribution of the paper comes from analyzing the interaction between internal governance and external governance as supplied by an activist. Since both internal and external governance in our model discipline managers, one may expect them to be natural substitutes (see, for example, Fama, 1980, Fama and Jensen, 1983, and Williamson, 1983). However, the two are in fact natural complements. More precise information from the activist makes it more valuable to identify and overrule a low-type manager. This makes the optimal investment in the board's signal higher. Indeed, they function as substitutes only when the board departs from the cash-flow maximizing level of governance. When the precision of the activist's signal is low, her expected payoff from generating a signal is low. The board can improve her incentives to enter by committing to use it more often, which it accomplishes by over-investing in internal governance (i.e., investing more than it would if the activist's entry could be taken as given). As the precision of the activist's signal improves, a smaller over-investment is needed to induce the activist to enter.[4]

Other work has shown that two governance mechanisms can be complements. For example, Acharya, Myers and Rajan (2010), suggest that governance by the board complements governance from subordinates within the firm. Immordino and Pagano (2009) show that the actions of a board can sometimes complement the actions of an oustide auditor. To our knowledge, ours is the first theoretical paper to focus on the relationship between internal governance and external governance supplied by an activist investor.

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 paper shows

[3]Shleifer and Vishny (1992) present evidence that firms divest more assets after they are acquired in a hostile takeover. In a related vein, Weisbach (1995) presents evidence that firms divest more assets after a change in management. More recently, Jin and Scherbina (2011) show that mutual funds tend to sell losers (stocks that have declined in value) only after a change in fund manager.

[4]Empirical results on the relationship between internal and external governance are mixed. For example, Mayers, Shivdasani and Smith (1997) find that mutual insurance companies, which are hard to take over, have more outside directors than stock insurance companies, suggesting that internal governance is a substitute for external governance. Ferreira, Ferreira and Raposo (2010) find that board independence is negatively related (and hence a substitute) to the informativeness of a firm's stock price, which is a proxy for external governance. Brickley and James (1987), on the other hand, find that banks in states that prohibit takeovers have fewer outside directors, suggesting that internal and external governance are complements.

that an activist's ability to influence firm decisions can both depend on and affect a firm's internal governance policies. Among other things, this suggests that empirical research on how investor activism creates value should take account of its indirect effect on internal governance policy.[5]

Finally, our paper 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 (2009), who show that activist shareholders should not 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 paper is organized as follows. The model is presented in Section 2. In Section 3, 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 4 analyzes the equilibrium of the entire game. We comment on some features of our model and discuss alternative modeling assumptions in Section 5. In Section 6, we present some of the testable hypotheses of our model. Section 7 concludes. All proofs are relegated to the Appendix.

2 Model

A publicly-traded firm faces a choice between two mutually exclusive projects, A and B. A project here 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 $\frac{1}{2}$.

The firm is operated by a manager who has a type θ_H with probability q and θ_L with probability $1-q$. The manager privately knows his own type. At time 0, the manager observes

[5] Admati and Pfleiderer (2009), Edmans (2009) and Edmans and Manso (2009) 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.

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, both managers have informative signals, with the high type having a more precise signal. After observing his signal, the manager chooses one of the two projects.

At time 1, an outsider chooses whether to generate a signal $s_E \in \{A, B\}$ about the state. The outsider is a potential activist. Her decision is modeled in Section 4. The precision of her signal is $\text{Prob}(s_E = k \mid x_k) = \psi$ for $k = A, B$. Further, $\theta_L < \psi < \theta_H$, so the outsider's signal is less precise than that of a high-ability manager but more precise than that of a low-ability manager. Thus, if the signals of the manager and outsider disagree, the first-best outcome accords with the manager's signal if the manager has high ability but with the outsider's signal if the manager has low ability. At time 2, regardless of the outsider's decision, the manager can continue with the project he chose at time 0 or switch to the other project. If the outsider has generated a signal, the manager observes its realization.

At time 3, the board obtains a signal $s_B \in \{L, H\}$ directly about the manager's ability. We assume that $\text{Prob}(s_B = H \mid \theta_H) = 1$ (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 signal is completely uninformative when $\alpha = 0$ and becomes fully informative as α approaches 1. The board also observes the manager's actions and whether an outsider has entered. Using all its information, it decides whether to uphold the manager's decision or implement the alternative project. The board chooses α, the precision of its own signal at time 0, before the manager moves. A screening level of α entails an investment or cost of $c(\alpha)$. We model the board's decision in greater detail in Section 4.

At time 4, investors in the broader market form posterior beliefs about the type of the manager. Let μ denote the posterior probability at time 3 that the manager has type θ_H, and In forming their beliefs, investors observe the actions of the manager, outsider, and board, but not the signals. Finally, at time 5, the cash flow from the project is realized as either 0 or 1. Let v denote this cash flow. Without loss of generality, we normalize the discount rate to zero. The timing of events is summarized in Figure 1.

The project in the model is a long-term project, whose outcome is not known in the short-run. However, the manager's labor market opportunities depend on investors' short-

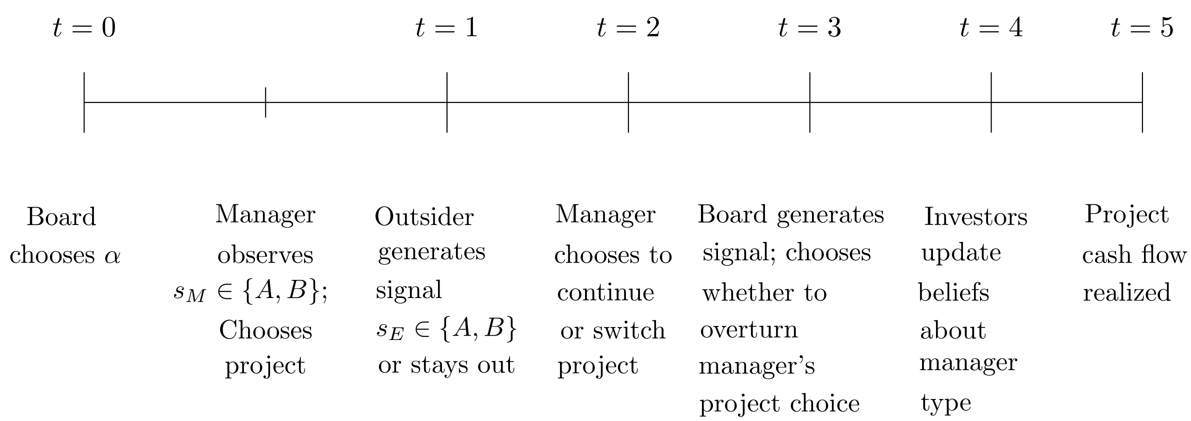


Figure 1: Sequence of events

run beliefs over his ability.[6] Specifically, the manager's payoff is

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

where $\beta \in (0, 1)$ is a parameter capturing the severity of the agency conflict in the firm (a lower β implies a more severe agency conflict) and μ denotes investors' posterior beliefs.[7] The assumption of linearity is for convenience only. The board, on the other hand, represents shareholders and therefore cares only about the overall value of the firm. Thus, the board's payoff at time 0 is $U_B = v - c(\alpha)$. At time 3, $c(\alpha)$ is sunk and the board maximizes its expectation of v.

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 $s_E \neq s_M$

[6] For example, if the manager were to leave the firm before time 5, his compensation in the new job would depend on his perceived ability (see, e.g., Harris and Holmström, 1982).

[7] 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.

(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 3, 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.

3 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 paper, we describe equilibria in the continuation game at time 2 only based on the strategies when the signals of manager and board 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, and let $\delta_i = \text{Prob}(x_A \mid \theta_i, s_M = A, s_E = B)$. Then, δ_i also represents the expected cash flow from project A in this case, and the expected cash flow from project B is $1 - \delta_i$. Further, $\delta_L < \frac{1}{2} < \delta_H$. Thus, when $s_E = B$, the first-best outcome is achieved by a high-type manager continuing with project A, and a low-type

θ_i	Accuracy of manager signal; $\theta_H > \theta_L \geq \frac{1}{2}$.
ψ	Accuracy of outsider's signal; $\theta_L < \psi < \theta_H$.
$c(\alpha)$	Board's investment in screening at time 0.
α	Informativeness of board's signal about manager.
s_M	Manager's signal about state at time 0.
s_E	Outsider's signal about state at time 1.
σ_H	Probability high-type manager fights.
σ_L	Probability low-type manager fights.
γ	Probability that board overturns on obtaining signal L.
v	Cash flow on project.
β	Weight on firm value in manager's preferences.
μ	Investors' posterior probability (at time 4) that manager has high type.

Table 1: Table of notation

manager switching to project B.

In general, the high-type manager has a stronger incentive to fight than the low-type manager. The expected cash flow from the project is $1 - \delta_i$ if type θ_i concedes. If $\gamma < 1$ and the manager fights, the expected cash flow is between δ_i and $1 - \delta_i$. The first-best cash flow is δ_i when the manager has the high type and $1 - \delta_i$ when he has the low type. Hence, it is costly for the high-type manager to concede and for the low-type manager to fight.

We show 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 $\gamma = 1$, $\sigma_H = \sigma_L$.

The equilibrium in which both types of manager concede with probability one (i.e., $\sigma_H = \sigma_L = 0$) is sustained by an off-equilibrium belief that a manager who fights is of low type with sufficiently large probability. However, 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).[8] Therefore, going forward, in considering equilibria in which $\gamma < 1$, we focus on the case $\sigma_H = 1$; that is, the high-type manager fights with probability one.

There are four different possible equilibria. If β is high, the manager's objective function is weighted towards 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.[9]

Conversely, when β is low and $s_E = B$, the low type has an incentive to mimic the high type by fighting. 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 is

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

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

[8] 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.

[9] 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.

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 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. 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. *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 $s_E \neq s_M$. We show that the board prefers the separating or hybrid equilibrium to the pooling equilibrium with sledgehammer governance.

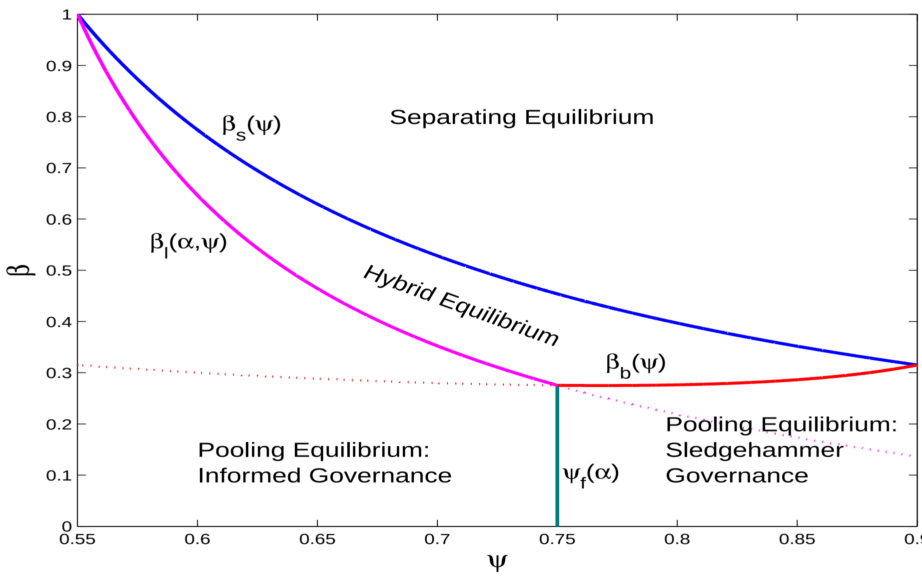
Lemma 2. *Suppose $\psi \geq \psi_f(\alpha)$. Then, the board's payoff in a pooling equilibrium with sledgehammer governance is lower than in a separating equilibrium or a hybrid equilibrium, whenever one of the latter two exists.*

Therefore, 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. Such an increase provides outsiders with more information about the manager, but does not affect the manager's own information. 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



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

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

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

From this expression, it follows that σ_L increases in α and decreases in ψ.

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 acitons 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.

4 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. The outsider is endowed with a fraction η of shares in the firm.[10] She can generate a signal about the future state. The signal has precision ψ and 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. 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:

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

These thresholds allow us to identify the circumstances under which the activist will enter.

[10] An equivalent assumption is that the outsider can purchase a fraction η of the firm's shares in the market at a price which does not anticipate her entry. Under SEC regulations, any stake of greater than 5% must be disclosed.

Lemma 3. *(i) Suppose* $\kappa \leq \frac{\alpha q(1-q)(\theta_H - \theta_L)}{q+(1-\alpha)(1-q)}$*. Then, it is optimal for the outsider to enter if* $\psi > \psi_2(\alpha)$ *and stays out if* $\psi < \psi_1$*. 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 ancticipates 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, it 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 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.

Lemma 4. *Suppose the activist 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:

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

Define $\beta_m(\psi) = \max\{\phi(\psi), \beta_c(\psi), \beta_b(\psi)\}$. As we show in the proof of the next proposition, 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 $\gamma = 0$.

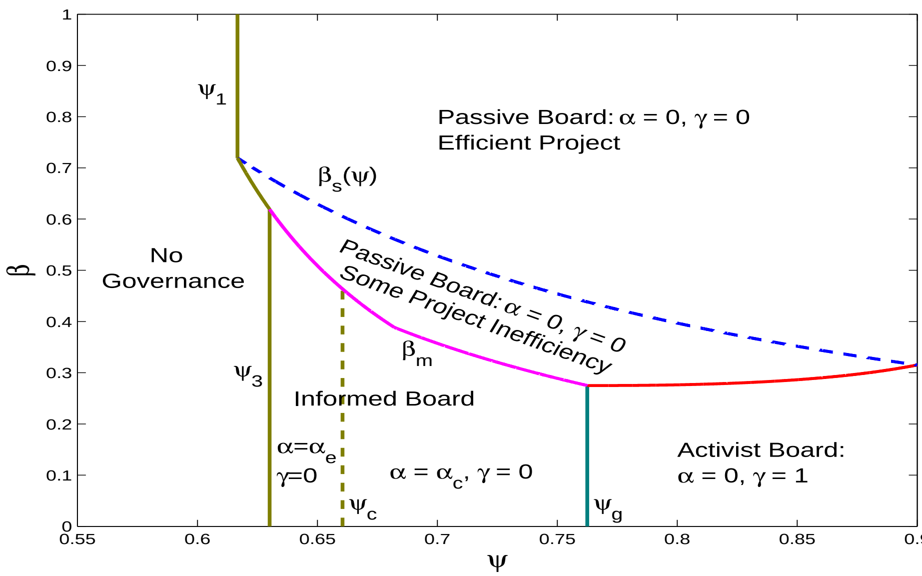
(b) If $\psi \in (\psi_g, \theta_H)$, the board chooses $\alpha = 0$. The outsider enters and a pooling equilibrium with sledgehammer governance is played at time 2, with $\gamma = 1$.

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 purely 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



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: Equilibrium in the Overall Game for Different Values of β and ψ

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.

4.1 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, $\alpha_e < \alpha_c$. The board no longer has to choose a higher α than optimally utilizes the outsider's information in order to induce the outsider to enter. Instead, 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. *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 (2004) 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.

5 Comments on Model Features

In this section, we comment on some features of our model, and 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 of the paper. 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 in our model.

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 (8), 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 reinformation 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.

6 Empirical Implications

We begin by describing proxies for the key variables in our model, β, ψ, α and σ_L. As the agency friction is driven by reputational concerns in our model, its strength is captured by standard proxies for reputational concerns such as manager age and manager tenure.[11] We describe our hypotheses using manager age, and then comment on tenure. Younger managers are more likely to worry about how they are perceived by outsiders, since they do not already have established reputations, whereas reputational concerns are less of an issue for older managers. Therefore, β decreases with age.

Good proxies for internal governance strength (α) in our model include the number of independent directors on a company's board, board size, and the number of board meetings that take place at a firm per year. More independent directors are more likely to scrutinize the manager (perhaps because they face their own reputational concerns). Larger boards are

[11] See, for example, Gibbons and Murphy (1992), Chevalier and Ellison (1999), and Hong, Kubik and Solomon (2000).

likely to leave information about the manager more diffuse. Boards that meet and discuss management more often are more likely to be able to assess managerial skill.

A natural way of measuring the strength of a firm's external governance (ψ) is to look for the presence of shareholders who are known activist investors. For example, Cohn, Gillan and Hartzell (2011) use 13(f) institutional holdings data to identify the presence of institutional investors who are members of sharkrepellent.net's "SharkWatch50" investors, a listing of known activist investors. Based on the prior track record of these investors, a continuous variable to capture their informational skills can be constructed. Their experience with the industry will also be a proxy for ψ. Another proxy for the strength of external governance that is constant cross-sectionally across firms but shows consideraible time series variation is is the size of the hedge fund industry (either in terms of number of hedge funds or dollars under management). Hedge funds are frequent participants in investor activism campaigns.

In our model, the high-type manager always fights. Therefore, σ_L can be directly proxied by the incidence of fights between managers and activists. For every activist campaign, one can construct an index variable that has value 0 if the manager cooperates and value 1 if the manager fights. For example, if the campaign reaches the stage a of a proxy battle, the variable is set to 1 (the manager chose to fight).

Our first hypothesis relates α and β. Our model implies that α is higher when β is lower. Further, unlike with an entrenchment story, the model predicts that once reputational concerns fall below a threshold, depicted by β_m in Figure 3, α falls discontinuously, with the board becoming completely passive.

Hypothesis 1. *(i) All else equal, the strength of internal governance decreases with manager age until managers are old.*

(ii) For old managers, internal governance is low and invariant to age.

Therefore, in a regression of internal governance strength on manager age and other controls, the coefficient on manager age should be negative. For managers in, say, the top quartile of age, the level of intervention should be approximately flat in age. Note that "all else equal" is an important caveat, as endogenous attrition of managers through time may lead to survivor bias.

When the activist is present, the strength of internal governance is a non-monotonic function of the strength of external governance. When the activist's information is noisy, the board too is active as it tries to induce the activist to play a role. As the activist's information quality improves, the board can reduce its investment. At a certain point, the board once again starts to invest more in internal governance in order to better exploit the activists information.

Hypothesis 2. *All else equal, for managers with a severe agency conflict (i.e., young managers):*

(i) In the cross-section, the strength of internal governance has a U-shaped relationship with the activism experience of the firm's institutional shareholders.

(ii) The strength of internal governance has a U-shaped relationship with the size of the hedge fund industry.

The U-shaped relationship is tested by including both the variable and its square in regressions. The coefficient on the variable itself should be negative and that on the squared term should be positive.

Our model predicts a hybrid equilibrium when the agency conflict is moderate. In such an equilibrium, the low-type manager fights less often as either β or ψ increase. The high-type manager always fights, so put together we have the following hypothesis.

Hypothesis 3. *All else equal, among managers who face moderate agency conflict (i.e., middle-aged managers), disagreements with outsiders:*

(i) Decrease with age.

(ii) Decrease with the activism experience of the firm's institutional shareholders and the size of the hedge fund industry.

This hypothesis can be tested with a logistic regression of whether a manager fights if an activist arrives. In this regression, the coefficient on age should be negative, and the coefficients on the activism experience of the firm's institutional investors and the size of the hedge fund industry should also be negative.

If manager tenure is used as a proxy for the strength of the agency conflict, our predictions are more subtle. While managers with less tenure have less of a track record and are therefore also more likely to worry about how they are perceived by outsiders, a newly-minted CEO does not have prior strategic decisions he needs to stand by. Once he has been on the job for a while, the agency conflict is more severe. In the long-term, if he stays on the job, his reputation is well-established so the agency conflict diminishes. As a result, our hypotheses above apply directly only to managers who have sufficient tenure on the job, at which point we can think of β being high and decreasing with tenure. For managers new to the job, the level of internal governance is likely invariant to tenure for the first few years.

7 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 exacerbates the misbehavior of the manager, thereby worsening the agency conflict, so that 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 $\mu_c = \text{Prob}(\theta = \theta_H \mid s_M \neq s_E, \text{ Manager concedes})$, $\mu_o = \text{Prob}(\theta = \theta_H \mid s_M \neq s_E, \text{ Manager fights and board overrules})$, and $\mu_s = \text{Prob}(\theta = \theta_H \mid s_M \neq s_E, \text{ Manager fights and board allows manager's project to stand})$.

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

$$\beta(1-p_L)(2\delta_L - 1) + (1-\beta)[p_L\mu_o + (1-p_L)\mu_s - \mu_c](\theta_H - \theta_L) \quad \geq \quad 0. \tag{5}$$

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

$$\beta(1 - 2\delta_L) \quad \geq \quad (1-\beta)(\theta_H - \theta_L), \tag{6}$$

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 (5), it is a best response for him to mix between fighting and conceding if and only if

$$\beta(1-\alpha)(2\delta_L - 1) + (1-\beta)\left[\frac{(1-\alpha)q\lambda_H}{q\lambda_H + (1-\alpha)(1-q)\lambda_L\sigma_L}\right](\theta_H - \theta_L) \quad = \quad 0. \tag{7}$$

Simplifying and solving for σ_L, we obtain

$$\sigma_L \quad = \quad \frac{q\lambda_H}{(1-\alpha)(1-q)\lambda_L}\left[\frac{1-\beta}{\beta}\,\frac{\theta_H - \theta_L}{1 - 2\delta_L} - 1\right]. \tag{8}$$

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 $\mu_s = \frac{q\lambda_H}{q\lambda_H+(1-\alpha)(1-q)\lambda_L} > \mu_c$.

Buidling 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 concededs. 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

$$q\lambda_H(2\delta_H - 1) \geq (1-q)(1-\alpha)\lambda_L(1-2\delta_L). \tag{9}$$

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 (9) may be re-written as $q(\theta_H - \psi) \geq (1-q)(1-\alpha)(\psi - \theta_L)$, or

$$\psi \quad \leq \quad \frac{q\theta_H + (1-q)(1-\alpha)\theta_L}{q+(1-q)(1-\alpha)} \quad \equiv \quad \psi_f(\alpha). \tag{10}$$

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 $\mu_f(\alpha) \le \frac{1-2\delta_L}{2(\delta_H - \delta_L)}$; that is, if and only if $\psi \ge \psi_f(\alpha)$. 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 (8). 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 $\psi \le \psi_f(\alpha)$ 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 (8). From equation (8), $\sigma_L(1-\alpha) = \frac{q\lambda_H}{(-q)\lambda_L}\left[\frac{1-\beta}{\beta}\ \frac{\theta_H-\theta_L}{1-2\delta_L} - 1\right]$. 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 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

$$F \quad = \quad q[\theta_H - (1-p_H)(\theta_H - \psi)] + (1-q)[\theta_L + p_L(\psi - \theta_L)]. \tag{11}$$

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 (11) 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 (8). 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 exactly indifferent between intervening and not.

Now, keeping ψ fixed, consider an increase in β. From equation (8), 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

$$\Pi(\alpha) \quad = \quad F - c(\alpha) \quad = \quad q\theta_H + (1-q)\psi - (1-q)(1-\alpha)\sigma_L(\psi - \theta_L) - c(\alpha). \qquad (12)$$

From the expression for σ_L in equation (8), 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 (11), $p_H = 1$ and $p_L = \alpha$. Substituting in these values, the payoff of the board in this equilibrium may be written as

$$\Pi(\alpha) \quad = \quad q\theta_H + (1-q)\psi - (1-q)(1-\alpha)(\psi - \theta_L) - c(\alpha). \tag{13}$$

The first-order condition with respect to α is

$$c'(\alpha) \quad = \quad (1-q)(\psi - \theta_L), \tag{14}$$

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

$$\Pi(\alpha_c) \quad = \quad q\theta_H + (1-q)\psi - (1-q)(1-\alpha_c)(\psi - \theta_L) - c(\alpha_c). \tag{15}$$

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

$$\tilde{\Pi}(0) \quad = \quad q\psi + (1-q)\psi \quad = \quad \psi. \tag{16}$$

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 2: Board payoff expressions

Use preliminary step 1 with the appropriate values of p for each kind of equilibrium. Then, for a fixed value of α, the payoff to the board in each of the different possible equilibria is denoted 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 $F_Y(\alpha, \psi) = q\theta_H + (1-q)\left[\psi - \frac{q\lambda_H}{(1-q)\lambda_L}\left\{\frac{1-\beta}{\beta}\frac{\theta_H - \theta_L}{1-2\delta_L} - 1\right\}(\psi - \theta_L)\right] - c(\alpha)$. Observe that in every equilibrium in which the outsider enters, the payoff is strictly increasing in ψ.

Preliminary step 3: 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 4: 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,

$$\beta_m = \begin{cases} \phi(\psi) & \text{if} \quad \psi \leq \psi_d \\ \beta_c(\psi) & \text{if} \quad \psi \in (\psi_d, \psi_g) \\ \beta_b(\psi) & \text{if} \quad \psi \geq \psi_g, \end{cases} \tag{17}$$

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 just 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. ■

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